

MIDDLE SCHOOL STUDENTS' PERCEPTIONS
OF THE TEACHING AND LEARNING INITIATIVE:
LAPTOPS FOR EVERY STUDENT

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(ABSTRACT)

Henrico County Public Schools (HCPS) deployed laptop computers to over 23,000 middle and high school students in the division. Access to the computer network was through a wireless system that provided convenient and unlimited classroom arrangements without the restrictions required with cabled computer systems. Because each student was assigned a computer and assisted in obtaining low cost Internet service at home, this initiative also provided 24-hour access to digital information. This program was called the Teaching and Learning Initiative (TLI). Division leaders were striving to utilize this initiative not only to provide its students and teachers with 21st-century technologies that included access to the latest digital information, but also to change pedagogical practices in HCPS to a student-centered model. The purpose of this study was to determine the perceptions of students about the influence that this initiative has had on their classroom experiences. Secondary purposes included student perceptions of pedagogical changes in instruction, information acquisition, and recommendations that students would have for improving the TLI. Literature on computer use in schools is reviewed as it related to the HCPS' laptop initiative, as well as the importance of giving students a voice in change processes. Through a qualitative analysis of interviews with student focus groups from six of the 11 middle schools in the division, middle school students' perceptions of their experiences in the TLI were obtained. Analysis of focus group interviews, classroom observations, and students' logs of classroom activities provided triangulation. Data were analyzed inductively and results emerged organized by subcategories, categories, and themes. Results were reported in narrative form and explanatory tables, with an emphasis on findings related to the research questions of this study focusing on students' experiences in the TLI. Conclusions derived from this study were: Middle school students were keenly aware of their

educational experiences and clearly articulated their thoughts; students' educational experiences changed during the TLI; some elements of constructivist classrooms were supported by laptop use, but not collaborative work; students obtained information from the Internet and websites, using textbooks less; computer reliability was a concern; cost to students for repairs raised equity issues; and benefits of the TLI went beyond the classroom.

DEDICATION

This work is dedicated to my wife, Beth Fry Chamberlain
and our wonderful children, Joshua and Erin, whom I cherish.

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During the Virginia Tech Orientation to Residency, Professor Parson talked about the doctoral student's responsibility in completing the dissertation and offered a 10-word sentence comprised of two-letter words, "If it is to be, it is up to me." Eloquent, but it was only partially true. Absent the help of many people, this study would not have been completed.

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CHAPTER 1

BACKGROUND AND STATEMENT OF THE PROBLEM

The Teaching and Learning Initiative (TLI) for Henrico County Public Schools (HCPS) in Richmond, Virginia is the first division-wide laptop deployment in the country.

[It is] a major test of the effectiveness of wireless technology. It is based on the desire to help all students--especially those who don't have computers at home. It is also a lesson in the perils and benefits of jumping headfirst into an education initiative. (Cook, 2002, p. 13)

Given the unique nature of this laptop initiative, research into its effectiveness and its impact on teaching and learning can provide information for HCPS and other school divisions throughout the country who are considering similar initiatives.

Formerly a high school teacher and high school assistant principal in HCPS, the researcher was immersed in the first 18 months of the high school initiative. Now a principal of a HCPS middle school where the laptops have just been introduced, the researcher believes that a study of the TLI at the middle school level is important because little has been documented about students' response to this type of change in their educational environment.

Purpose and Research Questions

The purpose of this study is to give middle school students' in the school division a voice in describing their experiences in the TLI, for their perceptions may be crucial to understanding what is happening in the classrooms. A student, involved in a multi-school study aimed at improving schools, provides an example of the importance of student voice. In describing her experience as a member of the Restructuring Collaborative, a national network of staff from regional educational laboratories and educators and students from throughout the United States, Maryanne, a student from Oregon said, "It was very flattering, but at the same time intimidating, to work with people who did this research as a career, people who had Ph.D.s and years of education under their belt...I realized that my opinion and results were important to the cause, I wasn't just the 'token student' on a research team" (Kushman, 1997, p. 9).

The primary research question that would guide this study is: What are middle school students' perceptions of how the TLI has affected the learning environment in HCPS? Utilizing students' perceptions, secondary questions would include: (a) Has the introduction of the TLI

created constructivist classroom activities? (b) How have student and teacher roles changed since the inception of TLI? (c) How has TLI influenced student access to information? (d) What suggestions would students make for the improvement of TLI?

Background

According to John Forsyth, President of Educational Research Service:

New models of teaching and learning are currently transforming education. These new models, grounded in authentic communication, collaboration, and investigation, are increasingly viewed as essential to raising student achievement to the levels demanded by 21st-century society...New computer and communication technologies play a key role in supporting the new models of teaching and learning. (Johnston & Cooley, 2001. p. v.)

Clearly, this is the view held by both educators and non-educators, as indicated by the billions of dollars spent annually to bring new technologies into schools across the nation. In 1983 there was approximately one computer for every 125 students in America's public schools. In 1994 our nation's schools spent more than \$3 billion dollars on computer technology, and by 1995, the ratio of students to computers was nine to one (Glennan & Melmud, 1996). By 2001, the figure for technology expenditure in U. S. schools was predicted to exceed \$10 billion (Kamp, Blohm, Tyre, Williams, & Schneiderman, 2000).

Research on how effective new technologies are in changing and improving the way students learn and teachers teach is important, as technology becomes an even greater part of the educational landscape. A review of education reforms and learning theories set the framework for the importance of understanding the ways in which technology impacts education today.

Reform Efforts

The publication of *A Nation at Risk* (National Commission on Excellence in Education, 1983) brought to the forefront the perception that our nation's schools were failing. Comparisons to other nations placed the achievement of U.S. students below the achievement of students from many other modern nations. The efforts to reform our educational system have involved a number of strategies.

Upon the heels of *A Nation at Risk* followed the Excellence Movement, a flurry of educational reforms.

The Excellence Movement offered a consistent direction for reform. But it was not a new direction. Schools simply needed to do MORE! Students needed to earn more credits for

graduation in courses that were more rigorous and required more homework. Schools needed to add more days to the school year and lengthen the hours in the school day. Schools needed to test students more frequently and raise teacher expectations before offering employment and granting tenure. The reforms of the Excellence Movement simply called for an intensification of existing practices. They contained no new ideas. (DuFour & Eaker, 1998, p. 3)

Schools were still not receiving high marks even after 8 years of effort. Reflecting on the accomplishments of the Excellence Movement, Edward Fiske, author of *Smart Schools, Smart Kids*, commented, “We came to a startling conclusion. There weren’t any” (1991, p. xiv).

A second set of initiatives collectively called the Restructuring Movement followed in the 1990s (DuFour & Eaker, 1998). Part of this movement included President Bush’s Goals 2000; things schools were to accomplish by the year 2000. Some aspects of Goals 2000 were that all children would start school ready to learn, high school graduation would reach 90%, U.S students would be first in the world in science and math, all adults would be literate and able to compete in the global economy, and all schools would be drug free (United States Department of Education, 1994). Few, if any, of these goals were met by 2000.

Our schools now face the federally mandated No Child Left Behind Act (NCLB, 2001) legislation. Like Goals 2000, NCLB legislation has put stringent requirements on schools to improve. The intent of the legislation is admirable: No teacher or school wants to leave *any* child behind. The difference is that failure to achieve the NCLB goals, including 100% high school graduation, could result in the loss of accreditation, the loss of funding, and even the loss of school district control over its educational system. It is apparent that congress believes that educators just need more motivation to succeed. However, “principals and teachers have always been motivated to ensure student success; they need better methods and materials, not just the consequences for failure” (Slavin, 2001, p. 23).

Teaching and Learning Methods

Schools may be experiencing less success than desirable due to the methods of teaching employed. Traditional models of learning involve rote memory, “in which students memorized predetermined facts disseminated by their teachers in contrived contexts within the classroom. However, our growing understanding of cognitive science is teaching us the limitations of these

traditional approaches” (Johnston & Cooley, 2000, p. 2). The result of this style of learning is recall of facts rather than understanding.

Students may learn at the next level, which involves technical knowledge (Caine & Caine, 1997). With technical knowledge students learn basic ideas, principles and concepts of certain subjects. Unfortunately, they frequently are not shown how to apply that knowledge in other contexts and are unable to use it in other ways than were taught in the class. Thus a successful student in a French class may still have problems finding his way around Paris (Caine & Caine, 1997).

Cognitive research over the last few decades has produced a great deal of information about how people learn. Simply using traditional pedagogy more vigorously will not increase the achievement levels that our society now demands (Johnston & Cooley, 2000). Findings include:

- People learn best when they can construct meaning by making connections between new knowledge and what they already know. Students retain more of what they learn when instruction is linked to real-life experiences and is embedded in actual production.
- The brain is a complex system of thoughts, emotions, imagination, and physiology that constantly exchanges information with its environment. Students learn best when they are immersed in complex experiences and allowed to follow their individual interests, so that they can make connections that are meaningful to them.
- Learning is a social activity, and is heavily influenced by interaction with others. Learning activities that enable students to work together and interact with a wide range of others are likely to engage their emotions and lead to powerful learning. (pp. 10-11)

From the basic concepts of cognitive research, terms such as constructive learning, cooperative learning, higher-order thinking, authentic learning, meaningful learning, critical thinking, student-centered learning, inquiry-based learning, and problem-based learning are derived.

Because research shows that students learn better when they are engaged in more constructivist, collaborative, and meaningful activities, teacher and student roles will also change from traditional models. The teacher will become a facilitator, guide, co-learner, while the student will be an explorer, producer, and teacher or mentor to other students.

Changing Materials

The development of information technologies has been concurrent to school reform efforts and new learning theories. In the early 1970s computers were huge machines that were housed in large computer centers. By the late 1970s, a computer was small enough to fit into one large room, had 64k of memory, and had come down in cost to only \$151,000. Adding a printer, a terminal, and a disk drive, would require another \$56,000. However, by 1979, microcomputers had been developed, and entire systems could be purchased for about \$6000 (McCain & Jukes, 2001).

In the past 20 years, microcomputers have shrunk in size and cost. Tiny microprocessors are embedded in almost every device that can be controlled, timed or moved. The worlds of science, medicine, and business have changed in tremendous ways. Education, however, seems to be lagging behind. Even though teachers may use computers and other modern technologies, it is questionable whether they provide genuine change in teaching and learning methods. McCain and Jukes (2001) asked, "is technology really changing our lives in fundamental ways, or is it merely being used to speed up old and outdated ways of doing things?" (pp. 8-9)

Intersection of Change

The demands for school reform, current learning theories, and technological developments have intersected at an appropriate time. Educators interested in making real changes in teaching and learning will utilize the technologies available to schools today. Use of the Internet is already making textbooks secondary sources of information that are obsolete before they are printed. Multimedia projects by students and interactive software programs have created an exciting new environment for students and teachers. Student learning is enhanced through communication with the world outside the school.

Beyond the classroom, where authentic work can take place...Technology provides a venue for students to work as adults on real-life problems, using the Internet to gather and manipulate information and conduct extended investigations through collaborations. Essentially, technology allows them to find individual pathways to learning. (Johnston & Cooley, 2001, p. 3-4)

Schools face issues of accessibility and equity in utilizing technology. Often computers are located in several labs throughout the school, which raises issues of scheduling and availability. Some schools have added several computers to each classroom and set up modular

learning activities. Each case presents limitations that may prevent teachers from making significant changes in their instructional strategies. Equity is also an important consideration in technology use. Schools are often composed of students whose parents have various educational backgrounds and socioeconomic statuses. Some students go home to state of the art computers and Internet access, while others' use of computers is limited to access only at school. One solution that a number of schools are currently using is the introduction of personal computers for each student.

The Teaching and Learning Initiative

Henrico County Public Schools in the suburbs of Richmond, Virginia began an initiative to change the way students are educated in its schools. The Teaching and Learning Initiative (TLI) involved a partnership with Apple Computers in which 23,000 laptop computers would be deployed to all its high school and middle school students, as well as all the teachers in those schools. Plans may eventually include students in elementary grades. Steve Jobs, Apple's CEO said of the initiative:

This is mammoth-the single largest sale of portable computers in education ever. Apple is thrilled to partner with Henrico County Public Schools in their revolutionary initiative because when every student and teacher has access to wirelessly-networked mobile computing, learning reaches far beyond the classroom. (News Release, 2001, p. 1)

Early studies on the high school students' first year in the TLI indicate that students have experienced changes in their learning environment. Extending the research to the middle school will add valuable illumination of students' experiences for that age group.

Overview of the Study

The researcher focused on student perceptions in order to obtain data about their experiences in the TLI. Student impressions were important because students are the beneficiaries of efforts made through HCPS' program. Studies in schools that do not include data generated from students would be lacking in an important source of information. In his book, *In Search of Excellence*, Peters (1982) described several important characteristics of successful organizations and businesses. One attribute common to these organizations was that changes in practices were made close to the consumer. Students are the customers and their perceptions are essential.

In *Look Who's Talking Now* (Kushman, 1997), the researchers indicated that student voice was often overlooked by most studies. "Rare was the school that requested feedback to learn more about what students thought" (p. 101). However, from their study, student insights were valuable. "We learned that students, even at younger ages, are far more articulate and perceptive about curriculum, instruction, and their own personal learning than we thought (p. 100). Student voice therefore, should be captured in better understanding changes that may have occurred in the classroom since the introduction of the TLI.

This study of students' perceptions of the Teaching and Learning Initiative is couched within the framework of other relevant research. Literature on the effectiveness of integrating educational technologies into schools is reviewed. Other schools' efforts with laptop integration are examined as well as a study of HCPS high school students' experiences during the first year of the TLI. Relevance and importance of student voice is also explored within the literature.

Qualitative strategies are used to obtain data for this study because of how this methodology lends itself to find the depth of meaning, perceptions, and rich descriptions (Merriam, 1998) from students involved in the TLI that cannot be fully explored with other methods of research. Focus groups from six of the middle schools in the division were formed and interviews were held at each site. Triangulation of data sources were provided through interview data, classroom observations, and student-completed classroom activity logs.

The researcher was the key instrument in the handling of the data, which was analyzed throughout the process. As suggested by Rossman and Rallis (2003), analysis starts at the point that you have decided on your research questions and that, "Experienced fieldworkers tend to describe and analyze as they go" (p. 272). Data was classified into categories, which then, as Rossman and Rallis (2003) suggested could be used to identify themes that emerged. Final themes and interpretations of the data were presented in a narrative report.

The reader should be aware of the limitations of this study as there are with most endeavors that involve individuals and new programs. Although the researcher has made provisions to involve representative samples of students from the middle schools in the division for his study, it cannot be assumed that these students represent all aspects or perspectives of middle school students throughout HCPS. And, although HCPS is comprised of students from diverse groups, it cannot be assumed that HCPS students are representative of students in other parts of the state or country. Therefore, transferability of this study to other schools or divisions

with their own unique characteristics should be done judiciously. The researcher does, however, intend for this study to be a basis or beginning of understanding how some students have experienced advanced technologies in school and at home through the TLI.

Definition of Terms

Several important terms are used throughout this paper; they are defined as follows:

Constructivist Classrooms: Include activities that engage students in the learning process. Lessons are student-centered, are often interactive, and are performed in collaborative groups. Teachers are facilitators and guides, while students are explorers, teachers, and producers. Student assessment is based on performance of authentic tasks (Johnston & Cooley, 2001).

Digital Disconnect: The underutilization of current information technologies in most schools (Levin & Arafah, 2002).

iBook: A portable, laptop computer that weighs 4.9 pounds. This Apple Computer product has a rechargeable battery that can operate for approximately 5 hours depending on the application being used. It has the capability of operating in either a wireless environment or by an Ethernet connection (Apple Store, 2003).

Help Desk: A station set up in each middle and high school to provide technical assistance to students with their iBooks. Computers that need to be repaired are collected and returned here. Teachers and the technology assistant supervise this station, which is staffed by students (Kinlaw, 2003).

Virtual Share: A system where students and teachers in HCPS can share files electronically through their computers. This system is being expanded to include electronic lessons from throughout HCPS (Kinlaw, 2003).

Wireless: A setting on laptop computers, which enables users to access the network through radio signal rather than through cables (Cook, 2002; Dinnocenti, 2000; Kinlaw, 2003; Smith, 2002; Windschitl & Sahl, 2002).

Summary

The backdrop to HCPS' TLI is the advancement in wireless computer technologies, school reform expectations, and research-based learning theories. Educational leaders in HCPS expect that the integration of these new technologies will change pedagogical practices in HCPS to exhibit more modern learning theories, bringing about the reform for which its communities desire. HCPS has invested millions of dollars in acquiring laptops for each of its middle and high

school students and their teachers. This initiative may eventually include thousands students in elementary grades.

In the early stages of the TLI, this researcher believes that a qualitative study of middle school students' perceptions of their experiences in this new environment can provide valuable information for school leaders and teachers. Students are a good source of information because they are customers close to the action and, unlike some other participants in the TLI, have no reason for giving anything but honest answers and meaningful feedback.

CHAPTER 2

LITERATURE REVIEW

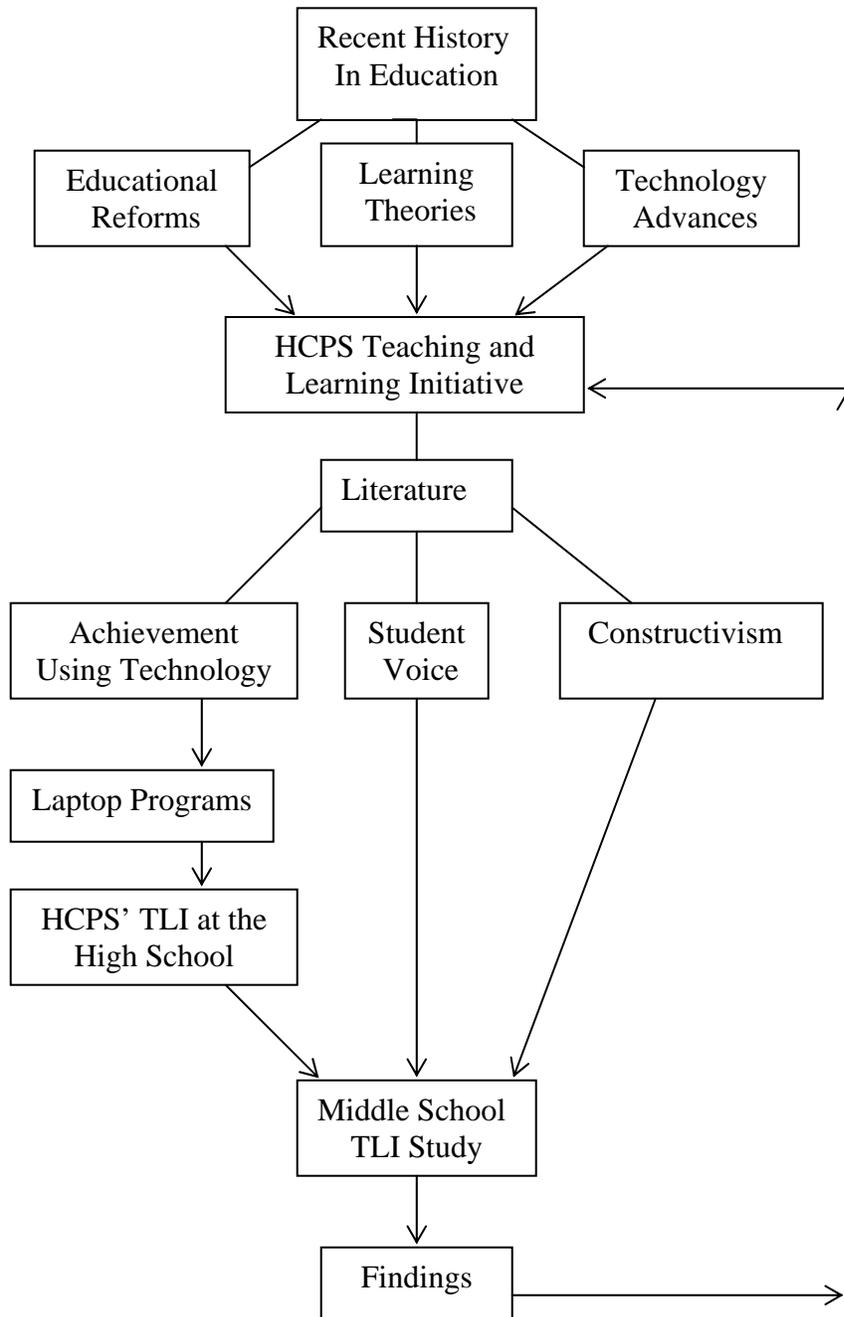
David Thornburg clearly articulates the feelings that both educators and non-educators have heard many times. “Schools that fail to adapt to the needs of the society in which they exist simply will go out of existence” (as quoted in McCain & Jukes, 2001, p. viii). Today’s society is demanding an increasing integration of technology into the schools because there is an increasing amount of technology in all areas of our lives. For that reason alone it is important for students to learn how to use technology. However, educators want to go beyond learning about technology just for the sake of knowing how to use technology. A history of the past three years of technology initiatives in HCPS begins this chapter. This is followed by an explanation of constructivism, a philosophy that is central to Henrico’s Teaching and Learning Initiative, and a review of literature as it relates to the effectiveness of technology in student achievement, findings from other laptop programs, and the rationale for giving students a voice in research. Sources used to search for literature include ERIC, Education Full Text, Dissertation Abstracts International, references contained in articles and dissertations, and personal contact with individuals who studied the TLI.

Figure 1 is a framework for the context of this study and how it fits into the literature. It essentially encapsulates Chapters 1 and 2. Three major issues, which have emerged in the last 20 years, are educational reforms, learning theories, and technology advances. TLI was implemented to address these three areas. A study of the literature includes constructivist learning theories, student achievement using technology, laptop programs, HCPS’ experience over the last two years of the TLI, and why student voice is important. This sets the stage for the middle school study of the TLI. Findings may then inform HCPS educators and make suggestions for strengthening the TLI.

A History of Technology in HCPS

Technology Beginnings

HCPS is a suburban school district in the Richmond, Virginia area with a student population of approximately 43,000 students. The school district covers areas that are both rural and highly developed. Its racial mix is 60% majority students and 40% minority students whose proportion is increasing each year and is expecting to overtake the majority by the year 2010.



Framework for Context of Study

Figure 1. A framework for the context of this study showing that the TLI is at the intersection of change fueled by reform efforts, learning theories, and technology advances. Research in technology use, constructivism, and student voice set the stage for the middle school study. Findings may lead to changes in the TLI.

Families cover the full range of socioeconomic status from impoverished to affluent.

The TLI is the largest initiative to bring technology to the classrooms in Henrico. In 1996, Henrico added five computers and a printer to each of its elementary classrooms and a single computer to each classroom in its secondary schools. In 1997, secondary schools received two computer labs that were connected for printer sharing. These labs marked the beginning of higher expectations in word processing for the writing assignments of high school students. That year, all high school juniors and seniors made at least one PowerPoint presentation as an English class requirement. Site licenses were obtained for software such as River Deep, an algebra drill program; NCS Mentor, an English writing training program; and Inspiration, a graphic organizer program.

In 1998, a computer lab designated for math use was added to each high school in response to the poor showing that students made on the state mandated Standards of Learning (SOL) tests in math across the state. Although it was only the first year of SOL testing, leaders in Henrico County were concerned that less than 40% of students passed the algebra SOL tests, while 70% or more passed science and English SOL tests (Virginia Department of Education, 1998). During that year, at least five network connections were added to each classroom in the secondary schools in anticipation of adding five computers to each classroom, similar to what was done a few years earlier in the elementary schools. These network jacks were connected to local and outside networks. The hardware connection work was often subcontracted out to private companies and was expensive and disruptive. To save costs, the county trained its own staff and students in the networking installation process at its technical schools.

Henrico's technology blueprint in 1999 called for five networked computers to be placed in each classroom in the school division. Networking costs and the limitations of five computers in each classroom raised concerns that teachers would not embrace significant change in their instructional practices. At the same time, costs of laptops were falling and wireless networks were becoming more practical. Superintendent, Dr. Mark Edwards, informally surveyed leaders across the division and asked what they thought of the idea of assigning each secondary student a laptop computer. Many questions were raised, but the overwhelming response was that it was an exciting idea.

The Initiative at the High Schools

The TLI began in the spring of 2001 with the deployment of laptop computers to all high school teachers, counselors, and administrators. Each person was given full use of the portable computer and encouraged to take them home and become fully familiar with it for both personal and professional use. The educators were also able to use the computers over the summer. Training began immediately with staff development sessions at each high school and other locations around the county. Summer training was required of all teachers, and they were paid to attend the training.

During the summer of 2001, many teachers were paid to write computer-based curricula, with the greatest emphasis on social studies, another area where students across the state had fared poorly on the SOL tests. The county began to develop a site called Henrico Learning Center (HLC), based on the Blackboard software that many colleges use, to post lessons and curricula across subject areas. Early indications were that the county would work with textbook publishers to get licenses for computer text access.

