Evaluation Report on the Progress of the North Carolina 1:1 Learning Technology Initiative (Year 2)

Submitted to
Bill Harrison, Chairman
North Carolina State Board of Education

Angela Quick
Rob Hines
North Carolina Department of Public Instruction

Submitted by:
Jenifer O. Corn, Ph.D.
The William and Ida Friday Institute for Educational Innovation
College of Education
NC State University

Contributors:
Rodolfo Argueta, Ed.D.
Kim Cohen
Kristen Corbell, Ph.D.
Elizabeth O. Halstead
Clara Hess
Jessica Huff
Kevin Oliver, Ph.D.
Ruchi Patel
Daniel Stanhope
Jennifer Tingen

October 21, 2009

THE WILLIAM & IDA FRIDAY INSTITUTE FOR EDUCATIONAL INNOVATION

1890 Main Campus Drive ■ Raleigh, NC 27606 ■ 919.513.8500 ■ www.fi.ncsu.edu
Table of Contents

Critical Issues Summary .................................................................................................................. iv
Introduction ........................................................................................................................................ 1
Schools/Participants .......................................................................................................................... 1
Data Collection .................................................................................................................................. 3
Data Analysis ..................................................................................................................................... 4
Results ............................................................................................................................................... 4

Evaluation Question 1: How have school infrastructures and support systems evolved to meet staff and students' 21st century needs? ............................................................................................................ 5
Infrastructure and Support Systems ................................................................................................. 5
School Staff Perspective ..................................................................................................................... 5
Student Perspective ............................................................................................................................ 6
Hardware .......................................................................................................................................... 7
Laptop Repair Issues ........................................................................................................................ 8
Laptop Maintenance .......................................................................................................................... 10
Loaner Laptops ................................................................................................................................ 11
Selecting Tablets vs. Laptops ........................................................................................................... 11
Software ........................................................................................................................................... 12
Software Tools Used During School ............................................................................................... 12
Software Tools Used at Home ........................................................................................................... 12
Monitoring Software ....................................................................................................................... 13
Technical Support Personnel ........................................................................................................... 15
District Technology Staff .................................................................................................................. 15
On-site Technicians .......................................................................................................................... 16
Student Tech Teams .......................................................................................................................... 16
Instructional Support Personnel ........................................................................................................ 17
Technology Facilitators .................................................................................................................... 17
Policy/Procedures ............................................................................................................................ 18
Laptop Misuse ................................................................................................................................... 19
Blocked Sites ..................................................................................................................................... 21
Leadership ......................................................................................................................................... 21
Advocacy .......................................................................................................................................... 22
Evaluation ......................................................................................................................................... 22
Modeling Technology Use .............................................................................................................. 23
Support for 1:1 Professional Development ...................................................................................... 24
Psychosocial Support ....................................................................................................................... 25
Shared Decision-Making ................................................................................................................... 26
Vision ................................................................................................................................................. 27
Support for Infrastructure and Resources ....................................................................................... 28
Professional Development ................................................................................................................ 31
Local Professional Development ....................................................................................................... 31
Friday Institute Online Workshops ................................................................................................... 32
Summary for Evaluation Question 1 - Infrastructure and Support Systems ................................... 32

Evaluation Question 2: How have teacher and student technology attitudes and skills changed over time? ........................................................................................................................................ 35
Technology Attitudes and Skills ........................................................................................................ 35
Teacher Attitudes/Beliefs about Technology ..................................................................................... 35
Item Analysis – Spring 2009 ........................................................................................................... 35
Item Analysis – Across Time ............................................................................................................. 35
Composite Scores – Spring 2009 ..................................................................................................... 37
Composite Scores – Across Time ...................................................................................................... 40
Student Attitudes/Beliefs about Technology ................................................................. 41
  Item Analysis – Spring 2009 .................................................................................. 41
  Item Analysis – Across Time .............................................................................. 41
Teacher Technology Knowledge/Skills ........................................................................ 43
  Item Analysis – Spring 2009 ................................................................................ 43
  Item Analysis – Across Time ............................................................................... 43
  Composite Scores – Spring 2009 ......................................................................... 45
Student Technology Knowledge/Skills ........................................................................ 47
  Item Analysis – Across Time ............................................................................... 47
Summary for Evaluation Question 3 - Technology Use .................................................. 66
Evaluation Question 3: How have teachers’ instructional practices changed over time? ... 51
  Technology Use for Teaching and Learning .......................................................... 51
Teacher Technology Use ............................................................................................ 51
  Item Analysis – Spring 2009 ................................................................................ 51
  Item Analysis – Across Time ............................................................................... 51
  Observing Teacher Technology Use .................................................................... 53
  Changing Lesson Plans .......................................................................................... 55
  Exemplary Lessons .................................................................................................. 56
  Use of Technology for Assessment ...................................................................... 57
  Use of Laptops for Communication – School Staff Perspective ......................... 58
Student Technology Use ............................................................................................. 59
  Item Analysis – Spring 2009 ................................................................................ 59
  Item Analysis – Across Time ............................................................................... 59
  Use of Laptops for Communication – Student Perspective ............................... 63
  Student Use of Laptops for Collaboration ............................................................ 65
Summary for Evaluation Question 3 - Technology Use .................................................. 66
Evaluation Question 4: How have student learning and achievement in core academic subjects changed over time? .................................................................................. 68
  Student Learning Outcomes ................................................................................. 68
  Student Attendance ................................................................................................. 68
  Student Participation on Online Courses .............................................................. 68
Student Engagement .................................................................................................. 69
  Teacher Item Analysis .............................................................................................. 69
  Student Item Analysis .............................................................................................. 71
  Observing Student Engagement ........................................................................... 72
  Discussions about Student Engagement .............................................................. 73
Student 21st Century Skills .......................................................................................... 75
  Teacher Item Analysis .............................................................................................. 75
  Student Item Analysis .............................................................................................. 76
  Discussions about 21st Century Skills .................................................................. 78
NC Computer Skills .................................................................................................... 82
End-of-Course (EOC) Tests ......................................................................................... 83
  SAS Value Added Assessments ............................................................................ 89
Summary for Evaluation Question 4 - Student Learning Outcomes .......................... 98
References .................................................................................................................... 99
Appendix A – Demographics and Item Analysis
Appendix B – Data Collection Tools
Appendix C – Leadership Framework for Technology Innovation Projects in Schools
Appendix D – Local Professional Development
Critical Issues Summary (Year 2)