Deployment of the laptops to nearly 12,000 high school students began in the summer of 2001. Students and their parents received a brief orientation the day the computers were issued and were encouraged to enjoy the benefits of personal computing at home and at school. The laptops came with hardware and software to accommodate 24-hour computing access in a wireless environment. However, things did not go exactly as planned.

Several issues arose in the early fall. Students discovered pornographic sites that were not filtered. Students started communicating with each other during school time through instant messaging programs, and installed games and other software they did not own. Instead of educational uses, they were using their laptops for music and games. One of the more serious infractions occurred when several students hacked into the school's grading database and allegedly gained access to grades and other private information.

Teachers were asked to continue to add technology-based instruction to their classes. Unfortunately, school and county networks frequently crashed and were inoperable for hours or days at a time. One of the problems was that many students downloaded movies, which used a large part of the network capability and caused the system to crash. Experts from Apple worked on the capacity of the network, but it was clear that the network requirements for the TLI were much bigger than had been anticipated.

The Apple computers were not as durable as desired. Latches that closed the top of the computer, disc drive drawers, and chargers broke by the hundreds. Another weakness was breakage of the LCD screen of the computer. Students were required to pay a \$100 deductible to get the iBook back from Apple. The repair cost was approximately \$700 per unit. Apple acknowledged that there were problems and repaired many of the broken computers free of charge.

Because of all of these issues, it was decided to return all the iBooks to Apple to replace the poorly engineered parts on the iBook. New software was installed in each computer that blocked e-mailing at school and prevented students from installing unauthorized software. The network was changed so that the grading programs and other sensitive data could only be reached through the Ethernet and not in the wireless environment of the system that students used. The repairs and changes in the software were completed in less than two weeks in February of 2002, and students had their iBooks returned to them.

Despite all of the negative issues mentioned, educators remained positive during that year. Teachers had made progress in their use and knowledge of computers and how they could utilize them in the classroom. Students became dependent on their iBooks for notes, projects and papers, and were upset when they had to lose the use of their computers even for a few days.

The Middle School Step

HCPS' computer initiative plan is eventually to include all students from third grade through twelfth grade. The goals are to integrate laptop computers into the classroom, giving students opportunities to learn with up-to-date technology and information access, at home and at school. The desire is that instructional practices will change, providing for more student-centered classrooms in which real time learning takes place.

In the spring of 2002, each HCPS middle school educator received a laptop computer. Like their colleagues in the high schools, middle school teachers were encouraged to carry their computers home and become familiar with them. Although some teachers continued to use older Apple model desktop computers in the classroom for printing needs, most started using their laptops exclusively. Like the high school teachers, the middle school teachers received training throughout the spring and summer.

The high school experience the previous year impacted the middle school phase of the TLI. Problems with the network, student hacking, and inappropriate uses of the laptops by a

number of students caused school leaders to reconsider immediate deployment to the middle school students. A full semester of training and instruction for students, and a more extensive orientation for parents was required before middle school students received their laptops in January of 2003. It was believed that with the increased training, the middle school students would use their computers for educational purposes, there would be less breakage, and parents would assist their students in this initiative. Over the previous summer, the county installed more servers to handle the memory needs that had arisen from the first year, to increase the network capacity at each school. During these early stages of work on the TLI, the school division worked hard to maintain the positive reputation that it had in other areas of instruction. An account of recent HCPS academic successes follows.

HCPS Successes

The introduction of any major change to instructional delivery, especially considering the monetary cost of the laptops to HCPS, may have raised questions about the effectiveness of those changes. In the past few years there has been a great emphasis on test scores and school accreditation across the state of Virginia. Concerns surfaced that the introduction of the iBooks may have distracted educators in the school division from improving scores and increasing state accreditation for its schools.

The HCPS Annual Report (2003) gave positive reports in a number of areas. For the first time, all 62 of the regular Henrico County Public Schools achieved full accreditation. HCPS high school graduates were offered over \$17 million in scholarships. HCPS had a dropout rate of 1.52%, the lowest in county history (HCPS Annual Report). And, as reported in an HCPS News Release, the average SAT score climbed by a dozen points in 2003 (Binns, 2003). Cause and effect conclusions must not be drawn by these successes. However, it would be hard to show that parents, educators, and students had been distracted by the introduction of computers to the high school students. It is worth noting that a SAT-prep software program had been installed on the student laptop computers a year before the SAT scores increased. How Henrico's technology efforts fit into the literature and the background for studying students' perceptions of the TLI are explored in the remaining part of Chapter 2.

Constructivist Learning Theories

Educational leaders in Henrico County Public Schools have emphasized the shifting from pedagogical practices of didactic, teacher-centered instruction, that are often found at the

secondary level, to student-centered practices consistent with constructivist views of teaching. Constructivism is a philosophical belief in how people attain knowledge or come to understand. It can be defined as,

the belief that knowledge is personally constructed from internal representations by individuals using their experiences as a foundation. Knowledge is based upon individual connections that are not tied to any external reality, but rather to the knower's interactions with the external world. Reality is to a degree whatever the knower conceives it to be. (Jonassen, 1990, p. 32)

Descriptions of the theories about constructivism can be traced back to work by Piaget and Vygotsky. Piaget (1970) posited that learners reconstruct knowledge as they develop their thinking through manipulating objects in the environment. Conflicts in the learner's perceptions and the data experienced cause the individual to reorganize his or her way of thinking. Vygotsky (1978), in discussing the "zone of proximal development" (p. 84), explains that a child, who may not be able to perform a particular task independently, may be able to perform the task in collaboration with a more advanced child or adult. Working with others, then, becomes an important aspect of how learning takes place.

Drawing on philosophical discourse over many years since Piaget's (1970) and Vygotsky's (1978) work in this area, Doolittle and Hicks (2003) depicted constructivism as a term that is used in diverse ways in philosophy, theory, and pedagogy. They list four philosophical tenets of constructivism:

Tenet 1: Knowledge is not passively accumulated, but rather is the result of active cognizing by the individual.

Tenet 2: Cognition is an adaptive process that functions to make an individual's cognition and behavior more viable given a particular environment or goal.

Tenet 3: Cognition organizes and makes sense of one's experience, and is not a process to render an accurate representation of an external reality.

Tenet 4: Knowing has its roots in both biological/neurological construction and in social, cultural, and language-based interactions. (pp. 76-77)

There is not complete agreement on epistemology in educational theory. Objectivists claim reality and knowledge are external and that there is only one correct and absolute understanding of any issue (Bopry, 1999; Duffy and Jonassen, 1991). However, constructivists

claim “meaning is imposed on the world by us” (Duffy and Jonassen, 1991, p. 7). Bopry directs objectivists to recent developments in systems theory that show strong philosophical support for constructivism.

Drawing from the basic tenets of constructivism, Doolittle and Hicks (2003) developed several principles.

1. Construction of knowledge and the making of meaning are individually and socially active processes.
2. Construction of knowledge involves social mediation within cultural contexts.
3. Construction of knowledge is fostered by authentic and real-world environments.
4. Construction of knowledge takes place within the framework of the learner's prior knowledge.
5. Construction of knowledge is integrated more deeply by engaging in multiple perspectives and representations of content, skills, and social realms.
6. Construction of knowledge is fostered by students becoming self-regulated, self-mediated, and self-aware. (pp. 83-85)

Doolittle and Hicks added a corollary; “teachers should serve primarily as guides and facilitators of knowledge construction, not dispensers of knowledge” (p. 85).

Educators wishing to develop constructivist pedagogical practices will utilize appropriate theoretical principles, at the forefront of which is student-centered instruction (Greening, 1998). Savery and Duffy (1995) suggested several general ways that teaching can incorporate constructivism. Learning should be tied to a larger task or problem; this means that students should be able to see that the activity is relevant. Students can benefit from involvement in choosing the activity; it is important, though, that student goals are in line with the class content needs. The activity should be as real as possible; for example, instead of memorizing dates and events in history, students can engage in activities similar to what a historian would do. Students should engage in complex tasks that simulate the environment in society; apprenticeships are good examples of this type of learning. Students should be in control of how they solve problems; giving students ownership increases the meaning of the task to them. Class activities should include collaborative learning groups to discuss alternative ideas; “the quality or depth of one's understanding can only be determined in a social environment where we [sic] can see if our [sic] understanding can accommodate the issues and views of others” (p. 34). Finally,

activities should be designed to support the student and at the same time challenge his or her thinking; to do this the teacher becomes a facilitator, coach, and guide (Savery and Duffy).

Several strategies have been suggested that can accommodate these principles. Teaching methods include, role-playing, simulations, case studies, guided learning, learning by teaching, cooperative learning, collaborative learning, and learning by design (Gros, 2002). Problem based learning as suggested by Savery and Duffy (1995) is a powerful tool for engaging in most aspects of constructivist environments.

In concluding a discussion on the characteristics of constructivism, it may be helpful to look at a comparison of the traditional classroom with the constructivist classroom, which is HCPS' goal. Schieber (1999) compares the two settings by breaking the classroom down into four components: students, teachers, curriculum, and assessment. Students in traditional classrooms can be seen as empty vessels to be filled by knowledge from the teacher; students in constructivist classrooms are seen as "thinkers with emerging theories about the world" (p. 28). Students in traditional classrooms do individual work; students in constructivist classrooms work collaboratively. Teachers distribute knowledge to students in traditional classrooms; teachers in constructivist classrooms facilitate and coach students. Teachers in traditional classrooms let students know if they have the right answers; teachers in constructivist classrooms learn from students their level of understanding to prepare for ensuing classes. Curriculum in a traditional classroom uses school assigned books and materials; curriculum in constructivist classrooms "relies heavily on primary sources of data and manipulative materials" (p. 28). Curriculum in the traditional classroom imparts information in small parts and moves to the larger concepts; Curriculum in the constructivist classroom is "presented whole to part with emphasis on big concepts.... [and] pursuit of student questions is highly valued" (p. 28). Assessment in the traditional classroom is mainly through testing; assessment in a constructivist classroom is through student projects and presentations (Schieber).

Technology Research

Attitudes and Achievement

Studies about the effectiveness of the use of technology on student achievement go back as far as the introduction of any new technology that may have been invented. Even limiting a review to computer-based technologies and the effects on student learning covers a significant

number of studies. A review of some large studies and meta-analyses on education technology is a logical place to begin.

Kulik (1994) performed a meta-analysis of more than 500 individual research studies on computer-based instruction carried out between 1981 and 1991. The meta-analyses utilized quantitative techniques giving weight to sample size and effect size in each study to produce average effects of the studies in combination. Findings in this study indicated that, on average, students who used computer-based instruction score at the 64th percentile on achievement tests, while the control group score at the 50th percentile. Additionally, students learned more in less time when they receive computer based instruction, as well as develop more positive attitudes. It was noted that not all areas of computer based instruction reported positive effects.

Bayraktar's (2000) and Kuchler's (1998) meta-analyses found positive effects on student achievement for students using Computer-Assisted Instruction (CAI). Bayraktar's research focused on science achievement and showed an increase in achievement for students who used CAI over those taught by traditional methods. His analysis of 42 studies found an average effect size of .273, which translates to performance on the 62nd percentile, while those taught by traditional methods were at the 50th percentile. Effects were greatest in physics classes and smallest in biology and chemistry. Kuchler, examined 62 studies over the last 20 years on mathematics achievement, and in addition to positive effect sizes, he found that there are greater positive effects on students of low socioeconomic status.

Sivin-Kachala's (1998) review of 219 research studies from 1991 to 1997 found similar results to that of Kulik (1994), Bayraktar (2000), and Kuchler (1998) in the area of achievement. He found that there were positive effects on achievement and self-concept, and described the experimental groups as those in which students were taught in technology-rich environments. This study included special needs children who experienced the same kinds of positive effects as regular education students. It is important to note from his analysis that how the teacher used the technology, the type of software used, the specific student population involved, and the level of student access to the technology related to the effectiveness of the technology.

Mann, Shakeshaft, Becker, and Kottkamp's (1999) analysis of West Virginia's Basic Skills/Computer Education (BS/CE) program that integrated technology into the teaching of spelling, vocabulary, and math for elementary students showed similar results in achievement to the afore mentioned studies, but the achievement was specific to increases in Stanford 9 scores.

Research determined that BS/CE was more cost-effective for improving student achievement than reducing class size or certain tutoring programs. Similar to findings by Kulik (1994), Mann et al. found that technology rich instruction reduced the time needed to learn certain concepts.

Wenglinsky (1998) used data from the National Assessment of Educational Progress (NAEP) to assess the effects of technology on student achievement in mathematics. Wenglinsky performed a regression analysis on more than 13,000 fourth and eighth graders, and controlled for socioeconomic status, class size, and teacher characteristics. By eliminating the factors listed above, Wenglinsky determined that there might be a relationship between the differences in technology use and math scores on the NAEP. Wenglinsky found that eighth-grade students who used higher-order thinking software had gains of 15 weeks above students who did not on the NAEP math achievement. However, fourth-grade students only showed three to five week gains in scores, and both fourth and eighth grade students who used only drill and practice technologies actually performed worse on the NAEP than those who did not use drill and practice technologies. It is important to note that although positive correlations are shown between certain types of technology use and math achievement on the NAEP, cause and effect is not directly proven.

Large studies and meta-analyses are helpful in obtaining the overall effect of phenomena. From the review of the several studies mentioned, technology integrated into education has been shown to have a positive impact. However, because of the averaging methods of meta-analyses, important factors may be overlooked that are evident in the individual studies that comprise them. Of 12 recent studies reviewed that examine the impact of technology on student attitudes and achievement, seven showed positive impacts in classrooms that utilized technology, four found no significant difference and only one study found that traditional methods of instruction produced better results than those that utilized technology. A review of those studies on student achievement and attitude follows.

Donovan (1998), Mitra and Steffensmeier (2000), Pye and Sullivan (2001), and Soublis (2001) found that students had better attitudes toward learning in computer-enriched environments. Donovan's study on fourth-graders' writing showed that students who utilized computers to compose essays had more positive attitudes towards writing than those who used pencil and paper. Mitra and Steffensmeier's five-year study examined the attitudes of college students toward computer use as the college became more networked. Results of surveys

indicated that at the $p < 0.05$ level, six of the nine areas of student attitude toward computer use showed significant positive changes in mean scores, while the other three areas showed no significant differences. Pye and Sullivan's study of middle school social studies teachers in 537 school districts in Missouri utilized a survey design and reported frequency responses from the random sample of 120 teachers. Their survey showed that there was "an increase in student enthusiasm for learning social studies and positive effect on the classroom learning environment occurs when computer-based instruction is regularly used in the middle school social studies classroom" (p. 100). Soublis' qualitative study utilized observations, attitude surveys, and interviews to obtain descriptive statistics on attitudes toward incorporating technology in the writing process. Her findings showed that student attitudes were average to high when integrating technology.

Technology impacts on student attitudes in McKinnon, Nolan, and Sinclair's (2000) study were paradoxical. Although students who utilized computers in learning activities scored better on achievement tests, results of attitude scores toward technology in the classroom of $F = 20.97$, $df = 2,818$, $p < 0.0005$ declined over the three years of the New Zealand study as shown by a $3 \times 2 \times 3$ ANOVA. The researchers theorized that the decline in attitude scores over the three-year period might be attributed to the computer use as becoming routine and perhaps taken for granted. They further theorized that the halo effect may have worn off or that the motivational effect of using computers had decreased.

Donovan (1998), Dunn (2002), McKinnon, Nolan and Sinclair (2000), and Rendell's (2001) research have shown positive achievement outcomes for students utilizing technology in the classroom across a spectrum of areas. Donovan utilized both qualitative and quantitative methods to determine the impact of writing for fourth-grade students. The Tacoma, Washington sample of 410 students was matched for age, grade, teacher experience, achievement, ethnicity, and gender. Students who composed essays using computers scored significantly higher on writing samples than those who used pencil and paper. McKinnon, Nolan and Sinclair, showed significant positive outcomes for cohort students on New Zealand certificate tests in English, mathematics and science. The results are substantial with effect sizes for English, math, and science of 0.64, 0.86, and 0.84 respectively. Other statistical results were: English, $F = 7095$, $df = 1,291$, $p = 0.005$; mathematics, $F = 9023$, $df = 1,292$, $p = 0.003$; and science, $F = 6.30$, $df = 1,289$, $p = 0.013$. Rendell compared remedial student use of the computer software, INVEST, an

algebra and geometry program, with those remediated by traditional means. Using a quasi-experimental design, the researcher tested the groups using the Wechsler Individual Achievement Test for both pretests and posttests. Findings showed significantly higher means for the treatment group on the posttests, $p < .01$, than the control group. Like Rendell, Dunn investigated a computer-assisted program on remedial students. The results from the remedial reading program showed significant gains on the Iowa Test of Basic Skills for students using the computer-assisted programs over those receiving traditional methods of instruction. Both Dunn and Rendell found that females outscored males in both treatment and control groups.

Arbisi (2000), Cramer and Smith (2002), Rose (2001), and Upton (2001) found that integrating technology into the classroom had no significant effect on achievement. Arbisi placed students in three groups to learn computer applications. The groups were taught by traditional, individualized, or on-line methods. The groups showed no significant differences in achievement scores as measured using an ANOVA where $F = .054$, $df = 2, 42$, and $p < 0.05$. Using a quasi-experimental design, Rose examined the effect on two classes of ninth-grade remedial math students with two pre-algebra software programs. One class was taught using software programs and the other was taught using traditional methods. Rose found that there was no significant difference in scores on the Fennema-Sherman Mathematics Attitude Scales or on the achievement scores for the two groups. One possible weakness was that different teachers taught the two courses.

Upton (2001) utilized a quasi-experimental design to determine effects of computer instruction versus print-based instruction on seventh-grade Texas history students. 246 students in 10 classes from two schools were given history lessons for three days in either print-based or computer based instruction. Upton utilized ANOVA to test for main effects of instruction type and for the other factors of gender, age, ethnicity and ownership of home computers. Although Upton demonstrated that there were no significant differences in posttest scores for the control and experimental groups, using only a three-day trial is questionable in trying to demonstrate any kind of experimental effect. Cramer and Smith (2002) examined the effects of technology on the writing samples of middle school students in two different schools. The two were chosen because one school had a technology rich program called the Movie Project and the other was considered a traditional school. Writing samples from the two groups were not significantly different when scored at the end of the school year. Cramer and Smith's study was weak in its

design because they failed to control for the important factor that the designated traditional school used many computer instructional strategies.

Johnson's (2001) study was the single recent study in an ERIC and Dissertation Abstracts search in which there was a clear case for better success in a traditional format of instruction over computer-based instruction. The study was a causal-comparative design that included a sample of 152 students enrolled in agriscience classes. The curriculum was divided into four parts and scores for both the experimental (computer based) and control (traditional) groups were compared on teacher-made tests for each part. Independent t-tests were performed on the overall test and on each unit test. A significant difference was found on the overall test and on three of the four units favoring the traditional instructional method.

There is not 100% agreement as to the effectiveness of technology integration into education. However, the large majority of research reviewed for this study does show modest to significant gains in achievement and attitude toward learning when technology is appropriately integrated into the learning experience.

Laptop Programs

Henrico's TLI, the focus of this study, differs from some of the earlier technology efforts: the seamless use of technology with laptop computers. The following section will review some of the experiences that other schools have found in introducing laptops.

Although not a laptop program per se, the Apple Classrooms of Tomorrow (ACOT) program is reviewed here because its design accomplished many of the same things as laptop initiatives and is one of the earliest (Sandholtz, Ringstaff, & Dwyer, 1990). The ACOT program involved 32 classrooms in five different schools and lasted from 1985 to 1989. Each student and teacher in ACOT classrooms was assigned a desktop computer at school and at home, allowing for the constant use of technology throughout the day and evening. Much was learned from that program about classroom management issues that were complicated by the technology. More importantly, how teaching and learning changed in these classrooms was carefully studied.

Among other findings obtained from the ACOT study were descriptions of the stages teachers experienced when incorporating technology into the classroom. The Survival stage was overwhelming for teachers as they attempted to deal with the new physical environment, student misbehavior with the new technologies, hardware failures, and the sense that teachers were no longer the center of instruction. During the second stage, Mastery, teachers learned how to deal

with cheating and misbehavior in various ways, developed plans for technical problems, and became more knowledgeable of the technologies and software use. Impact was the final stage in which teachers started using technology to their advantage for “monitoring student work, keeping records, grading tests, developing materials, and individualizing instruction” (Sandholtz, Ringstaff, & Dwyer, 1990, p. 7). In this stage teachers also accepted new roles in which students were often the experts, and the classroom became student-centered. Also important from this study is that “educational change takes time. Data from this four-year study demonstrate that even when classrooms are drastically altered and teachers are willingly immersed in the innovation, change is slow” (p. 9).

Several current studies have been performed at schools that initiated a partial introduction of laptops (Donovan, 1998; Pomerleau, 2000; Rockman et al., 2000; Schieber, 1999; Sherman, 2001; & Smith, 2002). Donovan’s study involved single classrooms of laptops in 10 different schools, and examined the writing advantages for those using computers. Although the researcher found that students using computers scored better on writing assignments than those who used paper and pencil, the advantages of laptops specifically are not demonstrated in this study because similar outcomes could have been demonstrated in school desktop labs.

Pomerleau (2000) and Sherman’s (2001) qualitative studies on programs that introduced laptops found positive outcomes as a result of their use. Pomerleau examined the experiences of three cadres of 30 sophomores who were part of the Principio Project. In each classroom where innovative pedagogy was introduced, laptop computers were furnished. In the project teachers used didactic instruction, Socratic dialogue, and coaching. Pomerleau showed that innovation did take place, excellent instruction was modeled, and students were well prepared for post-secondary experiences. Sherman described the experiences of 12 seventh to ninth grade teachers who taught art in laptop environments. Laptops for each student greatly enhanced certain aspects of art such as digital imagery, photography and multimedia. Teachers with access to the Internet, and websites felt that their teaching was improved and that they had to change their teaching style.

Smith’s (2002) account of Dowell Middle School’s acquisition of 40 wireless laptop computers is an example of how some schools are slowly integrating laptops. Laptops were placed on three carts for classroom check out. Laptop use was mainly for research on the Internet, word processing, spreadsheets, and presentations. Bringing the lab to the class saved

time and allowed students to work together more easily in a familiar environment, especially with the wireless connection to printers and websites. Battery problems appeared to be the greatest drawback of this experience.

Rockman et al. (2000) and Schieber (1999) examined similar aspects of laptop deployment. Each student and teacher in their experimental groups owned or rented a laptop computer; therefore, like the ACOT program, participants had 24-hour access to their computers. The impact the program had on supporting constructivist pedagogy was crucial to their studies. "Constructivist pedagogy holds that students, not teachers, become the center of instruction, and that students' interests lead their inquiries as they seek to construct their own knowledge of the world" (Rockman et al. 2000, p. 31). The similarities to Henrico's TLI make these important studies to review, given ubiquitous laptop access and the desire for more constructivist instruction that is examined in this study.

Rockman et al. (2000), in a three-year study, examined the experiences of students and teachers with Microsoft's Anytime, Anywhere Learning Program. The initial sample in the Rockman et al. study consisted of over 450 students and 50 teachers in 13 public and private schools. Laptop users and non-laptop users were matched and evaluated over the three years of the study. Important findings from the study were that teachers who taught in laptop classes developed more constructivist instructional practices, frequently used student-led inquiry and collaborative work, and used more project-based work. Even in the early stages of the program, teachers indicated that they needed to change their instructional strategies to properly utilize the laptops. Non-laptop classroom teachers followed more traditional practices that "employ direct instruction" with "the sequence: review, teach, guided practice, individual practice...The laptop program itself, then, may be acting as a catalyst for change" (p. vii). Although standardized test result differences were inconclusive, Rockman et al. reported that laptop students performed better on writing assignments, rated their computer skills higher, and had more positive attitudes toward computers than non-laptop students had. The researchers commented,

Student achievement that is based on traditional measures of academic grades and standardized tests do not tap into the nature of schoolwork accomplished with ubiquitous laptop access. For the most part, students aren't asked to conduct research online, organize large bodies of information, or make presentations on the test they have to take, yet that's what Laptop students spend their time doing. There is a disconnect between the

classroom and home uses of the computer and the assessments we tend to use. (pp. 66-67)

The Rockman et al. (2000) study seems to be well done, however, there is an aspect of the study that weakens it, especially in its application to the TLI. The selection of students as laptop students was limited to only those who could own the computer. The researchers indicated that some schools offered assistance, but some schools did not. The issue of equity could have had an impact on creating unequal samples for comparison.

Schieber's (1999) study was an analysis of the second year of the Copernicus Project, and like the Rockman et al. (2000) study, was in partnership with Microsoft and Toshiba's Anytime, Anywhere Learning laptop program. This study focused on Snohomish School District in the state of Washington. Using a quasi-experimental design, Schieber attempted to determine if writing skills were improved and if a change in the classroom environment was effected by one-to-one laptop use.

Schieber's (1999) experimental and control groups consisted of over 400 fifth and sixth grade students in three different buildings. Nine classrooms of students with laptops were the experimental group, while 15 classrooms of students without laptops were the control group. Scores on writing assessments near the end of the school year were compared to determine if laptop use had any effect on the writing skills. Pretest and posttest results on a classroom environment questionnaire were analyzed to determine if there were differences in the two groups' perceptions about the learning atmosphere. Schieber's findings indicated that no significant differences were found in either area of study.

Careful examination of Schieber's (1999) research raised several questions. First, the comparison groups, formed by volunteers, were significantly different, in both achievement and grade level composition before the treatment. This raises concerns that any results obtained would be questionable. Although Schieber employs a statistical method, ANCOVA, which adjusts for the differences between the groups, as Lord (1967) suggests, "there is simply no logical or statistical procedure that can be counted on to make proper allowances for uncontrolled pre-existing differences between groups" (p. 305).

A second problem in Schieber's (1999) study was the reliability of the scoring of the writing samples. To determine if scorers had bias in the scoring of typed or handwritten essays, the researcher randomly selected 30 handwritten papers and had them typed. In each of the six

writing traits, there was a significant difference between the handwritten scores and the typed scores in favor of handwritten essays. Schieber discounted this finding by indicating that even allowing for more stringent scoring on the typed essays, those differences would not have changed the final outcome of his study.

A final concern with Schieber's (1999) study was in the use of the questionnaire, My Classroom Inventory (MCI), a shortened version of the Learning Environment Inventory. The dimensions of the classroom environment that are measured by this instrument--cohesiveness, friction, satisfaction, difficulty and competitiveness--only seem to address the domain of collaboration. A constructivist classroom would entail a number of other domains such as student and teacher roles, student-led inquiry, movement around the classroom, use of student projects, and emphasis on thinking skills over content (Rockman et al., 2000). Results on the MCI may also be suspect, as the researcher also changed the original four-point response to a two-point response of yes or no. Schieber stated that some students complained that they were unable to respond with a yes or no for some of the questions.

Few studies have been done on K-12 schools that have introduced laptops to every student in the way that Henrico has. Dinnocenti (2001) and Windschitl and Sahl's (2002) ethnographies were designed to examine the impact of such an initiative. Windschitl and Sahl examined the effects on three teachers. Among other issues, the question emerged, "Does the condition of ubiquitous computing [All students and teachers have unlimited wireless access to the network via individual laptop computers] influence teachers' movement toward constructivist pedagogy?" (p. 173). This question is similar to what Rockman et al. (2000) and Schieber (1999) were examining. Windschitl and Sahl's study was conducted at a Catholic middle school with 150 students in grades six through eight. Unlike most public schools, classroom sizes averaged only 18 students. The researchers found that the impact of ubiquitous computing was "mediated in substantial ways by teachers' interrelated belief systems...about what constituted 'good teaching' in the context of the institutional culture, and about the role of technology itself in the lives of students" (p. 195). The three teachers studied arrived at different places in terms of how the laptops affected the classroom. One teacher felt that the laptop greatly enhanced a student-centered classroom and helped her to develop a more constructivist classroom. The second teacher believed in most aspects of a constructivist classroom, but held that the laptop's use was

limited to making the classroom more efficient. The third teacher, who knew the least about technology treated the laptop only as a tool and marginalized its use.

Dinnocenti (2001) studied the impact of laptop use on third through fifth graders in an urban school. The researcher interviewed more than 200 participants including students, teachers, parents, and administrators. The researcher also observed classrooms, faculty meetings, social gatherings, and examined lesson plans and student work. Dinnocenti found that the laptops created motivation; however, professional development and technical support were important to success of the initiative.

Studies of Henrico's High School Initiative

Several studies have been completed that have examined the TLI in the first year of operation at the high school level. Blumenthal (2003) examined the teachers' and principals' perception of effective technology-based practices in the classroom in the first year of the TLI. Wilson (2003) studied the principals' perceptions of the leadership characteristics in the process of implementing the TLI and Kinlaw (2003) studied the experiences of high school students in the TLI. A review of each study follows.

Blumenthal's Study

HCPS Director of Research and Planning, Martha Blumenthal, conducted a quantitative non-experimental design study of the TLI utilizing a survey developed by North Central Regional Educational Laboratory called the enGauge Survey. All high school teachers and administrators were asked to participate. Twenty-one administrators and 403 teachers completed the on-line survey, which was approximately a 50% response rate. The 71 item enGauge Survey was created to measure changes in technology use and perspectives of teachers and administrators over time, and is intended to be administered each year.

Blumenthal's (2003) study was designed to determine if there were relationships between staff factors and effective practices, and if there were relationships between the educational system and effective practices in the classroom. Independent variables included school, role, years of experience, educational level, content area taught, vision, systems and leadership, educator proficiency, equity, and access. The dependent variables included alignment to vision, learning environment, range of use, and research base. She analyzed the data through inferential statistical tests, including bivariate correlation, ANOVA, MANOVA, and multiple regression.

Results from Blumenthal's (2003) study showed significant differences ($p = .000$) across content areas and teacher perception of effective practices. Mean scores across content areas of language arts, social studies, science, and others were similar, with math teachers producing a significantly lower mean score. These results indicated that math teachers were less frequent users of technology-based practices. Also showing significant differences ($p = .000$) were roles. Administrators had higher mean scores than did teachers. Years of teaching and educational level attained did not show significant differences in mean scores.

Blumenthal's (2003) study appears to be carefully done, however, the response rate of 50% may weaken the validity of some of the outcomes. Blumenthal explains that because the survey was on-line, those that responded may have been more comfortable with the technology, and therefore, may have given more positive responses than is representative of the entire population. She indicated that in the early stages of the TLI, the Hawthorne Effect might have been in play. While this study is useful in obtaining administrators' and teachers' perceptions that technology in the classroom has increased in the first year of the TLI, and what factors may have affected the implementation of the new technologies, it is not clear exactly what those activities were. And, although she discusses that research has shown that increased use of technology in the classroom increases constructivist type of learning, it is not clear that changes to those types of learning activities actually occurred in the TLI.

Wilson's Study

Assistant Superintendent for Instruction, Vickie Wilson conducted a qualitative study of the principals' perceptions of their leadership in implementing the TLI the first year of operation. The purpose of her study was to "give voice to Henrico's seven high school principals as they relate their leadership experiences during the first year of the initiative's implementation" (Wilson, 2003, p. i). Wilson' looked for principals' perspectives concerning challenges faced, lessons learned, and feelings in implementing the TLI in its first year. What she found was that leaders involved in the change process must possess strong leadership skills, those skills must be utilized with a greater intensity during the change process, and that, "they must be learners leading a learning community" (p. ii).

Wilson's (2003) qualitative study involved interviewing each of the seven high school principals, and although the sample was small, it does include the entire population of principals involved in the TLI that first year. Principals were contacted to obtain permission, set up

interview times, and were given interview questions to review in advance. Checking back with participants on the accuracy of her analysis, critiquing by an outside researcher, document analysis, and journal entries by the researcher allowed for triangulation among data sources, that increased the trustworthiness of her study.

Wilson (2003) found that four themes emerged upon which leaders needed to focus for the successful implementation of the TLI in its first year: “1) understanding the vision and believing in the purpose of the Initiative; 2) understanding the change process; 3) leading and maintaining change; 4) learning together, sharing, and building relationships within the organization” (p. 93). The overall theme that was reported in this study was, “leadership is leadership” (p.113), meaning that principals had to use the same leadership skills but with greater concentration. These themes are consistent with the literature on leadership during the change process. Wilson made an interesting observation that, “regardless of the principal’s age, sex, education, or experience; and regardless of their school’s demographics or culture, each reported the same types of experiences, feelings, challenges, and successes (p. 115).

Wilson’s (2003) study is an excellent study of the principalship during change. She reported and explained themes that emerged during her study. This study is instructive in understanding the leadership skills utilized during a major change process; however, it does not address the experiences of those in the classroom.

Kinlaw’s Study

Kinlaw (2003), Henrico County Public Schools’ Staff Development Director, studied the Teaching and Learning Initiative (TLI) for the Henrico public high school students who received their laptops in 2001. He documented their experiences for the first 18 months with the laptops. It is his research that inspired the development of this study and provided a basis for replication. Kinlaw followed a descriptive qualitative approach that was designed to provide students the opportunity to give voice to their experiences. His data were collected in focus group interviews with selected students in each of HCPS high schools. Kinlaw indicated that the design of his study was “not to test a hypothesis, but rather to discover information based on the experiences of students” (p. 42).

Kinlaw’s (2003) focus group interviews were conducted at each of HCPS’ eight high schools. Focus groups consisted of three to nine students, and were held in private conference rooms. Interview sessions were from 45 to 90 minutes and were tape-recorded. Kinlaw entered

each session with five prepared, open-ended questions, three of which can be found in Appendix H. His questions were designed to encourage students to expand answers and develop deeper responses and discussion. Approximately eight hours of interviews were transcribed verbatim.

Kinlaw (2003) found several themes that evolved from the interviews, and recorded them in combination with narratives and frequency tables. General categories were student experiences, teacher uses, and recommendations from students. Subcategories consisted of note taking, information access and research, websites, Virtual Share, use of time, organization, dependence, ineffective use of electronic presentations, the mandate, product reliability, textbooks, printing, and vocabulary. Frequency responses to each category are out of 50 total students in the focus groups.

Forty-nine students indicated that the initiative had changed their learning experience (Kinlaw, 2003). Students commented that in the second year of the program there was a much greater use of the computers by both students and teachers. In the area of note taking, 20 students indicated that the computer enhanced their note taking skills, while four students made negative comments about note taking. In the area of information access and research, 15 students said that the computer and Internet use had enhanced research projects, and seven students indicated that they no longer used the library. Fifteen students had positive comments about using websites to enhance learning activities. One student commented, "a lot of times you just can't get it from looking at a book, but if you go to a website and see diagrams that actually move, not just one image but a real movie, you can really grasp it" (p. 70). Only three students had negative comments about using websites. Virtual Share, an electronic system in which students and teachers can save and share files, elicited positive comments by 18 students. Twenty students indicated that the laptops made their work more efficient, and 12 commented that laptops aided them in doing homework. Seven students indicated that the laptops helped them become better organized. Fifteen students commented that they had become dependent on their computers. For some this created issues when the computer broke down and went out for repairs or they had failed to save their work somewhere besides their computer.

Three students from one focus group were exceptions to the large majority interviewed (Kinlaw, 2003). They reported that they did not benefit from the laptop initiative and that the county had erred in undertaking the initiative. One student complained that teachers were less interactive with their students after the introduction of the computers to the classroom.

The second general category was student perceptions of teachers' use of the laptops (Kinlaw, 2003). Twenty-seven students made positive comments about teachers' use of Virtual Share. Twenty-six students said that they enjoyed the PowerPoint presentations that many teachers used on a regular basis. Several students commented about on-line testing by teachers. One student indicated that online testing was a problem because the design did not allow for partial credit for problems. A few students indicated that some teachers used the laptops in ineffective ways by using Virtual Share as an alternative to handing out work sheets. A few students felt that it was wrong for teachers to direct students to websites for help instead of spending time explaining certain concepts. Six students commented on the mandate: the perception that administrators required all teachers to use the computer at least once each class. These students explained that because of the alleged mandate, teachers would do irrelevant assignments so that they could say they had used the computer that day.

The third general category was student recommendations about the Initiative (Kinlaw, 2003). Several students indicated that the initiative was too rushed and that other school divisions contemplating such an undertaking should take more time to implement it. There was agreement among students that the second year was much better because Internet access had greatly improved. From one to four students commented that schools interested in an initiative like Henrico's needed to focus on expectation of problems, preparedness, patience, student training, loaner laptops, parts inventory, considering a different product than Apple, and the importance of a good help desk.

Several issues emerged from Kinlaw's (2003) study. Eighteen students commented on reliability and repair issues with the laptops. CD trays, top latches, screens, keyboards and chargers seemed to break too frequently or easily. Ten students complained that it took too long to get computers back from repair, although most indicated that the turn-around time was much better in the second year of the initiative. Four students indicated that they used textbooks less than before, while four other students commented that they saw no difference in textbook use. Nine students stated that printing was a problem due to student computers that were disabled from loading home printer drivers without the school technician's assistance. Therefore, printing on school printers often involved long lines and wasted time. Several students mentioned that the initiative was important because of the digital age in which we live.

Kinlaw's (2003) study of the first part of the TLI is comprehensive and clearly shows that HCPS' students are aware of many aspects of the initiative and how it impacts them. However, it is not clear from his findings if the learning environment has changed in ways that are more collaborative, constructivist, or student-centered, or how teacher and student roles have changed. Interview questions that focused on those issues may have elicited responses that could have better recognized those factors.

Research on Student Voice

This section of the chapter is focused on the value of learning about student experiences with educational innovation. Kinlaw (2003) suggests that there are several reasons for giving students a voice in initiatives that involve technology and instructional changes. First, schools exist for students, but students are rarely consulted for their input. Second, "experts in organizational and school reform suggest that schools become learning organizations in which students and teachers learn from each other" (p. 16). Third, students have grown up with technology and are comfortable with it. A review of literature on student voice begins with research that indicates the value of student input.

According to Glickman (1998),

Young children, adolescents, teenagers or adults--students in all classrooms and schools across all subject areas have definite ideas about their education. Why do so many educators not ask or listen to their own students? The only answer that I can surmise is that...they will tell us what we might prefer not to know. (p. 151)

Glickman recounts a common occurrence at a conference where sessions were held during which students presented aspects of their learning experiences and ended the session with ideas to improve teaching practices. He tells how enthusiastic principals and teachers were about what the students had to say and rated student presentations over the national experts that had presented at the conference:

Yet what is puzzling to me is that these students who capture such attention are just like students that the attendees have every day in their own classrooms and schools...It simply doesn't occur to many of us to ask the same questions and gather the same suggestions from our own students. (pp. 150-151)

Wasley, Hampel and Clark (1997) depended on the voice of students in *Kids and School Reform*. The book, which covers three years of research, examines reform efforts in five

Coalition of Essential Schools based on Theodore Sizer's ideas. According to the authors, many educational researchers were writing about the reform efforts in schools, but no one seemed concerned about the student perspectives. "Because reform of our...schools is undertaken on behalf of our students, their silence seemed particularly troubling" (p. xi). Along with hundreds of interviews with parents, teachers and administrators, the voice of students added greatly to the understanding of this important reform effort.

In founding Best Practice High School in Chicago, Daniels, Bizar, and Zemelman (2001) discussed the importance of giving students voice in schools. One of their 11 key ingredients to improving secondary schools was, "voice and leadership. Both students and teachers exercise choice and make decisions in all elements of school life" (p. 10). And, in their discussion on typical leadership roles in schools, their thoughts are probably pretty accurate.

But if teacher voice is faint in governance of high schools around the country, student voice is barely a whimper...Students, just like the rest of us, are more likely to stay involved in an activity if they have some control over what takes place. The need for ownership sounds like a platitude, even as it's neglected, but remains essential nonetheless. (p. 87)

Some ways that Daniels et al. suggested to provide students voice were for students to discuss issues in advisories, serve on ad hoc committees for special needs, serve on councils that were formerly all adult, conduct student town meetings, and serve on governance boards.

In *Professional Learning Communities at Work* (DuFour & Eaker, 1998) and *Schools that Learn* (Senge et al., 2000), there is an emphasis on involving all participants collaboratively with a shared purpose and responsibility for enhancing the organization. The factory model for schools of the nineteenth and early twentieth century "is no longer relevant in the post-industrial, knowledge-based society" (DuFour & Eaker, p. 20). This factory model was based on uniformity and bureaucracy in which decisions were made from the top down, and teachers were factory workers responsible for carrying out duties exactly as directed (DuFour & Eaker). Although DuFour and Eaker emphasize the importance of each stakeholder in improving the organization, no attention was given to the importance of students in the learning organization.

Senge et al. (2000) added the importance of students within the learning organization and states,

In successful organizational learning initiatives, everyone learns and everyone supports. Students can be some of the most effective instigators for organizational learning; in turn, organizational learning can be one of the most powerful ways to develop students' capabilities for lifelong learning and success. (p. 25)

Learning from all participants in an organization is important, but students' views hold promise that educators immersed in traditional methods may not be able to see. "Young people are still new enough to the system that they can see the tacit rules and assumptions and help the rest of us to see them as well" (p. 58).

Student voice in the TLI is important not only because they are participants in the learning organization, but because of their unique perspectives as individuals that have grown up with technology. Educators could benefit from this fresh perspective as stated by McCain and Jukes (2001): "Growing up in an electronic age has allowed younger people to see the potential of new technologies before their elders" (p. 56).

In *Growing Up Digital*, Tapscott (1998) stated that the name of the year-old to twenty year-old generation should be called the "Net Generation" (p. 1). Unlike those that have gone before, the "N-Geners" (p. 2) have grown up completely enveloped by digital technology. "Today's kids are so bathed in bits that they think it's all part of the natural landscape" (p. 1), and "they are spending their formative years in a context and environment that is fundamentally different from their parents" (p. 15).

Several themes emerged from Tapscott's (1998) study of more than 300 N-Geners over a one-year period. One theme was that now, for the first time, children are authorities. According to Tapscott, the vast majority of home computer use is by children, and it is the children who are the driving force behind most new investments in home use technologies. Two-thirds of the kids also claimed that they were more proficient at the computer than their parents. "Parents traditionally have known more than children in virtually every conceivable domain" (p. 36). However, now children are authorities on important issues of technology. Peck, Cuban, and Kirkpatrick's (2002) study of two San Francisco high schools echoed this theme in identifying several students, called "open door" (p. 476) students, in each school as the experts that the adults frequently consulted for help with technological problems.

Many of the open door students used their expertise to serve their school in a tech-support capacity. These self-anointed 'tech gods,' like Jason, were well aware of their

importance to their schools. As one deity explained, "I like seeing how people look stupid when they don't know what they are doing on the computer, I say, 'This is how you do it,' and they go, 'Thank you, you are my god.' It makes me feel good." (p. 476)

A second theme that Tapscott (1998) discussed was that technology seems easier for children to learn. He reasoned that:

Because N-Gen children are born with technology, they assimilate it. Adults must accommodate-a different and much more difficult learning process. With assimilation, kids view technology as just another part of their environment, and they soak it up along with everything else. For many kids, using the new technology is as natural as breathing. (p. 40)

A study conducted by the American Institute for Research provided evidence that the gap between students and their schools' technology use was increasing (Levin & Arafah, 2002). Students are frustrated and increasingly dissatisfied by the digital disconnect they are experiencing at school.

They cannot conceive of doing schoolwork without Internet access and yet they are not being given many opportunities in school to take advantage of the Internet. Many believe that they may have to raise their voices to force schools to accommodate them better. (p. v)

Students have become increasingly dependent upon the Internet. If you were to take Internet access away, "many students would tell you-in all seriousness-that they would die" (p. 4). A high school boy stated, "It is my education. I get all my information off the Internet. I don't even look at books anymore" (p. 4).

Levin and Arafah (2002) recognized the value of student input in school initiatives involving technology. "Students said over and over that their schools and teachers have not yet recognized-much less responded to-the fundamental shift occurring in the students they serve and in the learning communities that they are charged with fostering" (p. 5). Students have much to offer schools considering meaningful changes and this was clearly addressed by Senge et al. (2000).

I have come to believe that the real hope for deep and enduring processes of evolution in schools lies with students, they have a deep passion for making schools work. They are connected to the future in ways that no adult is. They have imagination and ways of

seeing things that have not yet been reshaped by the formal education process. And they are crying out wanting to be involved, to become more responsible for their environment. (p. 58)

Summary

Henrico County Public Schools has attempted to add technology into its classrooms in significant ways since 1996. From 1996 to 2000, hundreds of computers and dozens of computer labs were added to HCPS' schools. The advent of better wireless technologies has made possible the one-to-one computing now utilized by all middle and high school students in the division. The TLI has not been without its problems. Limited network capacity lead to system crashes in the first year of operation. Student misconduct with their computers, and computer breakdowns also created issues. Fortunately, Apple has stood behind its product and repaired many of the problems without cost to students or the school division. In addition, Software upgrades, increased network capacity, and shorter repair turn around time has made the second year much more productive.

Constructivism, an important aspect of the TLI, was reviewed. Although there is little empirical evidence for the efficacy of constructivism, it has captured the attention of educators as a way to reform teaching practices. Constructivism focuses on student-centered learning, where students are given opportunities to construct their learning from previous knowledge. Teaching and learning practices emphasize activities where students participate in authentic tasks, collaborate with other students and teachers, and are self-directed.

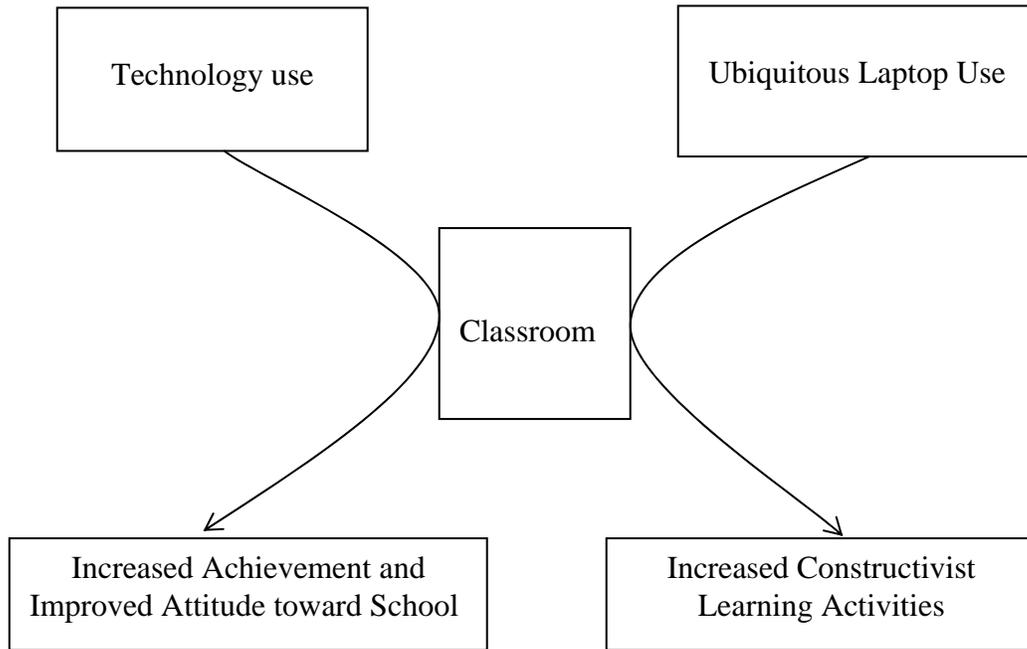
Literature concerning the effect of computer-based instruction on academic achievement and student attitudes was reviewed in this chapter. Several meta-analyses were examined and showed evidence that computer-based instruction and technology-rich environments had positive effects on both student achievement and student attitudes toward school. A review of laptop programs also showed at least modest gains in achievement for the majority of studies. One important finding in several studies, where students and teachers had ubiquitous access to computers and the Internet, was a change in the way instruction is delivered. These studies indicated that more constructivist and student-centered instruction was practiced. This has major implications for the TLI, a program that emphasizes that type of pedagogy.

Finally, literature that supports the validity of student voice was examined, and there are several reasons for listening to what students have to say. First, schools exist for students and for

that reason students' views should be considered. Second, experts in organizational reform suggest that all individuals in the organization should learn from each other. And third, students have grown up with the technology, giving them more expertise than adults.

It seems clear from the literature that integrating technology into schools has had positive outcomes for most students in the areas of achievement and attitudes toward school. HCPS' initiative is different from other programs in that it provides every middle and high school student in the division with a personal laptop computer 24-hours a day, creating seamless access to information. From the literature it is suggested that students' experiences in school will change with increased access to technology. A qualitative study of middle school students' perceptions could assist HCPS leaders and others to understand the students' point of view on how the TLI has changed their learning experiences. And, it may provide information about whether those classroom experiences have become more student-centered and constructivist.

Figure 2 is a summary model of the theory for this study. As stated earlier, research has shown that when technology is appropriately implemented in the classroom, student achievement and attitude toward school improves. Recent studies also indicated that with ubiquitous computer access in the classroom, constructivist learning activities would increase. This study is focused on the aspect of finding evidence for increasing constructivist activities experienced in the classroom through students' perceptions.



Theoretical Model

Figure 2. is a model of the theory that technology improves student achievement and attitude toward school, and that ubiquitous computing increases constructivist learning activities.

CHAPTER 3

METHODOLOGY

Henrico County Public Schools (HCPS) has undertaken an unprecedented initiative that provided laptop computers to each middle and high school student and teacher in the division. This initiative called the Teaching and Learning Initiative (TLI) was intended to not only provide ubiquitous access to information through a wireless system, but it focused on changing the teaching and learning practices in the division to become more student-centered. The purpose of this study was to provide a voice for middle school students' perceptions of their experiences in the first year of the TLI. The primary research question that guided this study was: What are middle school students' perceptions of how the TLI has affected the learning environment in HCPS? Utilizing students' perceptions, secondary questions include: (a) Has the introduction of the TLI created constructivist classroom activities? (b) How have student and teacher roles changed since the inception of the TLI? (c) How has the TLI influenced student access to information? (d) What suggestions would students make for the improvement of the TLI? This study is important in that it may provide valuable data to help educators in HCPS determine if students are experiencing the types of classroom changes sought by educators.