The Friday Institute for Educational Innovation at the NC State University College of Education submitted an evaluation report of the first year of implementation of the NC 1:1 Learning Technology Initiative (NC1:1LTI) pilot schools in September 2008 and a mid-year report in January 2009. The current report, submitted October 2009 presents the evaluation of progress at the end of the second year in the planned three-year evaluation. These pilot schools included seven Early College (EC) high schools and five large traditional high schools, with a total of approximately 6000 students and 400 school staff across the 12 schools. In these schools, every teacher and student received a laptop computer and wireless Internet access was provided throughout the school. The overall goal of the initiative is to use the technology to improve teaching practices, increase student achievement, and better prepare students for work, citizenship, and life in the 21st century.

A group of comparison schools, similar in type, size, student demographics, and student achievement on the prior year English and Algebra I End-of-Course tests were selected to provide comparative data from schools not implementing 1:1 programs. Many of the comparison schools had a significant amount of technology available for instructional purposes.

This evaluation study focused on the schools progress toward implementing the 1:1 environment and the barriers, successes, and lessons learned at various stages of implementation. A combination of teacher and student surveys, focus groups and interviews, classroom observations, and analyses of existing school-level data was collected. The intent of the evaluation was to provide information about the value of the initiative to enhance student learning, as well as to identify challenges to the successful implementation of 1:1 programs, strategies for meeting those challenges, and services and supports needed to enable successful programs throughout the State.

Due to the staggered implementation model of the 1:1 pilot initiative in NC, the Friday Institute evaluation team grouped schools into cohorts depending upon when the laptops were distributed to the teachers and students and whether the school was a traditional or EC high school. The 1:1 Trad Cohort A school distributed laptops to teachers in the spring semester of the 2006-2007 school year and distributed laptops to students in the fall semester of the 2007-2008 school year. Seven 1:1 EC Cohort A schools distributed laptops to teachers in the fall semester of the 2007-2008 school year and distributed laptops to students in the spring semester of the 2007-2008 school year. The 1:1 Trad Cohort B schools included four schools in two districts participating in a district-wide implementation. The only high school in a school district in the central region of the state, distributed laptops to teachers in the spring semester of the 2007-2008 school year and then distributed laptops to students in the fall semester of the 2007-2008 school year. All three traditional high schools in a rural district in the eastern part of the state distributed laptops to teachers in the fall semester of the 2008-2009 school year and to students in the spring semester of the 2008-2009 school year.

The following cumulative Year 2 evaluation report provides the results from data collected in spring 2008, fall 2008, and spring 2009. The results include detailed information from the participating 1:1 schools about changes in infrastructure and support systems, technology attitudes and skills, technology use for teaching and learning, and student learning outcomes. Looking across the cohorts of schools and over past two years of 1:1 implementation, certain critical issues emerge that are highlighted in this summary. These critical issues focused on the following four major areas: 1) leadership, 2) technology use for instruction, 3) student learning outcomes, and 4) infrastructure.

Critical Issue: Leadership

Currently there is much on-going research around the impact of 1:1 computing on various areas of teaching and learning. Variables typically analyzed include student achievement, teacher and student perceptions, student engagement and motivation, and parental participation. One area that has not been thoroughly researched is leadership for a 1:1 learning environment. Key characteristics emerged from the conversations with teachers at the pilot schools for school leaders to successfully support a new 1:1 laptop
project. These findings support existing research on leadership for innovations in schools, but speak specifically to the experiences of these NC teachers in our NC 1:1 pilot schools. Principals at each of the pilot schools, as well as those at any school planning a new 1:1 initiative, should consider their role in their 1:1 project as it relates to each of the following recommendations:

A Leadership Framework for Technology Innovation Projects in Schools
1. Vision and Expectations
   • Articulate a vision, exhibit excitement and buy-in.
   • Understand that incorporating technology may take more time for some people while others can act as technology leaders.
   • Indicate that the initiative is not a passing fad.
2. Advocacy
   • Leverage strategic partnerships to support the initiative.
   • Convene stakeholders to contribute to the development of technology-infused strategic plans.
   • Provide opportunities to showcase student work with stakeholders.
3. Infrastructure
   • Secure or purchase needed resources (hardware, software, tech support, access to websites).
   • Arrange schedules to allow for common planning time and group reflection.
   • Establish flexible policies supportive to technology in the classroom.
4. Psychosocial Support
   • Provide encouragement, visit the classroom, help with curriculum integration.
   • Encourage teachers to try innovative teaching strategies; reward the frequent, purposeful, and effective use of technology for learning.
   • Adapt and show contingency plans when things do not go as expected.
5. Modeling
   • Use a laptop rather than desktop.
   • Model responsible social interactions.
   • Promote effective communication and collaboration among colleagues, staff, parents, and students using digital tools.
   • Implement integrated technology-based systems to support management and operations.
6. Professional Development
   • Encourage faculty to attend professional development.
   • Provide training opportunities specific to teacher needs.
   • Respond to requests for assistance.
   • Monitor teacher integration during classroom visits.
7. Shared Decision-Making
   • Provide time for team problem solving.
   • Include others in decision-making (e.g., policies and decisions regarding which software to purchase).
   • Trust teachers to make sound professional decisions about instruction.
8. Evaluation
   • Provide a time for getting and providing feedback.
   • Establish metrics, collect and analyze data, interpret results, and communicate findings to improve educator and student performance.

Furthermore, schools and districts need resources for leadership development in this unique school context, as well as tools for assessing the quality of leadership. This new Leadership Framework for Technology Innovation Projects in Schools was used to create a new 1:1 Leadership Evaluation Scale that was piloted on the 1:1 online survey during the spring 2009 data collection.
Results from these items on the new 1:1 Leadership Evaluation Scale contributed to our understanding about how the quality of school-level leadership can affect the quality of implementation of 1:1 initiative and its impact on instructional and learning outcomes. For almost all leadership survey items, significantly more teachers in the 1:1 Cohort A EC schools agreed that their principals were providing effective leadership for the 1:1 initiative (around 80-100% for most items) when compared to the teachers’ perceptions of leadership of the principal at the 1:1 Trad Cohort A school. These results helped explain some of the differences found in the impact on teacher and student outcomes in this cohort over the past two years of implementation. Staff and students at the 1:1 Cohort A EC high schools repeatedly had higher opinions of their schools’ infrastructure and support systems, more positive attitudes about the use of technology in the classroom, greater confidence in their technology skills, more diverse and frequent use of technology for teaching and learning, and reported greater impact on student learning outcomes. There are, of course, many other variables that could contribute to these results including school size, traditional/early college instructional model, and sample of teachers and students. These findings will be further explored during the third and final year of the study with additional data from 1:1 Trad Cohort B schools.

Principal Turnover. Since the beginning of the 1:1 initiative, four principals have left the pilot EC high schools and two principals have left the traditional high schools. Administrator turnover is always a concern for sustaining innovative practices in schools (Hargreaves and Fink, 2006), and a 1:1 project is no exception. In fact, it may be even more disconcerting for school staff when a principal leaves in the middle of their efforts to implement a 1:1 project because it requires a major change to every aspect of how the school does business – teaching changes, learning changes, planning for teaching changes, and processes for managing the students and teachers change. Teachers need consistency in their leaders as they make changes to every other aspect of their work.

Critical Issue: Technology Use for Instruction

Teacher and Student Technology Knowledge/Skills. Figures 31-34, 39-42 showed a stable pattern across time where generally more 1:1 teachers and students reported increased confidence in their technology skills since the 1:1 project began. The critical issue highlighted in this set of line graphs, illustrating teacher and student responses over time, is that although the line moves vertically on the scale over time, the pattern did not change over three semesters of 1:1 implementation. This indicated that teachers and students have consistently been most comfortable with importing digital images, creating graphs and charts, creating multimedia presentations, and participating in blogs, and least confident in their abilities to create and update a database, import and edit digital videos, create a podcast, and participate in a collaborative wiki. These teachers and students have not been challenged to develop new, more advanced technology knowledge and skills. These findings provide specific information about topics for future professional development for teachers and students in these 1:1 schools on use of databases, digital videos, podcasts, and wikis in the classroom.

Teacher Technology Use. Analysis of teacher responses to the 1:1 survey over time showed two different patterns for use of laptops for planning and instruction. For planning purposes, 1:1 teachers reported using the laptops least frequently during the spring 2008 (Time 1), most frequently during fall 2008 (Time 2), and then use leveled out during spring 2009 (Time 3). Use of the laptops for instruction continued to climb over time, where teachers used it least frequently during the spring 2008 (Time 1), a little more frequently during fall 2008 (Time 2), and most frequently during spring 2009 (Time 3) (see Figures 43-46). Related to using the laptops for planning instruction, teachers reported having better organized lesson plans since the laptop initiative began and using their laptops daily for creating instructional materials and managing student information. To teach their lessons, teachers reported using the laptops most often on a daily basis for presenting content, providing directions, and accessing online textbook resources. These activities are still in the relatively basic instructional uses of the laptop – for disseminating information to students. Teachers were not giving online quizzes, taking virtual field trips, or participating in labs on a
daily basis. Teachers were not utilizing the laptops daily for advanced, interactive instructional activities. During site visits teachers were observed using their laptops during class. The most frequently observed teacher activities with laptops in the 1:1 schools included activating prior knowledge, advanced organizers, and facilitation. Teachers were least frequently observed using laptops for differentiated instruction. Differentiated instruction is often cited as one of the biggest benefits to a 1:1 learning environment. Teachers need additional professional development and support on creating a 1:1 classroom that employs advanced, interactive, digital instructional activities and strategies for differentiating instruction for students.