Through a qualitative design, this study involved the identification of experiences, perceptions, and feelings determined through rich, thick accounts obtained by open-ended focus group interviews, student logs, and observations. According to Ary, Jacobs, and Razavieh (2002), "you must look not only at what people do but also at how they think and feel, and must experience what happens to them" (p. 23). Therefore, the researcher conducted a descriptive, qualitative study with the primary data collected from focus groups comprised of middle school students who participated in the Teaching and Learning Initiative (TLI) that began in the middle schools in January 2003. Subcategories, categories, and themes that emerged from an analysis of the data are reported and described in narrative form.

This chapter provides details of the procedures that the researcher followed in order to answer the research questions proposed for this study. Participant selection and data collection methods are described, followed by the process for data analysis. Techniques utilized to add to the credibility, trustworthiness, and transferability of the study are explained as well as the role of the researcher and limitations of this study. In addition, a pilot study was conducted with those procedures described as well.

Data Collection

In the fall of 2003, the researcher obtained approval by the Institutional Review Board (IRB) of Virginia Tech to conduct the study. Immediately following IRB approval the researcher secured approval of the school district's superintendent through the Department of Research and Planning. Approval letters appear in Appendices A and B.

Participant Selection

There are nine regular middle schools and two alternative middle schools in HCPS. For the purposes of this study, the researcher collected data from six of the middle schools. Selecting six schools to conduct focus group interviews was consistent with Fern (2001) who stated, "most authors on the topic would argue that most focus group research requires somewhere between four and six groups" (p. 123). Krueger (2000) suggested that three focus groups are a minimum number. However, conducting more than five or six focus groups reaches a point of "diminishing returns" (Fern, 2001, p. 163). With information from six schools, the researcher expected that the data were sufficient to address the research questions in this study without generating repetitive information.

Schools for the study were selected by rank-ordering the schools by SOL passing rates and numbering the schools one through 11. The five even numbered schools and the pilot study school were included. It should be noted that HCPS had both the top scoring middle school in the state as well as some that had not yet reached accreditation status. This type of purposeful sampling was used to provide a good variation of the academic achievement levels of middle schools across HCPS. Merriam, (1998) refers to this as "maximum variation sampling" (p. 62).

Each middle school principal played an important role in the success of data collection. School leaders had been asked previously to give full support to research projects on the TLI, which had the approval of the Division of Research and Planning. As a HCPS educator for 26 years, and a middle school principal, the researcher had developed positive relationships with each of the middle school principals, which provided additional support.

In October of 2003, the researcher met with all the middle school principals whose schools were selected for the study, and informed them of their roles in selecting the participants needed for the study. During that meeting the researcher requested times where he could conduct focus groups, collect student logs, and observe classes at a particular school. The following week a letter was sent to each principal explaining the exact steps that he or she would take to select

students. This letter is found in Appendix C. Principals were asked to have their faculties submit names of seventh and eighth grade students who were representative of the racial, ethnic, socioeconomic, and gender make-up of their schools. The faculty was asked to consider students' expertise with technology and submit names of those who were highly proficient with computers as well as novices. From this pool of names the principal randomly selected 10 students for the focus group interviews, to insure that students were representative of the school for the groups listed above. Focus groups of 6 to 12 are often used (Anderson, 1998). Groups larger than 12 become difficult to manage and smaller than six "generally do not have enough [participants] to provide the synergy required" (Anderson, p. 203). Seventh and eighth grade students were selected for this study because they had been involved with the TLI for nearly a year, while sixth grade students were not included since they had just received their computers. Selected students had a range of computer proficiency and usually included one student who worked at the help desk or had been recognized as expert by students and/or teachers.

Each principal received a packet of information about the study that included letters of informed consent and assent. The principal or a designee delivered an envelope to each selected student and invited that student to be part of the study. Each packet contained a cover letter, a consent form, and an assent form. These forms and letters were checked for reading level using the Flesch-Kincaid Grade Level formula. Student Consent Form and letter home are at 6.7 and 6.9 grade level respectively. Parent Consent Form and letter home were both at 8.1 grade level. Several days before delivering the letters to the students, a letter was mailed to the parents of each of the selected students explaining the study and consent forms for signatures that their student would be bringing home. In some cases, the school made phone calls to parents instead of mailing the letter. The forms were designed to inform parents and students of the nature of the study, the protocol used, and how data would be collected. Copies of letters, forms, and protocol are found in Appendices D, E, F, and G.

Focus Groups

The primary data source for this study was through student focus group interviews. According to Seidman (1998), interviewing is more than just getting answers, "It is an interest in understanding the experiences of other people and the meaning they make of that experience" (p. 3). Other forms of obtaining perceptions from individuals, such as questionnaires, would likely constrain and be limited to those responses that the writer thought important enough to include in

the questionnaire. A focus group interview, however, allows greater freedom for both the interviewer to extend and probe a response, and for the persons interviewed to add something that was not specifically asked. Seidman (1998) offered that in many instances there is more than one way to collect data. However,

If the researcher is interested ... in what it is like for students to be in the classroom, what their experience is, and what meaning they make out of that experience ... then it seems to me that interviewing, in most cases, may be the best avenue of inquiry. (p. 5)

Rossmann and Rallis (2003) stated, "interviewing is the hallmark of qualitative research" (p. 180). They ask the question "Why interview" (p. 180)? and listed six answers: "To understand individual perspectives, to probe for clarity; to deepen understanding; to generate rich, descriptive data; to gather insights into participants' thinking; and to learn more about the context" (p. 180). For these reasons, the researcher selected interviewing as the most appropriate initial source of data.

Focus group interviews were held at each of the selected middle schools in the late fall of 2003 and winter of 2004. Focus group interviews lasted for approximately one hour and, as suggested by Creswell (1998), were held in private conference rooms away from distractions where audio taping, a vital part of collecting interview data, was accommodated. A focus group interview can be defined as: "an interview with a small group of people on a specific topic. Groups are typically six to eight people" (Patton, 1990, p. 113). Aside from saving time, rationale for holding group interviews versus individual interviews was to allow group dynamics to assist in the process because, "corrections by the group concerning views that are not correct, not socially shared or extreme are available as means for validating statements and views" (Flick, 1998, p. 114). However, the researcher safeguarded each individual because a dissenting voice might bring views not necessarily shared by the majority. Rossmann and Rallis (2003) also suggested that the group dynamics aid individuals in forming their own thoughts when they hear others speak. Creswell (1998) also cautions interviewers against allowing a single participant to take over the session and to encourage quiet individuals to participate.

Open-ended questions were used during the focus group interview. In describing in-depth interviewing, Seidman (1998) employed, "primarily, open-ended questions.... [The] major task is to build upon and explore their participants' responses to those questions. The goal is to have

the participant reconstruct his or her experience within the topic under study” (p. 9). As suggested by Creswell (1998), group interview sessions started with an explanation of the study and its purpose. The researcher informed the students how the information they gave would be used. Before commencing the interview, the researcher confirmed that assent forms and consent forms had been returned as suggested by (Creswell, 1998). Focus group protocol appears in Appendix H.

Although the focus group interviews were not highly structured, the researcher entered the focus group interview with nine prepared questions. Focus group interviews were designed to obtain data leading to answering the research questions. As suggested by Anfara, Brown, and Mangione (2002), there should be a careful alignment of questions asked with the research questions. Nine general questions were designed to create discussion that would lead to answering the research questions for this study. Table 1 shows the alignment of focus group interview questions with the research questions. Questions one and two do not appear on the table since they were designed as warm up and transition questions. Creswell (1998) advised that interviewers follow the questions designed for the interview and time constraints. He also warned against giving advice during focus group interviews so that the interviewer is primarily a listener not a talker.

Every effort was made to conduct focus group interviews during the student study hall time. Focus group interviews were audio taped and transcribed as suggested by Creswell (1998) and Merriam (1998) to preserve an accurate record of these sessions. An additional advantage to recording the sessions was that it gave the interviewer an opportunity to review the tape and improve on his techniques (Merriam, 1998). A fellow educator, with a master's degree in education, who has taken coursework in qualitative research, accompanied the researcher. The researcher's colleague had a degree in marketing, and experience in conducting focus group interviews. She acted as a moderator for the focus group interview and the researcher took the role as assistant moderator to tape record and take field notes. Kinlaw (2003) found this helpful in that the moderator could concentrate on the focus group process and the colleague could concentrate on taking notes that were important for remembering issues and themes identified

Table 1

Research Questions Alignment with Interview Questions

Research questions	Interview questions
What are middle school students' perceptions of how the TLI has affected the learning environment in HCPS?	3, 4, 5, 6, 8, 9
(a) Has the introduction of the TLI created constructivist classroom activities?	3, 4, 6
(b) How have teacher and student roles changed since the inception of the TLI?	3, 4
(c) How has the TLI influenced student access to information?	3, 5
(d) What suggestions would students make for the improvement of TLI?	7, 8, 9

Note. Interview questions can be found in Appendix H.

during the interview sessions, as well as recording non-verbal actions by the participants. To protect confidentiality, tapes were locked in a cabinet after being transcribed: only the principal and researcher viewed participant lists.

*Secondary Data**Student Logs*

Student participants in the interviews were asked to complete a log of the classroom activities that they experienced over a two-day period that were related to the use of laptops. Among other sources of information for qualitative studies, participant journals or diaries provided useful data (Creswell, 1998; Merriam, 1998). These documents have the advantage over other collection techniques because the researcher could review these materials when it is convenient (Creswell, 1994). These records provided an additional secondary source of data for this study. Most middle schools in HCPS follow an alternating schedule so that students attend

all eight of their classes in a two-day period, taking four classes each day. At the time of the interview session, students were given a form to use in completing the log as well as an envelope with the researcher's name and school where the form was returned. A sample of a completed student log from the pilot study was given to the students to provide guidance for them to complete their logs. Students were asked to give as much detail as possible about each class, the activities, and their feelings about each activity. They were reminded that they should not work on the log when they were supposed to be working on other class assignments. Upon completion of the log, they were to take the envelope containing the information to the office and return the completed logs to a person designated by the principal. Students had an opportunity to ask questions about the log at the focus group meeting. The Log form can be found in Appendix J.

Observations

One form of second stage data collection was through observations of classes that focus group students attended with an emphasis placed on observing the use of laptops. Interviews gave the researcher a control advantage in the interviewing process, as suggested by Creswell (1994); however, the information obtained from students could be enhanced through observations. These observations provided the researcher with firsthand knowledge of classes described by the students, and enhanced his understanding of the students' perceptions.

The researcher observed two classes at each of the six schools where focus groups were held. In the activity logs, students were asked to designate classes where effective computer use was experienced. Classes observed were selected from those student logs. When possible, one class was language arts or social studies, and the other observed was a math or science class. The researcher used an observation form that provided a list of anticipated activities that might be encountered in the classroom. This form can be found in Appendix I. Detailed notes were taken by the researcher who looked for interactive behaviors of students and the teacher as well as the activities within the class. Following suggestions from Rossman and Rallis (2003), the researcher kept a "running record" (p. 196) that detailed as much as possible the events seen during the class, with added "observer comments" (p. 196) that contained reactions to the class being observed. Immediately following each class the researcher wrote up the observation to expand on missing data, clarify information, and add explanations where needed. It was here that he wrote "details, emotions, and textures" (p. 197).

Data Analysis

According to Seidman (1998) qualitative data should be analyzed inductively:

The researcher cannot address the material with a set of hypotheses to test or with a theory developed in another context to which he or she wishes to match the data. The researcher must come to the transcripts with an open attitude, seeking what emerges as important and of interest from the text. (p. 100)

“Qualitative research is not a linear, step-by-step process. Data collection and analysis is a *simultaneous* [emphasis in the original] activity in qualitative research. Analysis begins with the first interview, the first observation, the first document read” (Merriam, 1998, p. 151). As suggested by Merriam (1998), focus group interview audiotapes were transcribed verbatim, to provide a database for the analysis. With six groups there were many pages of data to analyze that necessitated a process to group it into manageable segments. Transcripts were read several times, and the text was marked to indicate responses of interest. This “process of noting what is interesting, labeling it, and putting it into appropriate files is called ‘classifying’ or, in some sources, ‘coding’ data” (Seidman, 1998, p. 107). Miles and Huberman (1994) explained the importance of the coding process:

Codes are used to retrieve and organize the chunks.... The organizing part will entail some system for categorizing the various chunks, so the researcher can quickly find, pull out, and cluster the segments relating to a particular research question, hypothesis, construct, or theme. (p. 57)

For this study the researcher used a constant comparative method of analysis that resulted in grouping coded information into subcategories that were grouped into categories and further grouped into the larger themes that emerged during the analysis. Similar processes were employed with the data collected from student logs and the classroom observations made at the selected schools. Materials from these data sources were placed into the same categories and themes that were developed from the focus group interviews. Analysis of these secondary sources assisted the researcher in expanding, confirming, and refuting the findings from the focus group interviews. The initial categories considered had emerged from the literature. They were group work, project work, Internet use, research, Virtual Share, and student-led activities. Additional codes emerged during analysis.

Data Interpretation

Unlike quantitative analyses, which seek to predict, show causal relationships, and find generalizations in the interpretation of qualitative studies, “the emphasis is on illumination, understanding, and extrapolation” (Patton, 1990, p. 424). Once the coding process was completed, themes and linkages were sought. Rossman and Rallis (2003) distinguished between categories and themes. Categories were the words or short phrases that were self-evident. Several categories were in place from the start of the study as a product of the focus group interview questions and research questions for the study. “Categories provide direction for data gathering. Themes, in contrast, often emerge during intensive analysis as the researcher locates and describes more subtle processes” (p. 282).

Upon initial completion of the analysis, the researcher looked for alternative explanations of the data that ensured the best fit between data and findings. Alternative opinions and perceptions were described with negative cases considered in the analysis. As Patton (1990) noted:

Perfect patterns and omniscient explanations are likely to be greeted skeptically-and for good reason: The human world is not perfectly ordered, and human researchers are not omniscient. Humility can do more than certainty to enhance credibility. Dealing openly with the complexities and dilemmas posed by negative cases is both intellectually honest and politically strategic. (p. 464)

In addition, the researcher asked two doctoral students, who are conducting qualitative research studies, to examine the data and consider if alternate constructs were overlooked. This was accomplished by asking each colleague to code several unmarked pages from a focus group transcript early in the coding process. Comparisons among these analyses with those of the researcher confirmed that his findings were consistent with other researchers. He organized his findings by themes, categories, and subcategories, and presented these same findings in narrative form. His use of tables, located in Appendix L, noted the frequencies of student responses from focus group interviews.

Pilot Study

Prior to the start of focus group interviews across the division, the researcher ran a pilot of the proposed study. All procedures and permission forms were implemented, and the pilot

allowed the moderator to practice her focus group interviewing techniques and protocol to enhance the actual study. According to Seidman (1998),

The best advice I ever received as a researcher was to do a pilot of my proposed study.... Although it may not seem ahead of time that the world of interviewing research takes one along strange paths or through dangerous places, the unanticipated twists and turns of the interviewing process and the complexities of the interviewing relationship deserve exploration before the researchers plunge headlong into the thick of their projects. (p.32)

For convenience, the researcher selected a representative group of eight students from his school and practiced the protocol with that group, to look for ways to improve the process. In addition to practicing interviews, the researcher observed a class and asked each student in the focus group to complete activity logs. Data collected through the pilot study was examined and assisted the researcher to identify some coding possibilities.

The pilot study was productive. The focus group interview went well, with only a minor change made in the order of the questions. The researcher and his colleague decided that they would schedule full hour focus group interviews for the remaining schools since the first focus group seemed rushed. It was during this initial stage of the study that the researcher discovered the difficulty in getting students to return their logs. When subsequent students returned their completed activity logs, they received candy or a small prize as an incentive. Because this first focus group went so well, and no major changes were made in the interview questions or protocol, the researcher decided to include the data obtained from that first group. As suggested by Krueger (1998), "Do the first focus group. If it works, it's your first group. If it doesn't, it was a pilot test" (p. 57).

Trustworthiness of Findings

In any qualitative research endeavor, issues that affect trustworthiness must be addressed. Anfara et al. (2002) suggested that there are four basic criteria for assessing the rigor of a qualitative study: credibility, confirmability, dependability, and transferability. Credibility is the qualitative term analogous to the quantitative term internal validity; confirmability is the qualitative term analogous to objectivity; dependability is the qualitative term analogous to reliability; and transferability is the qualitative term analogous to external validity (Anfara et al.). In addition, the role of the researcher is an important consideration in examining the trustworthiness of a study.

Triangulation

An important strategy utilized in qualitative research, which addressed the first three criteria for qualitative rigor was triangulation (Anfara et al, 2002). “Triangulation is a means of checking the integrity of the inferences one draws. It can involve the use of multiple data sources ... [with the] assumption that data from different sources or methods must necessarily converge ... to reveal the truth” (Schwandt, 2001, p. 257). Triangulation in this study was provided through comparing findings from the focus group interviews, classroom observations, and student logs. Also, data from focus groups at six different middle schools in HCPS added a level of credibility to the findings because students from different geographical locations and different socio-economic levels had different experiences.

Transferability

Care must be exercised when discussing the transfer of research findings from one case to another case. However, with sufficient detail the reader can “engage in reasonable but modest speculation about whether the findings are applicable to other cases with similar circumstances” (Schwandt, 2001, p. 107). In addition to providing rich, thick accounts of the perceptions of students, careful details of the methods used by the researcher may assist the reader to examine possibilities of transferability. Anfara et al. (2002) also suggested that transferability is improved through purposive sampling, as was done in this study.

Role of the Researcher

The perspective of researchers and their personal biases are important in most types of research, and especially so in qualitative studies. Rossman and Rallis (2003) explained that in qualitative research it is not possible to eliminate bias. Therefore, it is important that researchers “have articulated [their] perspectives or frames of reference toward the topic” (p. 51). As the “primary instrument for data collection and analysis” (Merriam, 1998, p. 7), the researcher’s experience and perspectives could have a significant impact on the study. For this reason it is helpful to gain some insights about the researcher. For 18 years the researcher was a high school science teacher. He then served as an assistant principal for eight years and is currently a middle school principal. These educational experiences have involved four schools with different populations. For more than 20 years the researcher was also involved in coaching boys and girls of all ages in five different sports. In addition, the researcher was a church youth leader and Sunday school teacher for several years with middle school age students where he led many class

discussions with this age group. For this reason, the researcher felt confident that he had the needed experience to act as an assistant moderator during the student focus group interviews for this study.

As a former science teacher, the researcher may have some bias toward things that are technology-related. His experiences have indicated that students seemed to learn better when they were engaged in the learning process with hands on experiences and could see and understand the practical application that science laboratories provided. In addition, it may be important to note that there was a clear understanding that administrators at every level in HCPS should do as much as possible to make the TLI a success. With that in mind, unlike in quantitative research where variables are controlled, the researcher believed that he was able to be open and had “a willingness to listen and to ‘give voice’ to respondents.... It means hearing what others have to say, seeing what others do and representing these as accurately as possible” (Strauss & Corbin, 1998, p. 43).

Limitations

As is the case with any research, questions concerning transferability must be considered. Unlike experimental designs where individuals are randomly assigned to treatment groups, HCPS assigned the treatment to all students in this study since every student received an iBook. Designing an experiment for the TLI was impossible. Even if a contrived experiment had been designed that utilized participants who were randomly assigned to different treatments, it would not have been possible to generalize from Henrico students to other students in another division or state.

From this qualitative study other schools or school divisions should use caution in directly applying these findings to their particular setting. This is not to say that there is no transferability value in the findings from this study. According to Merriam (1998), if good descriptions are provided of the situation or individuals being studied, and multisites are used, “especially those that maximize diversity in the phenomenon of interest” (p. 212), it then becomes the reader’s responsibility to determine how the findings of the study applies to his or her situation.

Summary

Qualitative methods, as used in this study, have the advantage of best obtaining rich, thick accounts of students’ perceptions of their experiences in the TLI. Following approval by

the IRB and HCPS authorities, the researcher conducted a pilot study to test focus group interviewing techniques, practice the protocol questions, collect student activity logs, conduct a classroom observation, and make some preliminary analysis of the data obtained. Finding that the pilot study required no major changes, the researcher included data obtained from that school. The researcher then conducted focus group interviews at five other middle schools in the division. All interviews were taped and transcribed with confidentiality preserved for the participants. Secondary data was collected through student logs and observations that provided a format that allowed for triangulation. Data were analyzed inductively allowing subcategories, categories, and themes to emerge at any stage in the process. Narrative and response frequency tables were developed to present findings. Readers are cautioned about transferring the findings of this study to their particular situation.

CHAPTER 4

FINDINGS

The purpose of this study was to give middle school students in the selected school division a voice in describing their experiences in the Teaching and Learning Initiative (TLI). It was speculated that their perceptions were crucial to understand what was happening in the classrooms. The primary research question guiding this study was: What are middle school students' perceptions of how the TLI has affected the learning environment in HCPS? Utilizing students' perceptions, secondary questions included: (a) Has the introduction of the TLI created constructivist classroom activities? (b) How have student and teacher roles changed since the inception of TLI? (c) How has TLI influenced student access to information? (d) What suggestions would students make for the improvement of TLI?

The primary data was collected through focus group interviews with middle school students from six of the 11 middle schools in the division. Secondary sources of data were classroom activity logs from individual students in the focus groups, and classroom observations made by the researcher. A brief description of the schools where the data were collected will follow findings from the focus group interviews, student activity logs, and classroom observations.

Description of the Participants and the Setting

Principals reported that students were willing to participate in the study and seemed excited to be included in a doctoral research project. In one case a student who reported for the focus group interview was disappointed that she had to leave because she had forgotten to turn in the permission forms. No student left during the focus group interview or requested to be removed from the study.

In examining the demographic information that follows, it should be noted that in each school described, some students were not issued computers. Laptop computers were made available to all middle school students in HCPS. Some families chose not to accept computers because they thought their child was not mature enough to handle the responsibility, or parents had concerns about questionable materials their student might access on the Internet. However, the main reason students did not have computers was because they failed to pay the required

insurance, or they had not paid the \$100 deductible from damaging a computer. The deductible was due even if the computer was broken by accident.

School A is one of the larger middle schools in the division with nearly 1,600 students (HCPS Web Reporting, 2004). It is located in a rapidly developing area of the county and has grown by over 100 students in each of the last several years. Because of this growth, a new middle school is under construction, and others are planned for in the next few years. There are currently five mobile classrooms on school A's campus. The school population is diverse, both economically and racially, with a minority population of 23% and 11% on free or reduced lunch (HCPS Web Reporting). The school achieved full accreditation several years earlier and had recent State Standards of Learning (SOL) scores averaging over 90% passing (Henrico County Public Schools, 2004). Over 98% of the students in school A were issued iBooks (K. Perera, personal communication, November 15, 2003).

School B has a population of about 1,000 students (HCPS web reporting, 2004). Although it is only a few miles from school A, it had a slight decrease in its student population from the previous year. School B is located in an established residential area of the county and is fed by a mixture of middle and upper middle class neighborhoods. It has a long reputation of academic excellence, and on the most recent SOL tests, scored over 95% passing in most subject areas, placing it in the top few schools in the state (Henrico County Public Schools, 2004). School B has approximately 14% minority student and 10% of its students on free or reduced lunch (HCPS Web Reporting). Greater than 99% of students in school B have been issued iBooks (A. Poates, personal communication, April 2, 2004).

School C has a student population of a little over 900 (HCPS Web Reporting, 2004). Only a few years old, this school is one of the newer designs that follow the division's philosophy of keeping middle schools fewer than 1000 students and is located in a more urban part of the county. School C became fully accredited within the last two years with three of four recent SOL scores over 80% passing rate (Henrico County Public Schools, 2004). School C is over 85% minority population with 60% of its students on free or reduced lunch (HCPS Web Reporting). At the time this study was conducted, fewer than 75% of the students were issued iBooks (L. Kitten, personal communication, February 10, 2004).

School D has a student population of about 1,000 students and is located in a suburban area of the county (HCPS Web Reporting, 2004). It is unusual in that it offers an advanced

academic program to which students across the division may apply. This advanced group of students makes up about 200 of its population. School D is comprised of about 26% minority students and has 22% of its students on free or reduced lunch (HCPS Web Reporting). It has met full state accreditation and has passing rates of over 90% (Henrico County Public Schools, 2004). Over 99% of the students were issued iBooks at school D (E. Binns, personal communication, January 21, 2004).

School E has about 100 students (HCPS Web Reporting, 2004), and is one of two alternative middle schools in the division. It is housed in a remodeled church in the middle of a commercial area. Students are accepted to attend this school from seven of the middle schools located on one side of the county. Students may be assigned to school E for behavioral problems, or by parent requests. Because of the special needs of this population, class sizes average fewer than 15 students. Students at school E are required to wear uniforms. The population is comprised of about 75% minority students, with about 70% of its students on free or reduced lunch (Web Reporting). On the most recent SOL tests, students scored over the required 70% passing rate in 3 of the 4 areas tested, an improvement over any previous year (Henrico County Public Schools, 2004). Computers were issued to 76 students; however, about 25 computers were in for repair, or still had charges owed for repair. The principal explained that most of the students who were not issued computers were those who owed the \$100 repair cost from the previous school year (B. Browder, personal communication, April 2, 2004).

School F has over 1,300 students (HCPS Web Reporting, 2004) and is located in a commercial area of the county with a growing residential population. It currently houses three mobile classrooms on its campus; however, zoning changes will reduce its student population in the near future. One of the older facilities in the county, school F is a campus style school with 20 different buildings. School F has a diverse population with about 50% minority students, and 35% of its students on free or reduced lunch (HCPS Web Reporting). School F is fully accredited, scoring over 80% passing the SOL tests (Henrico County Public Schools, 2004). Greater than 93% of the students have been issued iBooks (F. Ricks, personal communication, April 2, 2004).

Participants in the six focus groups ranged from five to nine students with a moderator and an assistant moderator. Schools A through E had six, seven, eight, seven, five, and nine students respectively, for a total of 42 student participants. Principals from each school indicated

that the participants selected for the focus group interviews were representative of the make up of their school with participants from both seventh and eighth grades. Taken together there were 10 white males, eight white females, nine black males, 11 black females, one Asian male, two Asian females, and one Hispanic male. All participants were involved in the TLI since the second semester of 2003.

Findings from Focus Group Interviews

Focus group interview data were generated by the questions that follow:

1. Please state your name and tell us your favorite thing about school in ten words or less.
2. What do you like about computers-not just iBooks?
3. Think back to the first semester of last year before you had the iBooks. Would you say that your school experiences have changed as a result of the laptops? If so, how have they changed? If not, how have they not changed? Please provide examples?
4. This next question is about roles. Students sometimes perform different roles in the classroom. They can be passive, work in groups, or be experts and leaders in the class.
 - a. First, how has your role with classmates changed? Can you give examples?
 - b. Second, how has your role with your teacher changed? Can you give examples?
5. Has the way you get information in class changed? For example are there differences in the use of textbooks, handouts, or teacher lectures.
6. The next question is about project work.
 - a. Are you doing more projects than before?
 - b. Are these group projects or individual projects?
7. What recommendations do you have regarding the laptop initiative for Henrico County or for other school districts that might consider a similar initiative?
8. We have discussed a number of things today. What is the most important thing that we should know about the laptops in middle school?
9. What would you like to share about the laptop initiative that was not covered in the questions?

Following question nine the assistant moderator orally summarized the student responses from questions three through eight. Students were asked if they had comments to add to these summaries.

Questions one and two were warm up and transitional questions. The majority of the data for this study was obtained from focus group interview questions three through nine. An examination of student responses revealed that in answering questions students tended to discuss issues related, but not exactly on topic. The students repeated certain issues of interest or concern regardless of the current interview question. This presented challenges in analysis of each question as data were sorted and coded.

Focus group interviews generated nearly six hours of audiotape recordings that were then transcribed into approximately 120 pages of typed transcripts. Transcripts were analyzed; words or phrases were coded producing over 600 individual items. Identical items were placed into over 100 categories. The many categories were further reduced to 30 subcategories. These 30 subcategories were then grouped into 10 categories: several related directly to the research questions and consisted of changing roles, information acquisition, and projects. These three categories were organized under the theme of changing school experiences. Other categories derived from the focus group interviews were computer reliability, monitoring and getting into trouble, efficiency, carrying the iBook, and teacher resistance. These categories were organized under the themes of student recommendations, most important issues, and issues appearing throughout the focus group interviews.

Findings from the focus group interviews will be presented in several parts. First, focus group interview questions three through six, probed students for information on how their school experiences have changed with the introduction of the laptop computer. Questions four, five, and six were specific as to how roles, information acquisition, and project production have changed. Second, questions seven and eight, probed students for their thoughts and recommendations on the most important issues concerning Henrico's laptop initiative. Third, topics are examined that appeared throughout the focus group interview, but were not directly related to the focus group question asked. This will include responses to question nine, which did not generate any new areas of discussion.

Findings are presented in narratives of themes that arose during each part of the focus group interview, and include quotes that represent those responses. The design of this study does

not lend itself to quantitative analyses; however, the researcher considered that it was important to recognize that several or all focus groups responded in similar fashion to certain questions. During focus group interviews, if one participant made a statement, often the remaining participants would nod in agreement and not offer a dissenting opinion. Arguably, findings were strengthened when more participants in a focus group responded in like fashion. Responses from each focus group to the issues that follow can be found in Appendix L. Direct quotes from focus group interview transcripts are cited parenthetically with the first letter designating the school, the numeral designating the student, followed by the page number where the quote was found.

Changing School Experiences

Student responses to questions three through six, taken together, showed that 41 of the 42 students in the focus groups have witnessed changes in their school experiences since the introduction of the laptop computers. The single student, who did not express changes in school experiences, did not respond to any question or become involved in any discussion except for the warm up question that all students were asked to answer.

Changing experiences-question three. Thirty-one of 42 students, representing all focus groups, responded to question three with examples of how their school experiences had changed in the last year since receiving the laptops. Although two students from focus group E expressed that their school experiences had not changed since receiving the laptops, their responses to subsequent, more focused questions, indicated that they had experienced some changes. One student said, "I would say that it has changed, because without the iBooks I didn't have the opportunity to search for things that I needed in civics or in a science lab" (E-9, p. 3). Another student said,

We seem to be getting a lot more done in class because we don't have to take so much time on notes. It's a lot quicker, and [teachers] can also show us presentations on their iBooks that makes it easier than reading it from the book. And we can also do it by ourselves. It's a lot easier to study that way. (A-4, p. 8)

Question three was open ended and generated over 90 responses that related to 25 subcategories. Subcategories included efficiency, the Internet, note taking, projects, research, software, and many others. Because responses generated from focus group interview question three were diverse, the remaining student responses from question three were combined with the

findings from the remaining focus group interview questions that related closely to themes presented later in this chapter.

Changing roles-question four. Question four, which asked students to discuss how their roles in class have changed, generated responses from 26 of 42 students, representing all focus groups. Several students expressed that they had become more of an expert in class than the teacher. One student stated, "Some of us know a bit more about computers than the teachers.... I am actually able to show them how to make that test they are trying to print out smaller" (A-6, p. 11). Another student said, "Our teacher didn't know how to print yet, so I put all the printers on her iBook so she could print. I taught her how to put different things in Virtual Share so that they are not messed up" (F-6, p. 4). Another student expressed some teachers' reactions to this new role and stated, "Sometimes we know all the short cuts and the teachers just follow the long ways.... They just get frustrated sometimes that we know more about the iBooks" (B-4, p. 6).

One student recognized how some shy students have changed roles and stated,

Before the iBooks, there were some students who were just more passive, and they would just listen to what the teacher said and be quiet and not show their opinions. But now with the iBooks, they know something about technology and can share that with other students and the teacher. I think it helps them to open up a little bit. (A-2, p. 11)

Another student explained that students, who were less inclined to participate before the computer, are more willing to participate now that they have the computer. "When it's time to do a presentation, people are usually shy, but if you have your iBook, it's more interesting. You have pictures and graphics to show. You can explain more" (C-4, p. 4).

A dissenting opinion by one student indicated that students were less involved in the class than before the laptop. "We are less active. Since we got our iBooks we just sit there, and we have our iBooks open and go to the Internet.... We would use that instead of reading out loud and doing all sorts of things" (B-7, p. 18).

Several students expressed the opinion that students have become more independent since the laptop computers were issued to each student. One stated, "Since everybody has an iBook: we are more individual and teachers tell us to take notes. You don't need to get into groups anymore" (D-7, p. 6). Another student discussed the independence that the laptop had given him through the K12 Planet, a server where students and parents can access that lists grades and assignments for each class:

We can get on K12 Planet and see what we need to do. They [teachers] don't have to tell us what to do all the time. We can see it on K12 Planet.... For make-up work it shows you what you still haven't turned in. (D-2, p. 6)

Question six probed students' perceptions of differences in their projects from last year. One part of the question specifically asked if projects were group or individual. Considering that group projects or individual projects would comprise one aspect of student participation in class, those responses are combined here with responses about group or individual work from question four.

There was some disparity in students' perceptions of group work versus individual work in the classroom. One student stated,

Since we've gotten the iBooks, I think we've done more group projects than independent projects, like the iMovie I am doing. Me and another girl are working as partners on that, and in math we are doing a big group project. (A-4, p. 16)

While another student stated, "Most of our projects come from our iBooks, so it is really convenient if we do a project individually.... It's a lot easier than getting a whole bunch of people" (B-7, p. 10). A third student described how security issues affected group projects. "Projects are individual because...you have to type in your password to get to places, and you can't give anyone your password. So it makes it hard to work in groups" (B-3, p. 10). School rules may also influence group work with iBooks. As one student expressed, "It's all individual because you are not allowed to share folders or let anyone borrow your iBook. So most of the time it is individual" (B-4, p. 10).

Information acquisition-question five. Focus group question five was designed to explore students' perception of how they obtained information in class. Students were specifically asked about textbooks, handouts, and teacher lectures. Responses were generated from 27 of 42 students representing all focus groups.

Using the computer, students obtained information by doing searches on the Internet, going to specific websites, or receiving notes and work through the teachers' Virtual Share Folders. Twenty-five students representing all focus groups discussed using the Internet or going to websites to obtain information for research. Fifteen students, representing five of the focus groups, mentioned the convenience of obtaining notes and other materials from their teachers' Virtual Share Folder.

The discussion about the use of the computer to get information versus use of textbooks generated many responses. Nine students stated that they used the computer to get information more than they used the textbook. One student said that information acquisition was equally divided between the computer and textbooks. Another student explained, "We get our information a lot different now.... We used to get it on the textbooks. Now we have to refer to the iBooks" (B-7, p. 19). Another student said,

I think it's changed because not many teachers are using textbooks anymore.... In science class, like for notes on chapter quizzes and stuff, she'll put it on Virtual Share and you get it off instead of having to study for it in your textbook. (F-2, p. 2)

Students from two different focus groups mentioned that they now leave their textbooks at home for certain subjects. One student explained, "I've gotten a lot more information from the Internet this year than I have from textbooks. My history teacher actually allows us to leave our book at home" (A-3, p. 14). One student stated that it was necessary to go to the locker more often to get books last year. A student from focus group E had a dissenting opinion and said, "I don't think it has changed a thing about the books because we use the books the majority of the time anyway. We use the books a lot instead of going to the Internet to research stuff" (E-5, p. 8).

A number of students discussed how finding information is quicker or easier with the iBook. One student explained, "With a computer you can go online and just type in anything, and you can find it a lot quicker than if you had to go through all the books" (A-2, p. 4). Another student said, "If you need a piece of information, you don't have to go that far to get it. You just get on the computer, and you look it up on the Internet" (B-5, p. 2). One aspect of this is that there is less need to go to the library to get information or reserve a computer lab for student use. One student explained, "We don't have to go to the library to do a project. We can just do it at home on your computer. It gives you more time at home to do your work" (F-4, p. 2). Another said,

Before we had the iBooks...if we needed to go to the Internet, [we had to go] to the trouble of renting out [reserving] the computer room ... for the period and [had] to hurry up. But now with the iBooks it's different because everybody can do it inside of the classroom with the airport. It just makes it a whole lot easier. (A-3, p. 8)

Some students talked about how enjoyable obtaining information with the laptop was. One student said, "Working out of the textbook is boring. When you do it on the computer,

you're more into it" (C-4, p. 2). Another student said, "I think that computers are more fun than books. Books are boring.... Plenty of students do not like to read.... The computer is like the new book" (C-3, p. 2). Another student agreed. "It's more fun. Kids want to explore the websites, and it makes them more curious" (F-2, p. 6). Two students mentioned that using the textbook was a form of discipline. One said, "Now most people think of the textbooks as a punishment. If you're good in class and you're quiet, you can just do all your work on your iBook instead" (C-5, p. 5). In a dissenting opinion one student said,

Even though it is easier to do everything in class.... Before the iBooks, you would have to go to the library to get all the information and stuff, and with the iBooks we could go online. Even though it does make it easier, like technology is good and everything. I just don't know, personally, I liked it better before. (A-2, p. 10)

A second part of focus group question five explored students' thoughts about the use of classroom handouts and worksheets. This question generated disparate responses. Several students thought that there were fewer handouts, and paper was being saved while several others claimed that the amount had not changed. One student indicated that the number of handouts had increased. One student said, "I like how my science teacher puts it on QuickTime Player [software that can show animation]. It shows a little movie, a little slideshow about what we're learning, instead of having to have a handout" (F-2, p. 7). One student said, "If we lose a copy of our homework, ... instead of her having to print up a thousand copies every time we need it, we have a copy on our computer, so it makes it easier" (D-1, p. 7). However, another student from the same focus group stated, "I don't think it's changed at all because when we get worksheets, we are expected to use the worksheet. We don't need to go online or anything" (D-7, p. 8).

A few students discussed the problems with using the computer instead of getting hard copies of handouts. One stated,

She [the teacher] has hard copies if somebody doesn't have their charger, and it runs out of charge. I think it's kind of easier to have a hard copy than to have it on your iBook because iBooks seem to mess up, or at least mine does. (F-5, p. 7)

A student from a different focus group said, "Sometimes when we get worksheets and quizzes from Virtual Share, the teachers' folders, if students have technical difficulties with their iBooks, then they [teachers] can get kind of frustrated and get upset; so they just print them out" (D-6, p. 8).

Students from two focus groups mentioned that handouts did not align with the Internet sites where they were directed to find the answers. One said,

Even though the Internet has more stuff, it is more spread out and it might not all be true. But a textbook, it's all right there. A lot of times we get worksheets where all the answers are all in one section of the textbook. That would be a lot easier than just going online and searching for it. (D-2, p. 13)

Another student stated,

It's changed this year, but last year they [teachers] had a bunch of worksheets that would be given for the textbook instead of the iBook. You'd have to look a lot harder because they wouldn't have the direct answers.... In the textbook there would be a direct answer. But now they're starting to get more and more iBook appropriate Internet sites worksheets. (A-3, p. 15-16)

Focus group question five specifically probed for students' thoughts on the amount of teacher lecture. Most students responding to this question felt that there was less teacher lecture. One student said,

The lectures are smaller, way smaller. They don't talk as much because they know they can say 'go to Virtual Share and get so and so out of the Drop Box.' Then when you pull stuff out of the Drop Box, they have all the directions on there so they don't waste as much time talking. (C-3, p. 7)

However, a number of students thought there was little difference. One student said, "In my classes my teachers still lecture a lot" (F-1, p. 8). A couple of students thought that teachers lectured more because of the need to explain how to get to certain sites or to discuss consequences for doing the wrong thing with the computer. One student said, "They give us twice as [many] lectures. They give us lectures on what you're supposed to do. Then, they give you lectures on if you go to this website you are going to get this punishment" (C-4, p. 9). Similarly, one student discussed the issue of getting all students the information that they needed and said,

I think the lectures get shorter about what you're doing, but the directions about how to get where the notes are on your iBook gets longer. They have to take you through everything sometimes, and you don't really have the time to do the stuff the teacher wants you to do because people are having problems with their iBooks. They have to go

and help the other student that is having the problem, and you don't really get to work on what you need to. (B-5, p. 8)

Projects-question six. Question six probed students for their perceptions on the category of class projects. Thirty of 42 students, representing all focus groups, responded to this question. Student perceptions concerning the issue of whether there are more group projects or more individual projects have already been presented. Findings involving other aspects of class projects follows.

Several students responded that they were doing more projects than last year. One student explained, "We have been doing a lot more projects because it's easier to do.... You can just go on the Internet to find the information, ... put it into a presentation, and put it in the teacher's drop box" (B-4, p. 9). Another student gave a rationale for more projects and stated,

I think we are [doing more projects] because most of the projects require research.... Before, teachers weren't giving us as much because a lot of people didn't have computers at home, and so they would have to do them at school or at the library.... That would be sort of difficult sometimes. And now that we have the iBook, they think that there is no reason for us not to do it. (D-4, p. 9)

A few students claimed that there was no increase in assigned projects. One student said, "I don't see where there has been a drastic change in projects because the projects we do, we don't use the iBooks for.... It's the same as last year" (B-1, p. 9).

Several students discussed the advantages and enjoyment of using the computer to produce projects. One student described a project that he had done where he presented music and movies to the words of a poem he had written. "Putting music to the words ...and really getting your moods across that you tried to make in the poem. You get it across more [when] you get to show by pictures [too]" (A-4, p. 9). Another student compared the old way of doing projects to using a computer. She said,

In science we had to do a project for astronomy.... It is better to do them on the computer because hand writing it takes much, much longer to write all the information.... We had five or more pictures and under the pictures we had to describe the pictures. We had to have slides five through nine [with] all the information. That's a whole bunch of information that you had to write on a poster board.... If we had to do it on a poster board, they would probably say something like, 'I don't want to see any open space.' ... But with

the computers you can just push a button, and the slide comes up. It takes less time because you can get information off the computer, and you can copy information to it. And then you can go back and summarize it. With the computer, you can hook them to the TV, and everybody can see your presentation instead of everybody having to move to the front. (C-3, p. 9)

In like vein a student said,

In history we had to do a Roman mythology project, or science we had to do the Big Bang Theory. I actually enjoy doing projects on the computer. When you hand write them, I think there is more pressure on me, and I try to cram it in at the last day to try to avoid [doing] it. (C-4, p. 9)

A small number of students had concerns about projects presented on computers. One talked about the similarity that projects may have and said, "Now [with] the projects, you don't get much of a variety of what your project will look like because it is set in the iBook.... You can't put things on your project that makes it look different" (B-5, p. 20). Another had a concern about computer difficulties affecting projects. "I get tired of my iBook freezing and crashing; and when I'm doing my project, and I don't save to my personal folder, the whole thing is destroyed.... I had to do it over three times" (C-4, p. 10). Another student talked about the problems of grading digital projects that are placed in the teacher's drop box and said, "She tells you if you've done something wrong ... and you try to go back and prove that to her, you really can't because it's on your iBook, and you can change it" (D-4, p. 6).

Recommendations-Question Seven.

Question seven probed students for their recommendations on improving the laptop initiative. Thirty-seven of 42 students, representing all focus groups, responded to this question. Students willingly gave recommendations about the laptop initiative that covered a variety of categories. Findings of student recommendations follow:

It is a good thing. Students generally agreed that Henrico County Public Schools (HCPS) did the right thing in issuing computers to all high school and middle school students. They echoed this was a great educational opportunity that related to the real world. Students suggested that other school divisions should pursue this type of initiative. One student said, "I would say to do just what we are doing right now.... It can be a whole lot of fun and easier to do work" (A-5, p. 18). Another said, "I think it is worth having the experience" (B-6, p. 5). In talking about the

opportunity created by HCPS, one student said, "I think all students, no matter what they say...enjoy and appreciate that we have this opportunity to learn with a different technology.... Not many students get to learn with technology" (D-1, p. 15). Another student said,

One of my friends told me that her family does not have a computer...With the iBooks it does give them a good opportunity to get used to what they're like when they get a job.

I'm guessing that almost every job uses a computer in a way. (A-5, p. 21)

One student referred to the increasing amount of technology and said, "I think the iBooks have a really great potential, and the technology is just going to keep getting more and more. And so, if we really use them, then I think they will be really great" (A-2, p. 19).

Wrong websites blocked. Students suggested that the school division blocked the wrong sites on the Internet and that at times they had difficulty finding information they needed. However, some students suggested that HCPS should block more websites where students could get into trouble. One student said, "They block the wrong sites ...and that's where we need to go to get our information. I have to go home and transfer it to my iBook and that was like twice as much work" (C-4, p. 8). A second student said, "I think they should modify their blocking system ... like blocking websites that might be educational.... Look at what they are blocking before they block it" (C-5, p. 11). Other students were concerned that they could get into trouble too easily because some sites were not blocked. One student said, "They probably do need a better filtration system as far as the Internet" (D-6, p. 14). Another stated, "They should block off more websites and stuff because people are still getting into trouble for it"(F-2, p. 10).

More training needed. Some students suggested that students and teachers needed more training. Recommendations included training on saving work, operating system use, and basics on fixing the computer. One student said, "I think that they should have programs so that students can learn how to use the iBooks better because some people do not know how to add printers and some of the things that we need to know how to do" (D-7, p. 15). Another student added, "They gave us training with the iBooks last year before we received them, and that was really with a different [operating system] than we have this year. That's why some people feel lost again" (D-8, p. 19). One student discussed the need for additional teacher training and said, "Teachers have to learn how to use them more because it seems like the teachers know less than we do.... Sometimes we need them to help us, and they don't know how to help us" (B-1, p. 21). A couple of students recommended training experts for each class. "They should get someone

like a computer expert in each class so sometimes when our iBooks break ... we can get someone in the class to fix it right away" (B-7, p. 15).

Teach responsibility. Several students felt that students needed to be taught more responsibility, and that schools may want to consider whether some students are responsible enough to be issued a computer. One student said, "There [are] a whole lot of responsibilities you have ... to take good care of your iBook. Make sure you don't put certain things on your iBook" (E-9, p. 15). Another student added, "Keep it in a safe place. Don't leave it lying around because somebody could step on it" (E-3, p. 15). One student was concerned about the possibility of issuing computers to elementary students and said, "I think they are giving them to the elementary school. I don't think this is a good decision, because my little sister, she loses stuff. She lost her book bag once. How do you lose that? I'm not sure" (C-4, p. 12). In a dissenting opinion one student stated, "Last year, it was our first year, and we really didn't know how to care for the iBooks much. This year it seems like I know how to be more responsible with my computer" (D-1, p. 4).

Convert textbooks to computer. A few students suggested that the school division move away from using books and that information be found completely on the computer. One student stated, "I think it would be a lot more effective if they would completely replace the textbooks instead of having to carry around the textbooks and the iBook" (D-6, p. 12). Another student said, "I think our main subjects like math, science, English and those they should put all or most of the information on the computers" (F-4, p. 12).

Two other issues were raised during the focus group interviews when students were asked for their recommendations: that teachers needed to use the iBooks more and that the computers needed to be more durable. These two categories will be presented in more detail later in this chapter.

Most Important Issues-Question Eight

Focus group question eight asked for student perceptions of the most important thing they would like to share about the laptop initiative. Thirty of 42 students representing all focus groups responded to this question. Few new items were revealed at this point. However, computer reliability and monitoring were two discussed as the main things we should know about the laptop initiative.

Computer reliability. Computer reliability or categories related to it was mentioned at various points throughout the focus group interview. During question seven, when asked for student recommendations, as well as in question eight, computer reliability issues were frequently discussed. Students were concerned about the frequent breakdowns of the laptops. Computer malfunctions such as the computer freezing up, hard drive crashes, and files being lost were mentioned. One student said, “My iBook crashed, and I lost everything. So, I had to go back and get everything again and do it again” (D-2, p. 3). Another student said, “It freezes a lot. If it does, you have to try to cram your project in and do the whole thing over.... like my little sister, her whole computer crashed” (C-4, p. 12). Another student said, “There are too many kinks in the computers so they freeze up. Some people are half way through the lesson and the other folks are still trying to access it [a website]” (C-4, p. 17). Losing files causes concern. As one student said, “If you are typing, something happens to the computer, and all your stuff is gone” (B-5, p. 4). Another student said, “If our iBook crashes, and that happens a whole lot, I get tired of my iBook freezing and crashing. When I’m doing my project, [if] I don’t save to my personal folder, the whole thing is destroyed” (C-4, p. 10).

When the laptop malfunctions, students can get behind. One student said, My friend had his mouse mess up and his hard drive crash. He missed out on a lot of stuff. He had to do different bookwork not pertaining to the exact objective we were doing on our iBooks. I don’t know if he felt completely behind, but it was a lot for him to catch back up when he got his iBook back. (A-3, p. 10)

Students become accustomed to using the iBooks. One said, “When you lose your iBook, after you have been using it for a while, it’s kind of hard to transition back to pencil and paper- especially when you have a project and [the computer] has crashed” (D-7, p. 16).

Students discussed the aggravation of malfunctioning computers. “Some teachers get kind of frustrated with the iBooks from time to time, and students get frustrated too ... when they crash. That, sort of, has a common bond between us” (D-6, p. 7). Another student commented, “Sometimes when a computer crashes ... in the middle of a lesson, it gets the teacher frustrated because she has to stop and help. Then the iBook ends up being brought to the help desk and shipped away”(B-1, p. 6). Computer malfunctions may be a bigger frustration to teachers than students. One student said,

I like the iBook ... because it's a new, fun way to learn, but teachers get more frustrated with it. I think more than the students, because ... if they can't access this or do this, we can't do our homework. A lot of our homework is on [the iBook] and that messes with their lesson plans. (C-4, p. 14-15)

One student's opinion was that problems should be less at this point. He said,

All the kinks and things they need to work out. They need to work them out over the summer. They have three months to work them out. They had three months last year, with all the high schools. Weren't the high schoolers supposed to be a test for the middle schoolers? (C-3, p. 12)

However, the first student to respond to question eight in one focus group offered a dissenting opinion. She said,

When people complain that their iBooks are always crashing, sometimes people seem to overreact about every single little thing. Even if their iBook only froze one day, some people will say that their iBook is very, very slow ... because it froze once in a week. (D-8, p. 13)

Students expressed concern about how easily computers broke. One student stated, "You should take really good care of it because it can break down really, really easily. If you treat them badly, then, most likely, they will mess up on you" (B-7, p. 11). Another student said, "They are sensitive and break easily" (B-1, p. 13). A third student said, "You have to watch yourself because the iBooks, they break. They are real delicate" (E-8, p. 15).