**Student Technology Use.** 1:1 students indicated they are using their laptops most frequently for searching for new information, two-way communication with teachers and peers, and submitting assignments electronically. Fewer students indicated they are using the laptops daily to plan learning activities, analyze information, and track their own progress (see Figures 49-50). When asked about use in their core content courses (see Figures 51-52), student indicated they used the laptops least frequently during the spring 2008 (Time 1), most frequently during fall 2008 (Time 2), and then use leveled out during spring 2009 (Time 3). 1:1 students in this study reported using laptops most frequently in English, Science, and Social Studies courses. The most frequently observed student activities with laptops in the 1:1 schools included: research and communication. Students were least frequently observed using laptops for personal development (e.g. time management, calendar).

**Stabilization of the “Implementation Dip.”** Many schools experience “implementation dips” as they move forward with implementing a change (Fullan, 2001). The implementation dip is defined as a drop in performance and confidence as the school encounters an innovation that requires new skills and new understandings. Analysis of the survey responses for all participating schools over time revealed a stabilization of the implementation dip during the spring 2009, which helps to explain the patterns of technology reported by participating teachers and students. Figures 28-29, 43-44, and 49-52, showed a consistent trend where teachers and students spring 2008 (Time 1) survey results generally have the lowest percent of agreement or indication of frequency with each item. At this time, the 1:1 project is often still in development and expectations are still unclear. Fall 2008 (Time 2) have the highest percent in agreement or indication of frequency with each item where the novelty of technology is still running high and project is running more smoothly and teachers and students have had time to make adjustments to the new system. Finally, spring 2009 (Time 3) reflects a slightly lower, perhaps more realistic and stable assessment of the use of technology for teaching and learning. These findings will be further explored during the third and final year of the study when we have additional data collection points for both cohorts of schools.

**Increase in Communication Across the School.** Teachers and students reported that having laptops has increased communication between school teachers, staff, administrators, and students and parents. Many teachers in 1:1 schools have teacher websites where they post class announcements, assignments, and presentations. Staff and students use their laptops to email assignments and questions. Others indicated that they use synchronous chat programs that comes with their classroom monitoring software to facilitate communicate with administrators, teachers, and other students. Communication with school administrators is also better facilitated through computers, “They’ll send an e-mail throughout the whole school about current events.” School personnel also have convenient access to parents, and have emailed parents regarding poor performance on assignments. Some items on the survey asked students and teachers whether they used instant message or email to communicate with peers about school-related topics. Over time, we see a dramatic increase in the use of these communication tools after school hours.

**Software Tools Used During School.** Analysis of open-ended survey data on most common software tools used in the 1:1 schools for teaching and learning indicated that Microsoft Office applications are still the
most widely employed tools across all groups (i.e., Word, Excel, Powerpoint). Data suggested schools are only using a handful of the thousands of free Web 2.0 applications available. There is considerable room to increase student exposure to further Web tools. Lack of teacher awareness and lack of teacher time to experiment are the most likely barriers to greater use of these resources.

**Use of Technology for Assessment.** Some of the survey items addressed how technology is used for assessing student learning. Most teachers utilized some form of online or electronic assessment either through email, Curriculum Pathways, AVID, Activevote (similar to clickers), ClassScapes, online quizzes, Glinko.com, OneNote, games, Promethean boards, live chat, Study Island, blogs, electronic rubrics, and online textbook resources. Teachers liked being able to project anonymous, immediate assessments through polling during class to determine if students comprehended the material.

**Moving from Independent Work to Collaborative, Project-Based Lessons.** Students, teachers, and administrators all commented during focus groups that laptops enabled different modes of collaboration. Students in the 1:1 Trad Cohort B schools, still in early implementation, reported their work was still primarily independent, however students and teachers at the 1:1 EC and Trad Cohort A schools, where the 1:1 project has been operational for at least three semesters, described different modes of collaboration enabled by the laptops, specific tools in use that enabled collaboration, and benefits to collaboration in being able to access needed information at any time. This finding indicated that as teachers become more comfortable with using the technology in class they move from requiring independent work from students to more collaborative, project-based activities.

**Critical Issue: Student Learning Outcomes**

**Student Attendance.** Analysis of attendance data showed overall high rates of attendance at each of the 1:1 pilot high schools and comparison schools for the past two years. Student attendance rates across 1:1 schools and their comparisons for the 2006-07 and 2007-08 school years were all above 90% and remained virtually unchanged over the two-year period. These finds are contradictory to other 1:1 studies where attendance was affected by participation in a 1:1 project (Kershaw County School District, 2004; Texas Center for Education, 2007). One explanation of this apparent contradiction is that attendance was already so high in the pilot schools, that there wasn’t much room for improvement. These findings will continue to be monitored during the third and final year of the study.

**Student Participation on Online Courses.** Another student outcome of interest to stakeholders was the number of students participating in online courses. Data gathered from the surveys revealed a small percentage, between 10-20%, of students self-reported participating in an online course, including North Carolina Virtual Public School (NCVPS) or NC Learn and Earn Online. The 1:1 Cohort A EC schools reported slightly higher percentages than their comparison schools and 1:1 Trad schools reported slightly lower participation than the comparison school. These findings are counterintuitive because one would assume that an increase in student access to internet-connected laptops, especially in some of the more rural areas of the State, would result in significantly higher participation in online courses. One recommendation is that NCVPS and NC Learn and Earn Online partner with schools and districts implementing 1:1 projects to facilitate increased participation in online teaching and learning by teachers and students with ready access to state and district supported laptops. Online enrollment data will be further explored during the third and final year of the study.

**Student Engagement.** Multiple data sources supported the hypothesis that students were more engaged in the 1:1 learning environment. Survey results indicated that staff at the 1:1 schools generally agreed (about 80% of 1:1 EC teachers and about 65% of 1:1 Traditional teachers) that the use of laptops for teaching and learning increased student engagement. Likewise, student surveys revealed that students generally agreed that the more teachers use laptops/computers in class, the more they are interested in and enjoy school. School visits in the spring 2009 semester found an increase in the frequency of observations in
which all the students in the classroom showed a positive indicator of engagement such as sustained behavioral involvement, positive emotional tone, and exertion of effort and concentration. In focus group interviews, students, teachers and administrators at 1:1 schools were asked whether they believed that laptops had impacted student motivation and engagement. Despite some concerns about students’ tendency to be distracted by nonacademic uses for the computers, the responses were overwhelmingly positive. Both teachers and administrators noted that students seemed more engaged and on-task than they had been before they had the laptops.

**Student 21st Century Skills.** Multiple data sources found that students were increasing 21st century skills in the 1:1 learning environment. Teachers in the 1:1 schools indicated that their students use technology at least weekly to complete tasks related to 21st century skills. More than half of all 1:1 students surveyed indicated agreement or strong agreement that use of a laptop/computer at their school helps them to develop key 21st century skills. During focus group discussions, students, teachers, and administrators all agreed that using laptops in school now will help students as they enter the workforce, helping to teach students responsibility, self-direction, communication skills, creativity and problem-solving, information literacy skills, and collaboration.

**NC Computer Skills Test.** Ninth grade students at 1:1 schools made greater gains where a greater percentage of incoming freshmen in the non-1:1 schools had passed the computer skills test than those in the 1:1 schools, and by the end of the year the percentages were nearly equal. Additionally, looking across all ethnic subgroups, a larger percentage of 1:1 EC Cohort A students demonstrated proficiency on the computer skills test by the end of grade nine than non-1:1 EC Cohort A students.

**EOCs.** Binary logistic regression was used to determine the probability of passing the 2007-2008 and 2008-2009 school year Algebra I, Algebra II, Geometry, English I, Civics, US History, and Biology end-of-course (EOC) exams based upon membership in a 1:1 school. Analysis showed that for most EOC tests, attending a 1:1 school did not increase the likelihood of passing the state standardized test. Many of the 1:1 schools did show an increase in the percentage of students passing when comparing 2008 results to 2009 (see Figures 71-77). Additionally SAS EVAAS analysis revealed that the 1:1 schools tend to have high value-added effects for End of Course English I in 2009. Analysis of EOC data for the following school year will contribute to our understanding about the impact of 1:1 environments on student learning.

**Critical Issue: Infrastructure**

At the end of year two of this evaluation, we saw significant progress with implementation of the 1:1 pilot. In general, staff and students in the 1:1 schools reported that school infrastructure supports the use of the laptops for teaching and learning. Data collected in the spring 2009 revealed certain critical issues and recommendations related to laptop repairs and policies that could facilitate the effective use of the laptops in schools.

**Repairs**

**Durability of Screens.** Broken laptop screens continued to be the biggest, most costly repair issue for these projects. Broken screen repair required the machines be sent back to the manufacturer, which created an issue of considerable wait-time for processing, shipping, and repair. Most often, a broken screen occurred when students overloaded a book bag and crushed the laptop, or accidentally dropped the laptop. The most common screen issues reported by students included “black” screens, color fluctuations, vertical lines, and flickering images. Next generation laptops with more durable displays will be advantageous for use in schools.

**Onsite Technicians.** Onsite technicians provided a vital service to facilitating seamless and continuous use of laptops for teaching and learning. Onsite technicians allowed most repair issues to be resolved locally,
which meant shorter wait-times for students and staff to get their laptops back or wireless networks to be repaired. Onsite technicians allowed school-based personnel to track and prioritize repair issues based on the instructional needs. Finally, onsite technicians allowed the Technology Facilitator (TF) to focus on providing instructional support to the teachers instead of technical troubleshooting. Recommendations that seemed to improve the effectiveness of technical support at 1:1 schools included an onsite technician, streamlined processing of requests, efficient service provider, and the ability for school personnel to contact the service provider directly.

**Laptop Loaners.** When students needed a loaner laptop because of repair or maintenance issues, or because they left their laptop at home, schools had different options available. Most schools had some extra laptops on hand to loan students as needed. A general rule of thumb recommended by technicians and TFs was to order 5-10% more laptops than a school's needed inventory to keep laptops in students' hands when repair or maintenance issues surfaced.