Several students expressed concerns with getting computers repaired and the effectiveness of the Help Desk. For some, the issue was the timeliness of repairs. One student said, "If it gets shipped away, sometimes it takes up to a month to get it back" (B-1, p. 14). Another student said, "When we have projects due, especially on your iBook, they take our iBook to the Help Desk. They take a week or two weeks to bring it back" (C-4, p. 23). Several students talked about experiences of returned computers with everything erased. One said, "They told me I would get my iBook back in two days, and it took three weeks. Everything got deleted, and that made me mad" (D-2, p. 16). However, some students may not have a realistic view of repair time. As one student said, "If it is something really little, then they can fix it quickly ... instead of waiting until tomorrow and have it sent away and wait like hours to get it fixed" (B-7, p. 15). Students suggested that Apple Computers open repair shops closer to Henrico County.

One student said, "If our iBook breaks, they have to send it to Texas, which is almost all the way across the United States.... It takes a long time. [It would be better] if we could get some place right in Virginia" (B-7, p. 17).

Students discussed the need for the Help Desk to do more. One student said, "I think they should have the Help Desk open all the time because if your computer breaks at the last block and the Help Desk isn't open 'til the next day, it takes longer to get it back" (B-2, p. 14). Another student talked about the limitations of the Help Desk repairs and said, "Maybe [the school should] get the equipment at the Help Desk instead of having to ship it somewhere else, ... or let the Help Desk take the information on how to fix it" (B-3, p. 14).

All students that are issued a laptop computer are required to pay a nonrefundable \$50 insurance fee. If a computer is damaged accidentally, students are required to pay a \$100 deductible before getting the computer back. These expenses concerned several students. One student said, "It's a big sacrifice for all the schools in the county ... as in money, because you had to have the money to fix them, and each student pays \$100" (F-6, p. 13). Another student said, "I think they cause a little bit more [of a problem]. Sometimes it breaks and you have to pay money. You have to worry about if the insurance covers it" (F-5, p. 13).

Several students thought that Apple Computers might not have been the best computer to issue students. One student said, "I think that the person who said that we need better computers is right.... A friend of mine told me that in Roanoke they have different computers; they were Dells or something and ran better than the iBooks" (D-7, p. 19). In one dissenting opinion a student said, "I like these [Apple Computers] better because they are more student friendly. On windows they have a lot more stuff on them; they are heavier, and they are more complicated" (D-3, p. 19).

Monitoring. A number of students discussed the topic of monitoring. Monitoring issues included concerns about how teachers watch students for proper computer use in the classroom as well as remote monitoring by administrators. Remote monitoring is accomplished by software called Apple Remote Desktop. Administrators at each school use this software to view what students are doing on their computers anywhere in the building.

Surprisingly, a number of students were concerned that there was not more monitoring. One student was concerned that teachers were not monitoring enough and said,

You can see it out of the corner of your eye, somebody on their computer when they shouldn't be. You don't want to just go tell the teacher. You would feel like you're tattling. I wish it was just monitored some more or better. (A-3, p. 12)

Another student wanted increased teacher monitoring for the students' sake and said, "Teachers should know what we are actually doing. They should monitor us more to protect us.... Some people do bad stuff, and if they don't monitor us, then we eventually get in trouble" (B-6, p. 13).

Another student talked about some students being untrustworthy. "Teachers have to be able to trust us.... I think I have that trust with my teachers, but I know there are other kids in the classroom who [break rules]. Yeah, it would be great if we had more monitors" (A-6, p. 12).

Categories Appearing Throughout Focus Group Interviews

A dozen other issues were woven throughout the focus group interviews. Because of the open-ended design, comments or discussions may not have been directly related to the question being asked. However, some of these additional categories are important to present as they embody issues that reflect on student concerns.

Getting in trouble. Several students were concerned that iBooks caused a distraction for some people. One student said,

Before, some kids might not have any distractions around them, and they would be just normal kids, paying attention. But I noticed with some kids that after we got the iBooks, ... some students wouldn't do the work. They would just surf the Internet and play around. I have to admit that sometimes it's a distraction. (A-5, p. 12)

Another student said, "It's distracting.... If the teacher is boring, you go online [because] you're not interested in what she is doing" (D-4, p. 11).

Students were concerned that software, which came loaded on the computers, created more opportunities for them to get in trouble. Some students felt that the chances to get in trouble needed to be removed from the computer. Download Manager, a software that facilitates saving information from a website, was specifically mentioned. One student said, "I think that the Download Manager shouldn't be there because it's more tempting to use the Download Manager to download games instead of downloading educational tools" (C-3, p. 8). A music saving software, iTunes was also mentioned as a problem because some students were getting in trouble for saving music on their computers. One student said, "If they don't want us to have iTunes; don't put it on there" (C-4, p. 7).

Efficiency. In a previous section on information acquisition, students indicated that gathering information by computer was faster and easier. Several students indicated that the computer made them more efficient and more organized. A number of students discussed how note taking and word processing skills were more efficient through constant access to the laptops.

Organization was improved through the use of the computer. One student said, "I'm actually a little more organized now.... When I was writing down assignments for homework, I would have to take out my assignment notebook, find the right page, and go to the right subject. Now I can just put it on my calendar or Stickies on my iBook. (D-6, p. 6)

Stickies are software that opens a small, brightly colored window on the computer resembling a paper sticky note, where students can write reminders to themselves. One student offered a dissenting opinion about the efficiency of the iBook over a notebook and said, "With the iBooks, if you run out of power, you can't really get to it [the assignment].... If you're somewhere that you can't have the use of your charger, then it's kind of a problem" (F-5, p. 7).

Thirteen students representing five focus groups mentioned note taking on the computer. Obtaining notes on the iBook was accomplished in two ways: students could type in notes as they were given in class, or if available, they could load notes onto their computer by accessing the teachers' Virtual Share Folder, which was mentioned earlier. Getting notes through the teachers' Virtual Share Folder was efficient. Students mentioned the benefits of typing notes on the computer when notes were not available on the teachers' Virtual Share Folders. One student said, "The majority of people type faster than they write, so sometimes we can do notes a lot faster ... so they have more time to talk" (F-4, p. 8). Another student said,

It's neater and more efficient when you are taking notes [if] teachers [are] talking really fast and [do not] repeat what they say. When you are writing it down, you write it slowly to make it neat.... I can do it quicker with the keyboard. (D-4, p. 3)

A few students shared concerns about using the computer for notes. One student said, "I'm not the very best [typist], so I can't take notes very well on my iBook, and I've [gotten] into the habit of saving things and not remembering where they are" (D-5, p. 3). Another student felt that using computers primarily for taking notes was questionable. She said, "Most of my teachers

use it for notes and that's it... I think we are just basically carrying around a notepad" (A-4, p. 5).

Writing assignments were enhanced by the use of computers. Thirteen students representing five focus groups discussed using the computer for completing writing assignments. Speed, editing, and neatness of assignments were mentioned as advantages of laptop use. One student said, "It's a lot quicker, and also, it is neater than writing by hand" (A-4, p. 3). Another student said, "You can check your spelling. When you do it with a pen and paper, you have to look in the dictionary and make sure you spelled it right. On the computer it is better" (E-8, p. 1).

Carrying the laptop. Students in three of the focus groups discussed certain aspects of carrying around their iBooks. For some it was a relief in that there was less weight to carry than before. One student said, "Since we got the iBooks, a lot of the information is on the iBook, and we don't have to carry the textbook around" (B-7, p. 7). Some students discussed how teachers were trying to reduce the weight now that students had the iBooks. One student stated, "Before we got them [iBooks], we brought the textbooks home.... In one of my classes we keep our textbooks at home and she has a class set, so that makes less weight for me" (F-5, p. 12). Other students indicated that there was more weight to carry than before getting the iBook. One student said, "Sometimes you still do have to carry your books, like for math class, and the iBook just adds weight for stuff to be carried around" (B-1, p. 17). One student acknowledged that Henrico County Public Schools (HCPS) was still working to reduce textbook use and lessen the load carried by students. She said, "I think we are still carrying the same amount of books. I think we are still adjusting to the iBooks trying to incorporate the textbooks in there because we have not" (D-8, p. 4). Another student talked about the damage that packing books and a computer together can do. He said, "Sometimes they [textbooks] crack the screen [of the computer] because of the weight of them" (F-5, p. 12).

Teacher resistance. Several students from three of the focus groups mentioned that some teachers were not actively using the iBooks in the classroom. One student said,

Ever since we first got the laptops, my teachers just straight up told us that they don't really care about them and that they're not going to be using them in the class. And so, the teachers who do use them use them in addition to our textbook.... They are not really worth all the trouble. (A-2, p. 4)

Another student went into a long discourse on how little some teachers use the computers during class. The reasons seemed to be due to some of the problems they had experienced with websites and computer malfunctions. After some problems with one website, a teacher may send the students to another website, or give up and use a paper hand out. He said, "My history teacher is like that. She doesn't use the computer unless she absolutely has to, and that's only when we have a guest to look and see how we are doing on our iBook" (C-4, p. 17).

Most of the students from focus group E indicated that there was infrequent use of their computers. This may be due to the fact that many students did not have computers. One student said, "In our classroom half of us don't have iBooks.... [If] I don't have mine we can share hers ... but we hardly use them" (E-8, p. 5). One student expressed the consensus of focus group E in saying,

I think it has not helped me in any kind of way because we don't use them in class.

Therefore, if we don't use them in class, how is it helping us if they just sit here, or at home, or in our little briefcase? I think it would be better if we didn't have them at all because we don't do anything with them. (E-2, p. 3)

Findings from Student logs

Letters of permission detailing information about this study asked focus group participants to also provide logs giving details of the activities of two days of classroom experiences. Focus group interviews were completed by mid-January, 2004, however, obtaining the student logs proved to be a challenge. Two weeks after completing the initial focus group interview, the researcher received two student logs. The researcher verbally reminded the four remaining students to turn in their logs, once per week for the next month and received three of the four. The last student assured the researcher that he had already turned in his log. This experience led the researcher to provide a small incentive of candy, or an inexpensive game or toy to students from the remaining focus groups. A month after completing the final focus group interview, no student logs had been returned by the other five schools. Phone calls and emails were made to each principal asking that a reminder be given to the students requesting the return of their logs. Six of seven logs were returned from school B, all five were returned from school C, three of eight were returned from school D, none of the nine were returned from school E, and three of seven were returned from school F.

The quality of student logs varied. Several students carefully followed the instructions given at the top of the first page of the log sheet that requested details about the type of activity, time spent on the activity, and feelings about the activity. Many of the student logs only listed the activities that were completed during each class and gave little or no detail about the activity.

Although there was a lack of quality or quantity of student logs, there was data generated to obtain a picture of the types of activities students from the focus groups were experiencing. Thirty categories containing a total of 327 coded items were generated. These categories were further analyzed to see which ones coincided with themes that had developed from the analysis of the focus group interviews. Taken as a group, student logs showed a pattern of technology use that had become part of instruction in a number of classes. The computer was used in one form or another, as indicated in student logs, by all but two students.

An analysis of student logs as secondary evidence of categories that emerged from the focus group interviews follows. Direct quotes and references from student logs will be cited parenthetically with the first letter designating the school, and the numeral designating the student, followed by the page number where direct quotes were found.

Changing School Experiences

Student logs showed some evidence of changing roles since the inception of the TLI. Two students described situations where they took leadership roles in helping others while several logs listed students reading aloud to the class. One student wrote, "I volunteered to help my classmate who had been absent with his class project for an hour" (B-1, p. 2). However, there were many examples of teacher-led activities. Group work was listed as a classroom activity in almost every log with class discussions listed a few times. Student logs frequently listed independent or individual work including class work, writing journals, warm up exercises, and reading. Taking tests or quizzes was the most commonly listed activity with some students listing three tests in two days. Watching videos, a passive activity, was mentioned thirteen times.

Student logs indicated changes in how information was acquired. Two students listed using the textbook while 13 students listed using Virtual Share to obtain information. Using the Internet and accessing websites to obtain information or review material was mentioned in 20 student logs, while worksheets were mentioned 25 times. One student described an activity in his history class in which they looked for resources. He wrote, "We went to our iBooks to make a list of historical fiction.... The activities were fun" (A-1, p. 1). Another student listed an activity

in English class where students reviewed simple subjects on their iBooks (F-6). Two students listed reviewing verbs in French class on a website (F-4) and (D-5). Only two students mentioned teacher lectures in their two-day activity logs while several listed teacher Keynote presentations, an Apple Computer software package for making computer presentations.

Project work, a specific question in the focus group interviews, was also listed in student logs. Students indicated that class time was devoted to project work in nine of the logs. Student logs did not indicate if these were individual or group projects. One student wrote that she spent the entire English class making an iMovie (A-4), while another student placed a digital project for her civics class into the teacher's Drop Box (C-3). A third student wrote that their class watched iMovie projects during the class (B-2).

Other Themes

Computer reliability and monitoring students while on the computer were important categories that emerged from focus group interviews. One student's log described computer difficulty that a teacher had in a Keynote presentation. She wrote, "The Keynote presentation wasn't cooperating. Parts of it kept getting cut off, and although it was necessary to learn this ... I think taking notes is easier" (A-2. p.1) That same student wrote that more monitoring was needed during an iBook activity because students wasted time socializing. In one log, indicating the need for monitoring, a student wrote that a boy was removed from class for watching a movie on his computer during class time, (B-1).

During focus group interviews it was determined that efficiency and organization can be enhanced through technology. Most student logs listed note taking as a common class activity, and more than half of those logs indicated that students took notes on the iBook. One student mentioned that she usually used her iBook for taking notes and working on vocabulary in her Spanish class (D-3), while another student mentioned using the iBook for taking notes in health class, and spending an entire science class taking notes on the iBook (C-1).

Efficiency was increased through the use of Virtual Share to obtain notes, perform science labs, take quizzes, and obtain vocabulary words. A student wrote that in math class she spent most of the period doing an activity from the teacher's Virtual Share (C-4). Another student listed designing a spreadsheet in his science class for most of the period (F-6), while a third student wrote about checking grades in class through the K12 Planet website (D-1). A fourth student wrote that he took a test on the computer (C-4).

Websites proved effective resources as indicated by student use of websites to research viruses, Shakespeare, imperialism, and the Constitution. Two students listed using a website that is popular with math teachers (A-1) and (B-1). One wrote, "We checked our worksheets and finally, we went onto Larson's Math Series on our iBooks" (A-1, p. 4). Another student wrote about how the iBook enhanced an assignment on child labor. "The essay took more thought, and was especially hard because the pictures were extremely sad. The one nice thing about this assignment is that we could use the iBooks to learn using resources that would otherwise be impossible" (A-2, p. 1).

Findings from Classroom Observation

To conduct classroom observations the researcher obtained names of teachers to observe from student logs, placing this part of the research as the last data collection phase. When possible, the researcher observed classes that focus group students identified as the better ones to observe. In some cases, the focus group students were in the classes observed. It took only a few minutes to understand why these classes were chosen. In each case, the students were well behaved, instruction was clear, and class time was utilized fully by caring and articulate teachers.

The researcher observed one class from school A and two classes from Schools B through F. The observation form found in Appendix I was used to identify and describe specific computer uses, and detailed notes of activities, interactions, and seating arrangements were made. Twenty pages of hand written notes were transferred to a word processing document, condensing the notes into five pages of activities by class and school that related to the focus group interview subcategories and categories developed during this study. Related subcategories were further combined into the category of roles, projects, information acquisition, computer reliability, and efficiency. Direct quotes by teachers are cited parenthetically. The letter designates the school, and the teacher is designated by the numeral following the letter. An analysis of classroom observations follows.

Changing School Experiences

Focus group interviews included a question on changing roles. Because classes ranged from 45 minutes to 90 minutes in length, roles were analyzed as a percentage of time spent by students in leadership activities, working in groups, or doing independent work. Students who performed leadership roles were observed in only two classes. In one class, a student independently helped another student who was absent from the previous class. In the other class,

students spent 45% of the class time giving reports; however, none of the reports utilized the computer. Independent student work averaged 43% of class time, from a low of 10% in one class to a high of 90% in another. Teacher-led activities comprised an average of 35% of classroom time, with a low of 10% in one class to a high of 80% in another. Group work averaged 28% of class time, with two classes providing no time and one class providing 80% of the time to do group work. Lesson plans designed for students to work independently on their laptops became group work in every class because students without computers paired with those who had computers. Students who worked in pairs with the laptop computers appeared to be actively engaged in the topic being studied. The total percentage of time in different roles exceeded 100% due to some overlapping in the various activities.

Classroom observations verified that students were acquiring information in new ways through the use of the iBooks. In all but one class students obtained information from the Internet or a website. In three classes, students accessed the teacher's Virtual Share Folder to obtain information; in a fourth class, students were referred to the teacher's Virtual Share Folder to check answers from a test they had just taken.

In addition, observations revealed that traditional methods of obtaining information were not completely replaced by the iBook. Teacher lectures and class discussions were observed in all but one of the classes. In seven of the classes, students completed worksheets or workbooks. Textbooks were only used in four of the classes observed, and only one class watched a video.

Project work, a specific category from the focus group interviews, was observed in only one classroom. This class spent 80% of the class time doing research in groups of two. Students utilized the iBook to examine websites, and they used books that were reserved by the library. The teacher cautioned students from using Google, and reminded them that search engines often led to websites that had unreliable information. She asked that they use the websites posted by her instead. In another class, the teacher reminded students of a project that was due.

Other Themes

Aspects of computer reliability, monitoring, carrying the iBook, and note taking were observed. One classroom had 20 of 21 students with laptop computers, but most classes had several to nearly half of the students without an iBook. In both classes observed at school E, the instructors told the researcher that only about 20% of the students had iBooks in class because their parents were not willing to pay for repairs to the broken computers, or they had decided not

to invest the \$50 for the insurance. One teacher from school C made a similar statement. Both instructors indicated that the excitement of having the iBooks had decreased over the previous year.

The researcher observed that several students in most classes plugged in their computer to a charger during the class. In several cases, the wire to the computer was draped across an aisle where students would walk. Students and teachers appeared to be used to this situation, and skillfully stepped over the wire. Considering the expense of the repair to a broken computer, it would be interesting to note who would pay the bill, should a person trip on a wire, and knock the computer to the floor, or fall and break a leg.

From focus group interviews, students had differing opinions about carrying around the laptop computer. The researcher noted that most students carried backpacks into class that contained notebooks and other books as well. Some iBooks were contained in backpacks, but some students carried iBooks in separate carrying cases. Observations did not reveal if students were carrying more weight than before the iBook; however, no student came to the class with only an iBook. And, because some students chose to use separate cases, it appears that more care must be exercised in handling a computer than a textbook.

Some frustrations with the technology were observed. In four classes, teachers spent extended time with individual students trying to get the computer to work. In one class the teacher tried to help a few students get onto a website and after 10 minutes said, "Do not waste anymore time trying to get to the site. You may use a resource book to get this information instead" (F-1). She then turned to the researcher and said, "This is a good example of why you need hard copies" (F-1). In another class the teacher posted a website for students to access later. She had tried it earlier and said, "Today it has a glitch" (F-2). Three teachers expressed concern that students did not have their computers in class, which affected how the teacher conducted the lesson. In a third class a student's computer was not working, while another student's computer would not hold a charge and had to be plugged in to be used. In yet another class, there was frustration over a malfunctioning website link, which contained pertinent information to the class discussion. Even with these problems, it should be noted that in all but one class, laptop computers were used as a resource.

Monitoring student computer use, a category that emerged from the focus group interviews, was observed. Only four teachers monitored their students during computer use, and

one of the four teachers who moved around the room, was unable to see about half of the computers due to the arrangement of the desks. Even with a lack of monitoring, students appeared to be using the technology appropriately. The location of the researcher's seat enabled him to observe many of the students' computers. At no time did he see students going to other sites than those to which they were instructed.

A final category, efficiency of taking notes on the iBook, emerged from the focus group interviews and was observed. There were times in the majority of the classes where students could have taken notes on the computer, but students were observed taking notes on the iBook in only three classes. In one of the three classes, students also wrote journal reports.

Triangulation

Triangulation for this study was provided through the data from student activity logs, classroom observations, and focus group interview data. The primary source of data was from focus group interviews and was triangulated with data obtained through student logs and observations made by the researcher to verify findings and increase the trustworthiness of conclusions. Table two summarizes the major findings of this study and shows how these multiple sources of data support findings. Findings are organized by themes, categories, and subcategories, with major findings listed to the left of the chart, and the sources of data from focus group interviews, student logs, and classroom observations to the right of the chart.

Summary

Data generated through focus group interviews, student activity logs, and classroom observations indicated that students' learning experiences had changed since the introduction of the laptop computers. Forty-one of 42 students said that their educational experiences had changed in a number of ways during the focus group interviews. Data obtained through student logs and classroom observations verified some of the educational changes that students voiced during the focus group interviews.

Data generated from focus group interviews were coded and grouped into subcategories, categories, and then into themes that related to the research questions and other emergent themes. Findings were presented in narrative form providing examples of student comments related to the categories. This format gave rich, thick detail to the findings that should enable the reader to understand more fully what participants of this study experienced.

Table 2

Sources for Data Triangulation

<u>Major finding</u>	Source of Data		
	FGI	SL	O
<u>Theme: Changing School Experiences</u>			
Category: Changing Roles			
Students leading	X	X	
More group work	X	X	X
More individual work	X	X	X
Category: Information Acquisition			
Internet & Virtual Share	X	X	X
Computer more than textbook	X	X	X
Info by computer easier/enjoyable	X		
Less teacher lecture	X	X	
Category: Project Work	X	X	X
<u>Theme: Student Recommendations</u>			
TLI is good/other divisions should do	X		
HCPS blocks good websites	X		
HCPS should block more sites	X		
More training is needed	X		
Teach responsibility with computer	X		
Convert textbooks to computer	X		
<u>Theme: Most Important Issues</u>			
Category: Computer reliability			
Computers malfunction often	X		X
Frustrations with computers	X	X	X
Computers break easily	X		
Repair/cost concerns	X		X
Help desk concerns	X		
Issue a different computer	X		
Category: Monitoring students is important	X	X	
<u>Theme: Issues Appearing Throughout Focus Group</u>			
Category: Getting into trouble with computer	X	X	
Category: Efficiency			
Organization	X		
Note taking with iBook	X	X	X
Word processing	X	X	X
Category: Carrying weight			
Less weight	X		
More weight	X		
Category: Teacher resistance	X		

Note: FGI = Focus Group Interview, SL = Student Log, O = Observation

Focus group interview questions sought student perceptions about their roles in class. Participant responses showed that students believed the introduction of the iBook in class had given them opportunities to take leadership roles. Student leadership roles were realized because many students had a better understanding of technical issues related to the computer and could offer assistance to both teacher and student in the class. Although student logs verified some aspect of the student leadership role, observations showed few opportunities for students to assume these leadership roles.

Participants were asked about group work and individual work. Focus group interviews revealed that students were participating in more group work and individual work since the introduction of the iBook computers. Data from student logs and observations verified that large portions of class time were spent in group and individual work. It should be noted that some of the time attributed to group work was when students were required to pair up because some students did not have a laptop computer.

Project work was an important part of the participants' educational experience. Focus group interviews indicated that students were doing more projects, and that these projects were easier to do and more enjoyable when done with the iBooks. Student logs and observations verified that students were participating in project work as well.

Students acquire information in different ways since the TLI. Students obtained information from websites, teachers' Virtual Share Folders, and through the Internet. Focus group interviews revealed that there was less teacher lecture, less textbook use, and fewer handouts than before the introduction of the laptops. Student logs and observations verified that textbook use might be less since information is obtained through the computer.

Students were asked for their recommendations concerning the TLI. They responded that the program was good and that other school divisions should give their students laptop computers. Focus group interviews uncovered student concerns on several issues. Some students expressed concerns that HCPS Internet filtering system was blocking important websites, while at the same time others thought the school division should block more sites to keep students from getting into trouble. Students indicated that teachers and students needed more training on the use of the computers, and that students needed to be taught more responsible handling of the computer. Several students expressed an interest in converting the access of all textbook material through the computer.

During focus group interviews computer reliability emerged as an important issue. Students expressed concern that computers malfunctioned frequently and that files were often lost. These malfunctions as well as occasional difficulties getting onto websites caused frustrations for both students and teachers that were verified through student logs and classroom observations. Some students expressed concerns about the length of time expended getting computers repaired and the cost for insurance or the deductible payment associated with repairing a computer. Observations revealed that no classroom had all the students with iBooks, and most classes had several students without their laptop.