**Policies**

**Classroom Management.** Administrators, teachers, parents and students are concerned over monitoring student computer use, especially around appropriate use of the Internet. One special category of software used by most schools to address these concerns is monitoring software. The monitoring systems used by 1:1 schools include Crosstek SchoolVue, Apple Remote Desktop, DyKnow, NetOp, EduPlatform, and OneNote. A number of technical issues were reported with some of the monitoring systems including: the programs were not easy to use without training and the monitoring software had difficulty syncing correctly with the right students. Some teachers praised the systems for including a course management tool that allowed them to build lessons that students would be locked into during a class, so monitoring was not necessary. Teachers reported difficulty with trying to monitor 30 screens using the software while also trying to teach a lesson. Although, during the focus groups, administrators, teachers, and students said they would recommend that new 1:1 schools invest in some type of monitoring software despite the difficulty and expense with setting it up. One suggestion was to have an administrator, technician, TF, or teaching assistant monitor students from outside the classroom, so teachers can focus on teaching. Often the threat of monitoring, even intermittent, is enough to keep most students on task.

**Discipline.** The 1:1 pilot schools have made great strides in creating effective laptop policies to support their 1:1 initiatives. These schools found success by using another school or district’s laptop policy as a model and then getting input from their teachers, administrators, parents, and students about what would be most effective and meaningful for their school. During focus groups, students were unambiguous about one point in particular, that there needed to be consistent enforcement of the rules and policies in every single classroom. An infraction, such as checking email during class, should have the same consequences regardless of which teacher or administrator catches it. Also, information from students and staff indicated that the most effective tool for reducing discipline issues is alerting parents to inappropriate behaviors.

**Blocked Websites/Filters.** Defining the appropriate balance between student safety, acceptable use, and access to web-based resources is difficult but important. While very complex, it is also important to find ways to meet student safety needs, set acceptable use requirements, and avoid viruses, spyware, and hacking, without overly limiting what teachers and students can access and do with the computers. To the extent students are prevented from accessing important resources, 1:1 environments will not achieve full potential. Schools need more support in addressing the requirements of the Children’s Internet Protection Act (CIPA) while providing access to valuable education resources. Models of how to create the right balance need to be explored.

**Student Access.** According to teachers and students, another challenge was that not all students actually had a laptop with them every day. Some students may not have a laptop because a) their family declined
to receive a laptop by not paying the laptop fee, b) they forgot to bring their laptop to class when it was required, or c) their laptop was being repaired. The traditional high schools participating in this study indicated that any given day up to 20% of their students would not have access to a laptop due to these issues. This was particularly inconvenient for teachers since they then had to prepare two lesson plans, one for the group with laptops and one for the group without; create “laptop buddies” where the student without a laptop would borrow one from a designated peer; or use pair or group projects mixing students who did and did not have a laptop together. These solutions provided a temporary fix and all have negative consequences on use of instructional time. Schools should consider the following possibilities to alleviate some of the pressures on teachers: lowering the cost to the student to use the laptop for the school year; keeping a few loaner laptops in each classroom for students to check out; or instituting a day-user policy where those students who are not participating in the 1:1 initiative due to the reasons listed above do not take laptops home but check out a laptop each morning and return it before leaving school each day. This issue will be further explored during the third and final year of the study with a targeted focus on those students and families who are choosing not to participate in the 1:1 initiative.

This report presented the evaluation of progress at the end of the second year in the planned three-year evaluation. These pilot schools, including seven Early College (EC) high schools and five large traditional high schools, continue to build on the critical components of an effective 1:1 computing environment. Data from these schools revealed a leadership framework for the 1:1 environment, stabilization of the implementation dip for teacher and student technology use, several positive results for student learning outcomes, and provided essential recommendations for an adequate school infrastructure.
Evaluation Report on the Progress of the
North Carolina 1:1 Learning Technology Initiative (Year 2)

Introduction
The Friday Institute for Educational Innovation at the NC State University College of Education submitted an evaluation report of the first year of implementation of the One-to-One (1:1) Learning Pilot Initiative in September 2008 and a mid-year report in January 2009. This report, submitted October 2009, presents the evaluation of progress at the end of the second year as the next step in the planned three-year evaluation. The pilot evaluation includes include seven Early College (EC) high schools and five large traditional high schools with a total across the twelve schools of approximately 6000 students and 400 school staff. In these schools, every teacher and student received a laptop computer and wireless Internet access was provided throughout the school. The overall goal of the initiative is to use the technology to improve teaching practices, increase student achievement, and better prepare students for work, citizenship, and life in the 21st century. A central tenet of the 1:1 initiative under the current study is that preparing future-ready students requires future-ready school environments. The 1:1 initiative is a strategic approach to creating future-ready high schools by 1) providing a wireless, internet-ready, mobile device for every student and teacher; 2) ensuring broadband connectivity with wireless access at participating schools; 3) preparing teachers to use technology to enhance teaching and learning; 4) providing and supporting other technology resources; 5) integrating 21st century skills into the curriculum; 6) facilitating effective leadership and community support; and, 7) developing and implementing policies that support future-ready teaching and learning.

This report addresses progress toward the participation in the 1:1 learning initiative for these twelve pilot schools; highlights important milestones and progress related to project infrastructure and support systems, teacher and student technology attitudes and skills, technology use for teaching and learning, and student learning outcomes.

Schools/Participants
The 1:1 schools are situated in regions across North Carolina (see Figure 1), which has a richly diverse geographic and cultural landscape.

Figure 1. Map of 1:1 pilot high schools.