Students were concerned that they could get into trouble with the iBooks too easily. As mentioned earlier, participants thought that HCPS should block websites where students could get into trouble. Participants also indicated that HCPS eliminate features on the iBooks that could be misused by students resulting in disciplinary actions. Monitoring was discussed as an important responsibility of teachers and administrators that could reduce incidents of student misbehavior on the computer. Observations showed that although some teachers did monitor student computer use, other teachers relied on trust to keep students focused on appropriate computer sites.

The efficiency of iBook use emerged as an important category during the focus group interviews. Students discussed whether they could be more organized by keeping work and projects on their computers. Writing was easier and more enjoyable using the word processing tools contained on their computers. Focus group interviews, student logs, and observations revealed that many students utilized taking notes on the iBook.

Transporting the iBook generated some discussion during the focus group interviews. Some students stated they were using textbooks less; therefore, they had less weight to carry from class to class. Other participants felt that they needed to have the textbooks in class and that the iBook added additional weight. Student logs did not reveal any information on this issue; observations revealed that most students were carrying around other books, and that iBooks required careful handling.

Participants of some focus groups discussed teacher resistance to using the iBook. Students complained that some teachers rarely, or never, used the iBook. This issue seemed to be more prevalent in schools where fewer students had the iBooks in class. Students in school C and E had fewer students bringing iBooks to class, due to their failure to pay the deductible or the

required \$50 insurance fee to be issued a computer. Regardless of these complaints, the researcher observed that teachers in every class but one utilized the iBook at some point in the lesson.

CHAPTER 5

DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

The final chapter of this study is organized into several parts. First, the purpose, research questions, and methodology used for this study are reviewed. Second, findings are discussed on the effectiveness and rationale for employing student perceptions. Third, findings are discussed as they relate to the research questions of this study along with the subcategories, categories, and themes that emerged during the study. Fourth, conclusions are stated, followed by recommendations for further research.

Purpose and Research Questions

In January of 2003, Henrico County Public Schools (HCPS) introduced laptop computers to each of the middle school students in the division. This was the second phase of the program, named the Teaching and Learning Initiative (TLI) that deployed over 23,000 laptop computers. Some initial studies had been completed on the first year experiences at the high school level. Few studies have been done with middle school students' ubiquitous use of computers, and none with the magnitude of this initiative.

The purpose of this study was to give middle school students in the school division an opportunity to describe their experiences in the (TLI). It was believed that their perceptions were crucial to understanding what was happening in the classrooms. The primary research question guiding this study was: What are middle school students' perceptions of how the TLI has affected the learning environment in HCPS? Utilizing students' perceptions, secondary questions included: (a) Has the introduction of the TLI created constructivist classroom activities? (b) How have student and teacher roles changed since the inception of TLI? (c) How has TLI influenced student access to information? (d) What suggestions would students make for the improvement of TLI?

Methodology

A qualitative design was utilized in this study that involved identification of experiences, perceptions, and feelings determined through thick, rich accounts obtained by open-ended focus group interviews, student logs, and observations. The researcher conducted a descriptive, qualitative study with the primary data collected from focus groups comprised of middle school students who participated in the TLI, beginning in January 2003. Focus group interviews were

audio taped and transcribed verbatim. Participant responses were coded and placed into subcategories that related to the research questions. Themes that emerged from an analysis of the data were organized by categories and subcategories and described in narrative form. Secondary data was obtained through student logs of classroom activities over a two-day period, and through observations conducted by the researcher in two classrooms at each of the schools where focus group interviews were held. These three sources of data were utilized for triangulation of findings.

Discussion

An in-depth discussion of the findings from this study is provided in the following section. This discussion is couched in the context of relevant literature and the participants' perceptions, and draws from the triangulation provided from multiple data sources. Discussion includes the value of giving student voice, changing school experiences, constructivist classrooms, information acquisition, and other themes that emerged from the study.

Student Voice

The researcher believed in the importance of student input for this study. In focus group interviews, as students talked about their experiences with technology, it appeared that computer use came naturally to those who had grown up in a digital environment. Students have grown up with technology so that digital environments come naturally to them. According to Tapscott (1998), most children claim to be more proficient with computers than their parents, making kids the authorities on technology issues. Students were the experts that other students and adults consulted when experiencing problems with technology (Peck, Cuban, & Kirkpatrick, 2002). Several students in this study confirmed this finding when they spoke of their expertise exceeding that of their teachers in technology.

Students wanted and expected technology to be used in school; some became dependent on it (Levin & Arafah, 2002). During focus group interviews for this study, students expressed how much they enjoyed using available technology and wanted to move away from paper into more digital content. According to Levin and Arafah (2002), students stated that schools have not recognized the fundamental differences in students today when it comes to technology, another good reason for including student participation in this study.

Even though the students were only 13 or 14 years old, they articulated ideas and feelings about their experiences in the TLI with clarity. This is consistent with opinions expressed by

Glickman (1998) who described students as important and eloquent conveyors of ways to improve instructional practices. Because students are an important part of the learning community, their voices should be included (Senge et al., 2000).

Research Questions

Themes and the categories that comprise them, which emerged during this study, are discussed along with relevant literature for the research questions. Included are student's perceptions of their changing school experiences within the Teaching and Learning Initiative. Constructivist practices, role changes, and information acquisition are discussed.

The Primary Question

Students' perceptions on how the TLI affected their learning environment were primary to the research for this study. Findings indicated that their learning environment had changed. Forty-one of 42 students stated that their school experiences had changed since the introduction of the laptop computers. This is similar to the findings by Kinlaw (2003) with high school students involved with TLI where 49 of 50 students in his study agreed that their school experiences had changed.

Students appreciated the use of laptop computers in the classroom, in lieu of moving to the library or a computer lab to do research. As one student stated, "Now with the iBook it's different because everyone can do it inside of the classroom" (A-3, p. 8). Similar to this study, Smith's (2002) study found that access to laptop computers in the classroom saved time and allowed students to work in a familiar environment, especially with wireless connections to printers and websites. Kinlaw (2003) indicated similar results in limited use of the library as well as the convenience of ubiquitous computing.

Students seemed more motivated to do class work when using the laptops. One student said, "When you do it on the computer, you are more into it" (C-4, p. 2). Students indicated that using laptop computers added enjoyment to many learning activities including projects, research, and class work. Dinnocenti (2001), Donovan (1998), Kinlaw (2003), Kulik (1994), Mitra and Steffensmeier (2000), Pye and Sullivan (2001), and Soublis' (2001) studies showed similar findings to this study on attitude and motivation when students utilized technology. However, in schools C and E where fewer students had computers, mainly due to financial reasons, there may have been a decline in the interest from the first semester of computer use. This is similar to

findings by McKinnon, Nolan, and Sinclair (2000), who showed that over time, computer use may become routine and taken for granted.

Constructivist Classrooms

Henrico County Public School's (HCPS) Teaching and Learning Initiative (TLI) was intended to do more than give students personal computers. TLI's intent was to create classrooms that were more student-centered and constructivist in nature, moving away from more traditional didactic, teacher-centered instruction. Proponents of constructivism, a cognition theory traced to Piaget (1970) and Vygotsky (1978), described learning as a complex process where individuals built knowledge internally using personal experiences to construct meaning (Jonassen, 1990). Savery and Duffy (1995) suggested that in constructivist classrooms students are engaged in authentic, complex, and relevant learning, where students are given some ownership in the tasks. They add that these classrooms should involve collaborative work where teachers become facilitators and guides. As teachers become facilitators of learning, Johnston and Cooley (2001) suggested that roles in the classroom would change, and students would become leaders in classroom activities. Part of the impetus for introducing the laptops to students in the school division was the belief that an infusion of technology could not only facilitate changes in instruction, but that "the laptop program itself, then, may [act] as a catalyst for change" (Rockman et al. 2000, p. vii). Henrico County Public Schools had embraced these theories in the belief that learning takes place better utilizing the practices derived from them.

Focus group questions four and six were posed to determine if some of the characteristics of constructivism were present in HCPS middle school classrooms where laptop computers had been introduced. Question four looked for responses about leadership roles, group work, and passive student roles. Classrooms with more constructivist characteristics would be expected to show students in more leadership roles, more group work, and less passive activities. Question six asked about projects, and if those projects were individual or group projects. Classrooms with constructivist characteristics would show evidence of project work, which tends to be more authentic, and would involve group efforts in some projects.

Findings from this study showed that some of the characteristics of constructivist classrooms were occurring in HCPS middle schools. Focus group interviews and student logs indicated that students were taking on leadership roles. In most cases the leadership roles were in the form of student expertise with the technology. As one student stated, "Now with the iBooks,

[students] know something about technology and can share that with other students and the teacher” (A-2, p. 11). These findings are similar to findings by Sandhlotz, Ringstaff, and Dwyer (1990). Classroom observations showed that students were involved in passive learning in teacher-led classes 35% of the time, as compared to 43% of the time where students did independent work. Group work comprised the remainder of the time in the class.

Spending time working on projects, a more authentic type of learning, is another sign of constructivist classrooms. Findings from focus group interviews, student logs, and classroom observations indicated that project work was an important component of middle school classrooms in HCPS. Several students felt that there were more projects than the previous school year due to the iBooks. One student said, “Before, teachers weren’t giving us as much because a lot of people didn’t have computers.... Now that we have the iBook, they think that there is no reason for us not to do it” (D-4, p. 9). Students from every focus group indicated that their projects were easier to do, more enjoyable, and better when produced on the laptop computer, which were similar to findings from Rockman et al. (2000).

Constructivist classrooms emphasize collaborative or group work. Findings from focus group interviews, student logs, and classroom observations indicated that group work was a frequent activity in HCPS middle school classroom. It was observed that often group work, or work in pairs, occurred because several to half of the students did not have a computer. Teachers stated that most of the activities were to have been individual, but they were forced to pair up students to complete the planned lesson. In most cases the researcher observed that students who worked in pairs were fully engaged in the activity, and that the incidental social aspect of working together may have enhanced the learning activity.

Although there was a significant amount of time spent in group work, it is not clear whether the laptop computer supported group work, except incidentally. During focus group interviews students disagreed if they were doing more individual projects or more group projects. However, it was apparent that when using individual laptop computers, working in groups was restricted by the technology. As one student stated, “You have to type in your password to get to places, and you can’t give anyone your password. So it makes it hard to work in groups” (B-3, p. 10).

This study of HCPS middle school students’ experiences in the TLI parallels Rockman et al. (2000), Sandhlotz, Ringstaff, and Dwyer (1990), Schieber (1999), Windschitl and Sahl’s

(2002) studies, which were designed to determine if ubiquitous computing supported constructivist classrooms. Similar to the TLI, the Rockman et al. study showed that classes with ubiquitous computing developed more constructivist instructional practices, such as project-based work and student-led activities. Unlike the Rockman et al. study, it is not clear whether the TLI led to more group or collaborative work, except incidentally. This would support the findings of Schieber that laptop computing could not be shown to enhance group work. Findings from this TLI study could also indicate that a constructivist classroom could be supported by laptop computers, but was limited by the teacher's belief of what constitutes good instruction, as was the case in Windschitl and Sahl's study.

Information Acquisition

A secondary research question asked how the TLI influenced student access to information. Focus group interview question five specifically asked students to discuss use of textbooks, handouts, and lectures. Analysis of data showed that students received information in various ways. Traditional teacher lecture with class discussion still held a place in conveying information. Handouts were used extensively, with less use of textbooks. In some cases students believed that the textbook was used as a form of discipline. One student said, "Now most people think of the textbooks as a punishment" (C-5, p. 5). With the introduction of the laptop computer to each student, there was an increased amount of information received in a digital format through the Internet, websites, and Virtual Share. Many students found that format preferable. One student said, "If you need a piece of information you don't have to go that far to get it. You just get on the computer, and you look it up on the Internet" (B-5, p. 2). Some students saw the eventual demise of the paper textbook as one student said; "It would be a lot more effective if they would completely replace the textbooks" (D-6, p. 12).

A reduced use of textbooks and the library, and a growing dependence on the Internet for information found in this study are similar to findings by Kinlaw (2003) and Levin and Arafeh (2002). Students used digital resources when available. "Much like a school-issued textbook or traditional library, students think of the Internet as the place to find primary and secondary source material for their reports, presentations, and projects" (Levin & Arafeh, p. iii). With 24-hour, wireless access to the Internet that the TLI provides, students will likely increase their use and dependence on digital resources.

Several concerns are raised with the expectation of increasing the use of the Internet for information acquisition and reducing the use of textbooks for which students are asking. First, the Internet is a wide collection of resources with varying levels of credibility and usefulness. Eliminating adopted sources of information like textbooks is questionable without providing for the training teachers and students on determining the value, accuracy, and appropriateness of those sources of information. Because Internet sources are easily cut and pasted into projects, training needs to include fair and ethical use of information. Second, school divisions considering that an initiative similar to the TLI would eliminate the need for textbooks and other printed resources must prepare other ways of providing the needed SOL content in each subject area. Teachers would need time to write and develop more digital curriculum, which is already occurring each summer in HCPS. In addition, training on finding and using the increasingly available digital content would need to be provided.

Student Recommendations

A secondary research question was used to probe students for suggestions on improving the TLI. Focus group interview question seven asked for student recommendations for HCPS and other school divisions considering such an undertaking. Students largely complimented HCPS for the initiative and said that other divisions should give students laptop computers as well. Unlike findings by Kinlaw (2003) from the high school students, who said the division should be patient and have a more gradual transition; the middle school participants gave no reservations. One student recognized an important aspect of the TLI in providing equity as well as training for a technological future. She talked of a friend whose family did not have a computer at home and said, "With the iBooks it does [give them] an opportunity to get used to what they're like when they get a job. I'm guessing that almost every job uses a computer in a way" (A-5, p. 21). This statement reflected findings similar to Greening, (1998), Kinlaw (2003), and Rockman et al. (2000), and was the position taken by McCain and Jukes (2001) who stated, "Any society that relies on a highly complex technological infrastructure ... needs highly competent people to sustain, manage, and develop that society" (p. 67).

Students recommended that the school division filter websites carefully. HCPS technology department blocked new websites daily that were reported by administrators across the county as inappropriate for student use. However, students believed that certain educationally valuable websites were blocked that inhibited students' ability to complete assignments. Similar

findings were reported during the second year of the TLI with HCPS high school students (Kinlaw, 2003) and in Levin and Arafeh's (2002) study on student Internet use. At the same time, students were concerned that certain websites that contained inappropriate materials were not blocked. This was the ongoing issue about how to provide a safe environment for students, and at the same time, keep needed information accessible.

For any new program training is needed. Participants in this study indicated that both teachers and students needed more training. This is consistent with findings from Kinlaw's (2003) study of the TLI from the previous year. A specific concern mentioned in this TLI study was that there was a new operating system installed over the summer, and that students and teachers did not have the training with that system which they had received the previous year. Studies by Dinnocenti (2001), Levin and Arafeh (2002) Mitra and Steffensmeier (2000), Sandhlotz, Ringstaff, and Dwyer (1990) and Schieber (1999) confirmed the importance of training to the success of technology innovations. Wenglinsky's (1998) study showed the importance of giving teachers training when new technologies were introduced. His study, which examined technology factors that may have affected NAEP scores, suggested that students whose teachers had received technology training had higher scores than those whose teachers did not have technology training. Considering the increasing use of technology in most schools today, it seems incumbent upon teacher preparation programs in colleges and universities that instruction in the use of technology and innovative strategies using computers in the classroom become a requirement during teacher training.

Middle school participants from each focus group discussed the importance of students being responsible with computers. Several participants were concerned that some middle school students were not responsible enough to care for the expensive laptop. This may be a concern for HCPS since it has expanded computer offerings from the more mature high school students to less mature and less coordinated middle school students. Some middle school students talked about giving elementary school students the responsibility of handling the laptop. One student said, "I don't think this is a good decision because my little sister, she loses stuff" (C-4, p. 12). HCPS should examine research on how younger students care for the laptops before extending the program, in its present form, to younger students.

*Other Emergent Themes**Computer Reliability*

Similar to findings by Kinlaw (2003), Rockman et al. (2000), and Sandholtz, Ringstaff, and Dwyer (1990), participants in this study had concerns about the reliability of the iBook computers. Students were concerned about computer malfunctions, loss of files, and computers that seemed to break too easily. One student said, "My iBook crashed and I lost everything" (D-2, p. 3). Participants from Kinlaw's study thought that the machines had not had enough field-testing, and both groups included participants that thought the county should have considered a different machine. The TLI provided extensive testing with the iBooks used over the previous two years, by the fact that over 12,000 high school students used the same model of computer. However, the same parts such as CD trays, screens, chargers, and latches continued to fail in 2003 and 2004, as they had in the previous years with the high school deployment. One concern that the researcher noticed during observations was the number of students that had to plug in their laptop battery chargers during class. This could have proven to be a hazard as cords were draped across aisles in the classroom. Smith (1998) discussed this common problem of laptops running low on power at Dowell Middle School and the difficulties that it caused to their program. Participants in Kinlaw's study, as in this study, thought that computer repair time was too long. It is clear that there have been improvements in turn around time for repairs to computers in 2004. This is largely due to an Apple computer repair shop located in the Richmond area that opened in early 2004.

Students and teachers were frustrated by problems with computers or accessing online resources during lessons. One student said, "When a computer crashes ... in the middle of a lesson, it gets the teacher frustrated because she has to stop and help" (B-1, p. 6). Observations as well as focus group interviews revealed that teachers had to spend an inordinate amount of time with certain individuals in the class that were having computer problems. If the teacher was unable to solve the problem, the student was asked to use a book, handout, or pair up with another student to finish the lesson. At least one student had a differing opinion and expressed concern that students exaggerated minor problems. She said, "People seem to overreact about every single thing, [even] if their iBook only froze one day" (D-8, p. 13).

Teacher frustration may be a result of the number of students without computers in each class. Reasons students did not have computers included uncharged computers, computers out

for repair, or students who had not been issued a computer. At one school, 50% of students did not have computers because they were unable to pay the \$100 deductible for completed repairs, or their parents did not pay the \$50 insurance fee. At another school, nearly 75 computers were in storage until students paid for repairs. In both cases, these were schools with greater numbers of students at a lower socioeconomic status.

One student spoke of the importance of the TLI in providing for all students, as she talked of a friend whose family did not have a computer at home. Questions of equity must be raised when some students are unable to pay for insurance or repairs and thus are excluded from the TLI. Rockman et al. (2000) talked of the challenge of equity that affected their study.

While many sites recognized that most benefits occurred when all students in a particular class had laptops, ...many also worried about what that might mean for students unable to afford a laptop.... This is a critical concern for schools and worthy of further monitoring and study. (p. 10)

Monitoring

During most focus group interviews, participants expressed the need for faculty to monitor what students were doing. This was a concern because some students had been disciplined for accessing websites that had inappropriate material or were playing games and surfing the Internet during class time. Monitoring was accomplished both in the classroom and remotely. In order for teachers to monitor students' work on the laptops, classroom furniture arrangements need to be considered. From observations, it appeared that many teachers were not concerned about monitoring their students. Administrators monitored student and faculty computer use by a program that gives remote access to all computers in the building. As one student put it, "Some people do bad stuff.... If they don't monitor us, then we will eventually get in trouble" (B-6, p. 13). Participants expressed concern over certain software that came with the computer, which facilitated adding games and music and could result in disciplinary action. Sandholtz, Ringstaff, and Dwyer (1990) expressed similar concerns with student misbehavior and the need to adjust classroom management practices.

Efficiency

Participants in this study appreciated the efficiency that the computers gave them in organization, note taking, and word processing. One student said of taking notes on the computer, "It's neater and more efficient.... I can do it quicker on the keyboard" (D-4, p.3).

Participants from five of six focus groups discussed the speed, editing, and neatness of doing writing assignments with the word processing tools on the computer. This is similar to findings from a number of studies including Donovan (1998), Kinlaw (2003), Rockman et al. (2000), and Soublis (2001).

Carrying the iBook

The added weight of the iBook generated some discussion in half of the focus group interviews. There was disagreement as to whether it increased or decreased the amount of weight students had to carry from school to home and back. Some students claimed that they used textbooks less and, therefore, carried less weight. Other students disagreed and claimed that they carried more weight than before with the addition of the computer. Referring to attempts to get textbook materials completely on the computer, one student said, "I think we are still adjusting to the iBooks trying to incorporate the textbooks in there" (D-8, p. 4). Classroom observations revealed that carrying the iBook presented concerns as it was often transported in a separate case and most students carried at least some other books and materials. The findings from this study mirror Kinlaw's (2003) mixed review of the added weight of the computers.

Teacher Resistance

Three of the six focus groups discussed teacher resistance to the TLI. Statements were made about how little some teachers used the computer during class. One student said, "[Our teacher] doesn't use the computer unless she absolutely has to, and that's only when we have a guest" (C-4, p. 17). The focus group from school E, of which only half of the students had been issued computers, voiced the most concern over the lack of computer use. Kinlaw's (2003) study of the TLI at the high school level revealed some nonuse of computers by a few teachers, and some participants talked of a mandate that teachers were expected to use the computer daily. Peck, Cuban, and Kirkpatrick (2002), similarly, found that even with access to advanced technology, many teachers resisted its use. Teachers, who were part of the TLI during this study, did not seem to resist the use of the technology because computers were used in all the classes that the researcher observed. However, teachers may have limited their use of the computers due to the frustration of some students not having computers in class or because of malfunctioning computers. As one teacher said during an observation where some students were unable to get to the lesson's website, "This is a example of why you need hard copies" (F-1).

Conclusions

Several conclusions pertaining to the middle school participants in the Teaching and Learning Initiative can be made from the findings in chapter four and the preceding discussion:

1. Students in this study were keenly aware of their learning experiences and were able to clearly articulate their thoughts about those experiences. Computer use is natural for students who have grown up in a digital environment, and the researcher found that students spoke easily about their experiences with this technology.
2. Most students in this study experienced changes in their learning environment through extensive use of technology in the classroom. A student, who utilized a website on child labor in writing an essay, best expressed a powerful example of the changes that the technology has made. She said, "The essay took more thought, and was especially hard because the pictures were extremely sad. The one nice thing about this assignment is that we could use the iBooks to learn using resources that would otherwise be impossible" (A-2, p. 2).
3. Instruction for students in this study contained elements of constructivist classrooms including student leadership and authentic tasks that was supported by the infusion of laptop computers into the classroom. Most cases of student leadership were exemplified in their extensive knowledge of computers that often rivaled or exceeded the teachers' knowledge on the subject. Project work, which often involves authentic learning, was enhanced through better and more enjoyable computer made products.
4. Evidence of group work among students in this study, another component of constructivist classrooms, was supported only incidentally by the use of laptop computers. Observations indicated that students often were paired only because some students did not have computers, which was not the intended design of the lesson. And, because of the software limitations placed on the computer, it does not appear that students can participate in group work on separate computers.
5. Students in this study obtained information in ways that go beyond the traditional classroom and included extensive use of the Internet, websites, and teachers' Virtual Share Folders, thus decreasing dependence on textbooks and the library. Data generated from this study shows that teacher lecture still holds a place in delivering information; however, library use for research and textbook usage has decreased. Some students reported that using the textbook instead of the computer was considered a punishment.
6. Students in this study recommended that HCPS continue with the TLI and that other divisions should consider similar programs. Students recommended that they are taught responsible use and care of the laptops, that teachers and administrators monitor their computer use, that training is provided for students and teachers, and that filtering of the Internet be carefully considered. Participants indicated that the TLI was important because it gave them skills needed for their future work, as well as made research and writing easier and more enjoyable.

7. Reliability of the technology was an ongoing concern that may have impacted the effectiveness of the TLI and the level of participation by students and teachers. However, even with the problems, students and teachers embraced the program. Students and teachers complained of malfunctioning computers or websites that affected work on projects, lost files, or derailed lesson plans; however, observations revealed that teachers had made accommodations for most problems and were using the computers in almost every class.
8. Financing for individuals that cannot afford the cost of insurance or repairs to the laptop computers is a serious issue and needs to be addressed as an equity concern; students who cannot have a computer because of financial issues are at a severe disadvantage. Clearly some students were not able to take advantage of a computer issued by HCPS. Examination of demographics showed that schools with higher numbers of economically disadvantaged students had fewer students using the iBooks. Costs to the school division may be considerable in underwriting some of the expenses to students and families less able to afford it. HCPS may want to consider asking private foundations for assistance because without changes in the present policies, some students will be left behind.
9. Benefits of the Teaching and Learning Initiative went beyond the classroom, as students were able to use computers 24 hours a day, thereby extending their use of this tool after school and at home. Unlike programs in some schools where students only worked from school computer labs, laptops issued to HCPS students provided computer use every day, and all times of the day and night. Students' homework, project work, and their own personal work requiring a computer can continue at home giving them convenient access to resources upon which they have come to expect and depend in this information age.