Due to the staggered implementation model of the 1:1 pilot initiative in NC, the Friday Institute evaluation team grouped schools into Cohorts depending upon when the laptops were distributed to the teachers and students and whether the school was a traditional or EC high school (see Table 1). Demographic information is provided in Appendix A (see Tables A1-A10) for all study participants based on survey responses.
**1:1 Trad Cohort A**
This cohort includes one large, long-established traditional high school in an eastern school district. The 1:1 pilot also includes one large, long-established traditional high school in an eastern school district. This district has two other traditional high schools not participating in the 1:1 initiative. The 1:1 pilot school serves a diverse student population of 1300, as well as 86 teachers. This 1:1 Trad Cohort A school distributed laptops to teachers in the spring semester of the 2006-2007 school year and to students in the fall semester of the 2007-2008 school year.

**1:1 Early College Cohort A**
This cohort includes seven EC high schools participating in the study. Seven of the schools participating in the 1:1 pilot are EC high schools. These schools, located on the campuses of two-year community colleges, are intended to attract students from groups that are often underrepresented in college: racial minorities, students from low-income families, and those whose parents never attended college. Students in EC high schools graduate with both a high school diploma and two years of transferable college credit or an associate's degree. In most cases, EC students stay in high school five years to complete HS and college courses requirements complete those college courses. These EC high schools started operations in the past few years, supported by the Learn and Earn initiative signed by Governor Easley in 2004, and receive guidance and support from the NC New Schools Project. EC high schools are typically very small, with an average of 150 students and eight teachers at each school. The seven 1:1 EC Cohort A schools distributed laptops to teachers in the fall semester of the 2007-2008 school year and to students in the spring semester of the 2007-2008 school year.

**1:1 Trad Cohort B**
The 1:1 Cohort includes four traditional high schools across two districts participating in a district-wide implementation. All three traditional high schools in a rural district in the eastern part of the state distributed laptops to teachers in the fall semester of the 2008-2009 school year and to students in the spring semester of the 2008-2009 school year. The only high school in a school district in the central region of the state distributed laptops to teachers in the spring semester of the 2007-2008 school year and then distributed laptops to students in the fall semester of the 2008-2009 school year.

<table>
<thead>
<tr>
<th>Table 1. 1:1 pilot school cohorts.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cohort</strong></td>
</tr>
</tbody>
</table>
| 1:1 Trad A | Trad HS1 | 1376 | 86 | To teachers: March 2007  
To students: September 2007 |
| 1:1 EC A | EC1 | 113 | 5 | To teachers: November 2007  
To students: March 2008 |
| 1:1 EC A | EC2 | 124 | 8 | |
| 1:1 EC A | EC3 | 107 | 4 | |
| 1:1 EC A | EC4 | 222 | 12.5 | |
| 1:1 EC A | EC5 | 145 | 6.5 | |
| 1:1 EC A | EC6 | 152 | 9 | |
| 1:1 EC A | EC7 | 170 | 10 | |
| 1:1 Trad B | Trad HS6 | 1594 | 82 | To teachers: February 2008  
To students: September 2008 |
| 1:1 Trad B | Trad HS3 | 366 | 30 | To teachers: September 2008  
To students: January 2009 |
| 1:1 Trad B | Trad HS4 | 957 | 63 | |
| 1:1 Trad B | Trad HS5 | 746 | 49 | |

To enhance the scientific rigor of this evaluation, we analyzed comparative data for the EC 1:1 pilot schools from seven matched comparison EC schools that were not implementing 1:1 environments. We
also selected five-matched traditional high school for comparison with the 1:1 pilot traditional high schools. The selection process produced a group of comparison schools that was as similar to the 1:1 pilot schools as possible regarding variables such as teachers’ gender, race and ethnicity, and level of experience with instructional technology; and data about students’ scores on prior-year English I and Algebra I EOC Tests, and about students’ home Internet connectivity. In addition, data from the 2008 North Carolina Teacher Working Conditions Survey confirmed similarities among teachers’ perceptions at the 1:1 and comparison schools for items related to instructional technology and leadership. It is important to note that the NCDPI Annual Media and Technology Report (AMTR) data from 2008 indicated that the comparison schools did have a significant amount of technology available for instructional purposes, ranging from student-computer ratios of 1.43 to 4.29.

Data Collection
The data summarized in this report were gathered from surveys distributed to the 1:1 pilot schools and comparison schools in April 2008, September 2008, and April-May 2009, observational site visits, and archived files. Surveys were administered to three distinct groups: administrators (principal, assistant principal, TF, guidance counselor, etc.), classroom teachers, and students. Items on the comparison school surveys focused on the use of “computers” in school versus the use of “laptops” in the 1:1 pilot school surveys. Observational site visits at the eight pilots were completed in April 2008, October 2008, and April 2009 and included classroom observations, interviews with school TFs, and separate focus groups with school leadership, teachers, and students. For reference, data collection tools, including surveys and focus group protocols, are provided in Appendix B. Archival data analyzed included attendance, dropout data from the NC Education Research Data Center. SAS provided analysis for the 2008 and 2009 EOC data for participating 1:1 and comparison schools. Table 2 shows the types of data, data collected from pilot and comparison schools in the spring 2009.

Table 2. 1:1 evaluation data collected from 1:1 and comparison schools for spring 2009.