Recommendations for Further Research

In attempting to answer certain questions, researchers often generate other questions. In this study several issues were raised. Constructivist strategies that include collaborative work, long-term benefits of the TLI, altered use of the library, equity issues, and teachers' perceptions, are a few that could be examined. A discussion of these follows.

From the literature reviewed in chapter two, constructivist practices should incorporate collaborative work, and a number of studies showed evidence that infusing technology led to these practices as well as supported collaborative work. Observations from this study revealed that students were often paired together because in each class several students to half of the students did not bring their iBooks to class. It might prove interesting to see whether students that were paired for practical reasons benefited in ways that those who worked independently did not. And, if group work provides important benefits, as constructivist classroom theorists

suggest, a study of practices and training to incorporate group work utilizing laptop computers could be conducted.

Kinlaw (2003) suggested that students were using libraries less than before being issued the iBooks. Although this was a minor issue in both this study and his, it would be informative to determine how students utilize the library services. Information obtained from such a study could influence how school libraries operate and serve students who have access to information in other ways through their personal computers.

After three years of TLI at the high school and a year at the middle school level, questions about equity are emerging. Students that have broken their computers cannot receive their computers until the \$100 deductible is paid. Some families have chosen not to pay for the computer repairs or pay the \$50 insurance required each school year. A study of how those students are affected by not having computers while most students do, and the ways that teachers accommodate those students could be valuable.

School divisions such as Snohomish School District, that was the focus of Schieber's (1999) study on the effectiveness of laptop computers, based their decision on keeping the laptop program on improved test results. Students did not show test gains in Snohomish School District, which resulted in that school district ending its laptop program. A study of benefits beyond test scores could result in a better understanding of the true impact of ubiquitous laptop computing. The researcher is aware of anecdotal instances where students, who were involved in laptop programs, felt they were much better prepared for technologies encountered in college. A more formal evaluation of these benefits would involve conducting a longitudinal study of students who have moved on to college or careers, and had participated in the TLI. It would be beneficial to see what advantages they derived from this program.

Through this study, students' perceptions were obtained. It was noted during interviews and observations that teachers were occasionally frustrated with malfunctioning computers or websites. Students also talked of some teachers who rarely used the technology available to them. As those on the front lines providing instruction, teachers would be a valuable resource of information. A study of their perceptions could add greatly to understanding the Teaching and Learning Initiative and how it has affected classroom management, lesson preparation, and training needed to be effective in this new digital environment.

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APPENDIX A

Institutional Review Board Approval

Request for Expedited Approval of Research Involving Human Subjects

[please print or type responses below]

Principal Investigator (faculty/student): Dr. Penny Burge/ Mark Chamberlain PID 563-98-6684/
Department: Educational Leadership and Policy Studies Mail Code: _____
E-mail: mechambe@henrico.k12.va.us Phone 804-360-0478

Project Title: Middle School Students' Perceptions of the Teaching and Learning Initiative:
Laptops for Every Student
of Human Subjects 80

Source of Funding Support: Investigator's personal funds Sponsored Research (OSP No.: N/A) N/A Departmental Research

[X] All investigators of this project are qualified through completion of the formal training program or web-based training programs provided by the Virginia Tech Research Compliance Office.

Note: To qualify for Expedited Approval, the research activities must: (a) present not more than minimal risk to the subjects, (b) not involve any of the special classes of subjects, except children as noted, and (c) involve only procedures listed in one or more of the following categories. The full description may be found in the Expedited Review section of the Virginia Tech "*IRB Protocol Submission Instructions Document*" or 45 CFR 46.110 (<http://ohrp.osophs.dhhs.gov/humansubjects/guidance/45cfr46.htm#46.110>)

Please mark/check the appropriate category below which qualifies the project for expedited review:

- 1. Clinical studies of drugs and medical devices when proscribed conditions are met [see item (1), page 8 of the "Instructions" document].
- 2. Collection of blood samples by finger, heel or ear stick, or venipuncture subject to proscribed limitations [see item (2), page 9 of the "Instructions" document].
- 3. Prospective collection of biological specimens for research purposes by noninvasive means. Examples: hair and nail clippings, deciduous teeth, permanent teeth, excreta and external secretions, uncannulated saliva, placenta, amniotic fluid, dental plaque, muscosal and skin cells and sputum [see item (3), page 9 of the "Instructions" document].
- 4. Collection of data through noninvasive procedures routinely employed in clinical practice, excluding procedures involving x-rays or microwaves [see item (4), page 9 of the "Instructions"].

- [] 5. Research involving materials (data, documents, records or specimens) that have been collected or will be collected solely for non-research purposes (such as medical treatment or diagnosis [see item (5), page 10 of the "Instructions" document].
- [X] 6. Collection of data from voice, video, digital, or image recordings made for research purposes [see item (6), page 10 of the "Instructions" document].
- [X] 7. Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language communication, cultural beliefs or practices, social behavior), or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies [see item (7), page 10 of the "Instructions" document].

Dr. Penny Burge Co-Chair		Date
Dr. Travis Twiford _____ Co-Chair		Date
Mark E. Chamberlain _____ Investigator(s)		Date
Dr. David Alexander Departmental Reviewer		Date
Chair, Institutional Review Board	Print name	Date

This project is approved for ____ months from the approval date of the IRB Chair.

Mark E. Chamberlain

IRB Protocol for Proposed Study

Initiative: Laptops for Every Student

Justification

Henrico County Public Schools (HCPS) has deployed over 23,000 laptop computers to its secondary students over the past 18 months including all middle school students. The deployment of laptops to each student is intended to give students up to date skills by providing new instructional tools in research-based methodologies. This Teaching and Learning Initiative (TLI) was designed to bring about changes in the daily interactions between students and teachers. The researcher proposes to determine what perceptions the middle school students' have about the TLI and educational experiences for the first year that they have used the laptop computers.

Procedures

The researcher proposes to conduct a qualitative study requiring the participation of middle school students in HCPS. The study will take place in October and November of 2003. Focus groups from six of the 11 middle schools in HCPS will consist of eight to 10, seventh and eighth grade students, whose ages are from 12 to 14 years old. Seventh and eighth grade students are chosen to participate in this study because they will have had nearly a year of experiences in the TLI, while the incoming sixth-graders will have just received their laptops. Students will be randomly selected for the focus group interviews from a pool of students submitted by the faculty of each individual school. The principal will be asked to determine that the selected students are representative of the school by race, gender, socioeconomic status, and various levels of computer expertise.

Interviews with the focus groups will last approximately 45 minutes to 1 hour, and will be held in a private classroom or conference room reserved by the principal of each school. Sessions will be held during student study halls or before or after school to limit missed instructional time. Students will be asked to give responses to open-ended questions that are asked by the researcher. Students will be encouraged to expand on any of the questions. Emerging questions may require additional probing by the researcher. All interviews will be audio taped to obtain accurate records of the sessions and will be used as the primary data source. Taping is necessary because of the difficulty of taking the volume of notes needed in complex focus group interview settings. Interview questions are attached to this protocol. Secondary sources of information will be class activity logs completed by the focus group students covering two days of classes following the interview, and the researcher will conduct two classroom observations at each of the schools where he conducted interviews.

Risks and Benefits

There is no more than minimal risk to participating in this study. Participants will not directly benefit from this study. However, there may be benefits to understanding the influence that the TLI has had on middle school student educational experiences in HCPS, which may then be considered by other schools as they examine the outcomes of the TLI.

Confidentiality

Confidentiality will be preserved by several measures. Only the researcher and the individual school principal will know which students are selected for the focus groups by each school. Following the interviews, the principal and researcher will destroy the list of names of the participants involved in the interview. The audiotapes will be professionally transcribed, and when not in use for that purpose the tapes will be locked in a cabinet with access only by the researcher or the transcriber.

Informed Consent

In addition to IRB approval of this study, approval will be obtained from HCPS Director of Research and Planning, and each principal of the five middle schools in the county where interviews will be held. School leaders have been asked by the superintendent to facilitate approved TLI research.

Informed Consent forms for parents and Assent forms for students will be given to participants and their parents at least two weeks in advance. As stated in the forms, students may withdraw from the study at any time. Informed Consent forms and Assent forms are attached.

Focus Group Protocol, and Student Informed Assent forms, and Parent Informed Consent forms can be found in Appendices F, G, and H.

APPENDIX B

Henrico County Public Schools Research Approval

Friday, October 10, 2003

Study

P

Subject: Study
Date: Fri, 10 Oct 2003 08:51:46 -0400
From: Penny Blumenthal <mgblumen@henrico.k12.va.us>
Organization: Henrico County Public Schools
To: "MARK E. CHAMBERLAIN" <mechambe@henrico.k12.va.us>

Mark,

On both informed consent agreements, please add language under *Purpose of the Study* that indicates this study is part of doctoral degree requirements for Va. Tech. It is not clear that this is not being initiated by the county. If you make this change, you can proceed at any time!!

Keep me posted and let me know if I can help along the way.

Penny

Penny Blumenthal, Ph.D.

Director, Department of Research and Planning

(804) 652-3838

(804) 652-3734 (fax)

mailbox:/Macintosh%20HD/System%20Folder/
Preferences/NetScape%20Users/

APPENDIX C
Letter to Principals

TO:

FROM: Mark Chamberlain

RE: Focus Group Interviews with Students

DATE:

This communication is a follow-up to our conversation about conducting a focus group interview with your students concerning the Teaching and Learning Initiative. Please help me with the following.

1. Have your faculty identify students in seventh and eighth grades who are diverse with respect to race, gender, socio-economic status, and level of technology expertise.
2. Randomly select students from a stratified grouping that assures representation of each group for a focus group of 10 students.
3. Please mail the *letter to parents* to the student's homes as soon as you select the students. (Stamped envelopes are provided.)
4. Please give the envelope containing consent forms to each student. Both consent forms must be signed and returned to the school and then given to me before the start of the interview.
5. Please identify a person to whom the forms will be returned and inform the students.
6. Reserve a quiet room for the focus group interviews to be held and inform the students of that location.
7. The focus group interview will be held _____ and will last from 45 minutes to 1 hour.

Thank you for your help in this study. Call me a 360-0800 with any questions.

APPENDIX D

Cover letter to Parents

Sept. 2003

Dear _____

Your student has been chosen to be a part of a study to help me learn about students' thoughts on the laptop program. This program placed an iBook in every middle school student's hands. Your student does not have to participate. However, I think that what **he or she** can tell me about this program is important.

Your student will be bringing home an envelope with more information about this study. Please read through the materials with your student. To be a part of the interview session, your student needs to bring both consent forms. Signed consent forms should be returned to the principal in the same envelope as soon as possible.

Your student's group interview session is:

Date _____

Time _____

Place _____

This study is conducted with the approval of Henrico County, the Virginia Tech IRB, and the cooperation of Henrico middle schools. Should you have any questions about this study, please feel free to call me at 360-0800. There is no penalty if your student does not participate.

Sincerely,

Mark E. Chamberlain

Principal, Short Pump Middle School

APPENDIX E

Cover letter to Students

Sept. 2003

Dear _____

You have been chosen to be a part of a study to help me learn about students' thoughts on the laptop program. This program placed an iBook in every middle school student's hands. You do not have to participate. However, I think what **you** can tell me about this program is important.

You will find things you need to know about your part in the study with this letter. Please read through the materials with your parents. In order to be a part of the interview session, you **must** return both signed consent forms to the principal. Please return the signed consent forms to the principal in this same envelope as soon as possible.

Your group interview session is scheduled for: Date _____

Time _____

Place _____

Henrico County and the Virginia Tech IRB have approved this study. Should you have any questions about this study, please feel free to call me at 360-0800. There will be no penalty if you do not participate.

Sincerely,

Mark E. Chamberlain

Principal

Short Pump Middle School

APPENDIX F

Student Informed Assent Agreement

Please read this Assent form with care before you decide to be part of this study

Project Title:

Middle School Students' Perceptions of the Teaching and Learning Initiative: Laptops for Every Student

Purpose of the Study:

To learn students' thoughts about the use of the laptops in school. This study serves as part of the requirement for a doctoral degree at Virginia Polytechnic Institute and State University.

What you will do in the study:

You will be part of a group interview along with 5 to 10 other middle school students from your school. The researcher will read questions to you. Answers will be audio tape recorded _____ (initial) and then written down. Group interviews will last from 45 minutes to 1 hour. Group interviews will be held at many of the middle schools in the county. You will be asked to keep a log for two days of the class activities. Instructions for completing this form will be given at the interview session. Logs should be turned into the main office in the envelope you are given.

When you will participate:

The time for the group interview will occur when you do not have a class: such as, before school, during a study hall, or after school. The group interview will take place in a quiet room chosen by the principal.

Risks:

There are no more than minimal risks to participating in this study.

Benefits:

There are no direct rewards to the student for being a part of this study. This study may help educators understand what you think about using the laptops in school. There may be other benefits to you if the study shows ways to improve classroom learning.

Confidentiality:

Things you say in this study will be handled confidentially. After the group interviews, the researcher or another trained person will put the tapes into writing. Tapes will be placed in a locked cabinet to protect students' privacy. Only the researcher will have access to the tapes. No names will be included in the written record, and tapes will be erased after all reports of the research study are done. The researcher will study the transcript. Any student who leaves the study will have what he or she said removed from the study.

Voluntary participant:

Students are free to be or not be in the study.

Right to leave the study:

Students may leave this study at any time without penalty.

How to leave the study:

If a student wants to leave the study during the interview, the student should let the researcher know quietly and leave the room. To leave at any other time, the student or parent should contact Mark Chamberlain at the address listed below.

Payment:

The student will receive no payment for being in this study.

Who to contact if you have questions:

Mark E. Chamberlain, Principal of Short Pump Middle School
Short Pump Middle School, 4701 Pouncey Tract Road, Glen Allen, VA 23059
Telephone: 804-360-0800 E-mail: mechambe@henrico.k12.va.us

Who to contact about your rights in this study:

Penny Burge, Faculty Co-advisor

Telephone: 540-231-9730

E-mail: burge@vt.edu

Virginia Polytechnic Institute and State University

Travis Twiford, Faculty Co-advisor

Telephone: 757-363-3935

E-mail: twiford@vt.edu

Approval of research:

This research project has been approved, as required by the Institutional Review Board for Research Involving Human Subjects at Virginia Polytechnic Institute and State University, by the Department of Educational Leadership, and Henrico County Public Schools Division of Research and Planning.

October 10, 2003
IRB Approval Date

October 10, 2004
Approval Expiration Date

Agreement:

I have read and understand the conditions of this study. I have had all of my questions answered.
I give my voluntary Assent.

Name (print): _____ Date: _____

Student Signature _____

You will receive a copy of this form for your records. Focus group protocols are attached.

APPENDIX G

Parent Informed Consent Agreement

Please read this consent agreement carefully. I hope you will decide to give permission for your child to participate in this study.

Project Title:

Middle School Students' Perceptions of the Teaching and Learning Initiative: Laptops for Every Student

Purpose of the Study:

To learn what students' think about the use of laptops in school. This study serves as part of the requirement for a doctoral degree at Virginia Polytechnic Institute and State University.

What your student will do in the study:

Students will participate in an interview with 5 to 10 other students from the school. I will pose questions aloud. Responses will be audio taped _____ and transcribed. Group interviews will
(initial)

last from 45 minutes to 1 hour. Interviews will be held at many of the middle schools in Henrico County. Your student will be asked to keep a log of two days of classroom activities. Forms for this purpose will be given at the interview session. Completed logs should be returned to the student's main office in the envelope provided.

When your student will participate:

The interview will occur during non-class time: for example, before school, during a study period, or after school. The principal will choose a quiet location at the school for the interview.

Risks:

There are no more than minimal risks in participating in this study.

Benefits:

There are no direct benefits to the student for being in this study. This study may help educators understand the impact that laptop computing has had on students' experiences in school. There may be indirect benefits to students in that the study may show ways to improve classroom instruction.

Confidentiality:

Information obtained in this study will be handled in confidence. After the focus group interviews, a professional transcriber or I will copy audio tapes into a written form. Audio tapes will be secured in a locked cabinet to protect students' confidentiality. Only the transcriber or I will have access to the audio tapes. Names will not be used in the transcribed record, and tapes will be erased after all reports of the research study are completed. I will study the transcript to identify themes from student responses. If a student withdraws from the study during or after the audio taping, responses the student made will be deleted from the study.

Voluntary participation:

Student participation is completely voluntary.

Right to withdraw:

Students may withdraw from this study at any time without penalty.

How to withdraw:

If a student wants to leave during the interview, the student should inform me quietly and leave the room. To withdraw at any other time, the student or parent should contact me at the address below.

Payment:

The student will receive no payment for being in this study.

Who to contact if you have questions:

Mark E. Chamberlain, Principal of Short Pump Middle School
Short Pump Middle School, 4701 Pouncey Tract Road, Glen Allen, VA 23059
Telephone: 804-360-0800 E-mail: mechambe@henrico.k12.va.us

Who to contact about your rights in this study:

Penny Burge, Faculty Co-advisor

Telephone: 540-231-9730

E-mail: burge@vt.edu

David M. Moore, IRB Chair

Virginia Polytechnic Institute and State University

Telephone: 540-231-4991

E-mail: moored@vt.edu

Travis Twiford, Faculty Co-advisor

Telephone: 757-363-3935

E-mail: ttwiford@vt.edu

Approval of research:

Henrico County Public Schools' Division of Research and Planning have approved this research project, as well as the Institutional Review Board at Virginia Polytechnic Institute and State University.

October 10, 2003

IRB Approval Date

October 10, 2004

Approval Expiration Date

Agreement:

I have read and understand the Informed Consent conditions of this agreement. I have had all of my questions answered. I give my voluntary consent.

Name (print): _____ Date: _____

Parent Signature _____

You will receive a copy of this form for your records. Focus group protocols are attached.

APPENDIX H

Focus Group Protocol

1. The focus group interview will be conducted in a quiet room secured by the school principal.
2. A tape recorder or tape recorder microphone will be placed in the center of the table.
3. Students will be seated around the conference table along with the interviewer and his research assistant who will operate the recording equipment and take notes.
4. Guidelines for the interview will be reviewed prior to the start of the session:
 - (a) Students are asked to focus on the topic being discussed.
 - (b) Students should not make negative comments about other student responses.
 - (c) Participation is voluntary, and students may withdraw at any time.
 - (d) The researcher will explain how transcription will occur, and names be deleted.
 - (e) Students should speak one at a time.
 - (f) Students may ask the researcher questions to clear up any confusion they may have.
 - (g) Students may choose not to answer some questions.
 - (h) Students may share their own experiences that come to mind when they hear another student's response to a question.
 - (i) The interview will take place in a relaxed atmosphere.

Interview Guide

The researcher will enter the interview session with prepared open-ended questions to give students opportunities to express themselves in their own way. Because open-ended questions may lead to other areas of interest not specifically asked, but related to TLI, the researcher will encourage students in those responses. Questions 3, 7, and 8 were developed by Kinlaw (2003), and are used with permission: See Appendix K.

Focus Group Questions

1. Please state your name and tell us your favorite thing about school in ten words or less.
2. What do you like about computers (not just iBooks)?
3. Think back to the first semester of last year before we had the iBooks. Would you say that your school experiences have changed as a result of the laptops? If so, how have they changed? If not, how have they not changed? Please provide examples?
4. This next question is about roles. Students sometimes perform different roles in the classroom. They can be passive, work in groups, or even be experts and leaders in the class.
 - a. First, how has your role with classmates changed? Can you give examples?
 - b. Second, how has your role with your teacher changed? Can you give examples?
5. Has the way you get information in class changed? For example are there differences in the use of textbooks, handouts, or teacher lectures.
6.
 - a. Are you doing more projects than before?
 - b. Are these group projects or individual projects?
7. What recommendations do you have regarding the laptop initiative for Henrico County or for other school districts that might consider a similar initiative?
8. We have discussed a number of things today. What is the most important thing that we should know about the laptops in middle school?
9. What would you like to share about the laptop initiative that was not covered in the questions?

Assistant Moderator

- I. Summary-ask if accurate
- II. Hand out and explain student logs. Hand out copies of the permission forms. Distribute candy.

APPENDIX I
Observation Form

Date_____

Subject_____

Grade_____

Activity _____*Role & Engagement (codes) _____ **Details

Internet
Research

Website

Beyond Books

Virtual Share

Word Processing

Software

Class notes

Work Sheet

Teacher Technology Skills:

- Monitors student iBook use
- Adjusts for students without iBooks
- Ability to facilitate technology activity
- Clear directions on information access

*Roles: Student led-(SL), Teacher-led-(TL)

*Engagement: Individual-(I), Collaborative-(C), Student-centered-(SC), Teacher Centered-(TC), Authentic/Real World Learning-(AL),

**Use back for Running Record

APPENDIX J
Class Activity Log

Please tell about the activities for each class for two days. Describe the activities of each class as completely as possible. Give the approximate amount of class time spent on each activity in minutes. Explain how you felt about the activity. For example: Did you learn a lot? Was it fun? Give both positive and negative comments that apply to each activity. Please do not complete this form during assigned class time. You may use the back if you need more space. When you complete the log for two days, please place in the envelope provided and return to the principal. Place a star by the teacher's name for the class that you would like for me to observe.

Day 1

First Block

Second Block

Third Block

Fourth Block

Day 2

First Block

Second Block

Third Block

Fourth Block

APPENDIX K

Permission to Use Kinlaw's Interview



P.O. Box
3820 Nine A
Richmond, Virginia 23223
(804) 652-3675

July 21, 2003

To Whom It May Concern:

Mark Chamberlain, a doctoral student at Virginia Tech, has requested the use of interview questions from my dissertation entitled, "Digital Teaching and Learning: Student Perspectives," (University of Virginia, May 2003). Please note that Mr. Chamberlain has my approval to use the interview questions from this study. I am pleased that he is extending the study and feel that his findings will be useful to the school division and to the knowledge base of this timely topic.

If you have questions or need additional information in this regard, please contact me via e-mail at pkinlaw@henrico.k12.va.us or by telephone at 804-652-3675.

Sincerely,

A handwritten signature in black ink, appearing to read "Patrick C. Kinlaw", with a long horizontal flourish extending to the right.

Patrick C. Kinlaw
Director of Staff Development
Henrico County Public Schools
Richmond, VA 23223

APPENDIX L

Frequency of Student Responses for Categories and Subcategories

Number of Students in Focus Group	Focus Group Responses					
	A	B	C	D	E	F
Number of Students in Focus Group	6	7	5	8	9	7
<u>Theme: Changing School Experiences</u>						
Category: Changing Roles						
Students Leading & Helping	2	3	3	3	2	3
Group Role, Group Projects	2	0	1	1	3	3
Independent Role, Individual Projects	0	6	0	4	4	4
Category: Information Acquisition						
Internet Use	4	6	2	6	5	3
Virtual Share Folder	1	3	4	3	0	4
Computer used more than textbooks	3	2	0	1	1	3
Info by iBook Easier & Enjoyable	3	3	4	4	3	3
More Handouts/fewer handouts	1/0	0/0	0/2	0/2	0/0	0/3
Same Number of Handouts	0	0	0	1	2	0
More Teacher Lectures/less lectures	0/1	0/2	1/1	1/1	0/0	0/1
Same Amount of Teacher Lectures	0	0	0	0	1	3
Category: Projects						
More Projects	2	2	3	3	1	3
Same Amount of Projects	1	1	0	0	1	1
Computer Projects Easier/Better/Enjoyable	4	1	2	2	1	4
<u>Theme: Student Recommendations</u>						
Initiative Good/Other Schools Should Too	3	4	2	1	5	1
HCPS Blocks Good Websites	0	0	3	1	3	0
Block More Websites	2	2	3	2	0	1
More Training	0	5	0	2	0	1
Teach Responsibilities with Computers	1	1	1	1	4	2
Convert Textbooks to Computer	0	0	2	0	3	0

Note: The numerals in each cell indicate the number of students responding to the category or subcategory

Frequency of Student Responses for Categories and Subcategories (Continued)

	Focus Group Responses					
	A	B	C	D	E	F
<u>Number of Students in Focus Group</u>	6	7	5	8	9	7
<u>Theme: Most Important Issues</u>						
Category: Computer Reliability						
Computers Malfunction Often/Files lost	1	5	3	5	0	2
Frustrations with Computer	0	1	3	1	0	0
Computers Break Easily	0	2	1	2	1	0
Repair Concerns	1	5	1	3	0	0
Help Desk Concerns	0	5	2	2	0	0
Cost Concerns	3	1	1	0	0	3
Issue a different Computer	0	0	0	3	1	3
Category: Monitoring Important	5	4	0	2	0	1
<u>Theme: Issues Appearing Throughout Focus Group Interviews</u>						
Category: Getting into Trouble	2	0	4	2	1	0
Category: Efficiency						
Organization	1	0	0	4	2	1
Note taking	4	3	2	2	0	3
Word Processing	3	2	0	3	3	2
Category: Carrying the iBook						
Less Weight	0	3	0	1	0	2
More Weight	0	4	0	2	0	2
Category: Teacher Resistance	2	0	1	0	6	0

Note: The numerals in each cell indicate the number of students responding to the category or subcategory