<table>
<thead>
<tr>
<th>Code</th>
<th>Cohort</th>
<th>Surveys</th>
<th>Site Visit</th>
<th>Archival</th>
<th>Code</th>
<th>Cohort</th>
<th>Surveys</th>
<th>Site Visit</th>
<th>Archival</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC1</td>
<td>1:1 EC A</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>EC13</td>
<td>Non-1:1 EC A</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC2</td>
<td>1:1 EC A</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>EC11</td>
<td>Non-1:1 EC A</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC3</td>
<td>1:1 EC A</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>EC10</td>
<td>Non-1:1 EC A</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC4</td>
<td>1:1 EC A</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>EC9</td>
<td>Non-1:1 EC A</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC5</td>
<td>1:1 EC A</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>EC14</td>
<td>Non-1:1 EC A</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC6</td>
<td>1:1 EC A</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>EC12</td>
<td>Non-1:1 EC A</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC7</td>
<td>1:1 EC A</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>EC8</td>
<td>Non-1:1 EC A</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trad HS1</td>
<td>1:1 Trad A</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Trad HS2</td>
<td>Non-1:1 Trad A</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trad HS3</td>
<td>1:1 Trad B</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Trad HS16</td>
<td>Non-1:1 Trad B</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trad HS4</td>
<td>1:1 Trad B</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Trad HS17</td>
<td>Non-1:1 Trad B</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trad HS5</td>
<td>1:1 Trad B</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Trad HS18</td>
<td>Non-1:1 Trad B</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trad HS6</td>
<td>1:1 Trad B</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Trad HS19</td>
<td>Non-1:1 Trad B</td>
<td>x</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Through classroom observations, focus groups, surveys, and analyses of existing data, we have examined the progress toward implementation of a 1:1 environment. Table 3 summarizes the alignment of the NCLTI project goals, evaluation questions, and data sources. These evaluation questions are used to organize the information presented in this report.
Table 3. Alignment of NC 1:1 LTI project goals, evaluation questions, and data sources.

<table>
<thead>
<tr>
<th>Project Goals</th>
<th>Evaluation Questions</th>
<th>Data Sources</th>
</tr>
</thead>
</table>
| 1. Improve school infrastructure and support systems to meet 21st century needs. (school-level) | How have school infrastructures and support systems evolved to meet staff and students’ 21st century needs? | Policies/Procedures  
1:1 Online Survey  
Focus Groups  
Site Visit Checklist  
Laptop Repair Checklist  
1:1 PD Inventory/Quality |
| 2. Improve staff attitudes and skills related to technology. (teacher-level) | How have staff attitudes and skills changed over time? | Classroom Observations  
1:1 Online Survey  
Focus Groups |
| 3. Enhance instructional practices by facilitating teachers’ ability to infuse instructional technology into routine classroom pedagogy. (classroom-level) | How have teachers’ instructional practices changed over time? | Classroom Observations  
1:1 Online Survey  
Exemplary Lesson Plans  
Focus Groups |
| 4. Improve student learning. (student-level) | How have students 21st century skills changed over time?  
How have student learning and achievement in core academic subjects changed over time? | Classroom Observations  
1:1 Online Survey  
Focus Groups  
EOCs  
Attendance, Discipline |

Data Analysis
Where possible, simple statistical tests were run on survey data to identify significant differences between group means for the 1:1 and comparison schools. Please note that Likert scale items are often treated as interval scales, but are in fact ordinal, thus results from traditional hypothesis testing on individual Likert items must be interpreted cautiously. Results should be looked at as general trends, since Likert scale data violates assumptions of statistical tests (e.g., they do not have a normal distribution, in many cases the homogeneity of variance assumption is violated). Thus, any interpretation of significant group/mean differences must be done with these issues in mind.

Qualitative methods were also used to provide an accurate and comprehensive picture of the first year of the 1:1 learning initiative. The qualitative data collected for this study were focus groups, observations, and document analysis. Focus groups were audio-taped, transcribed, and finally imported into Atlas.ti software. Transcripts were open-coded by construct area. Frequency counts were utilized for data collected from observation protocols. Content analysis techniques were used for document analysis.

Results
These processes have enabled us to identify important critical issues, milestones and progress and major challenges and recommendations based on the data from the second year of implementation for the Cohort A schools and initial implementation phase for the Cohort B schools. The following narrative provides the detailed results for each evaluation question, as well as a summary of findings for each section.
Evaluation Question 1: How have school infrastructures and support systems evolved to meet staff and students’ 21st century needs?

A number of data sources were used to investigate the adequacy of the 1:1 schools’ infrastructure, hardware, software, technical support personnel, instructional support personnel, procedures and policies, leadership, and professional development. School laptop policies were reviewed, the 1:1 online survey included a section on infrastructure, and the staff and student focus groups asked specific questions about the status of the school infrastructure and how support systems have evolved to facilitate successful implementation the 1:1 initiative.

Infrastructure and Support Systems
Specific items on the student, teacher, and administrator surveys asked about adequacy of the school infrastructure to support the laptop project.

School Staff Perspective
Significant differences were found between EC teachers at the 1:1 and non-1:1 schools in regards to agreement about support from support personnel and the school preparing teachers to use technology (see Figure 2). This was a major accomplishment for the 1:1 schools since the amount of technology was so much greater in the 1:1 schools.

Figure 2. Percent of 1:1 ($n = 59$) and Non-1:1 ($n = 37$) ECHS teachers indicating agreement that their schools have various technology infrastructure components in place.

Note. *Significant differences in group means ($p < .05$)

Teachers at the 1:1 Trad Cohort B high schools were more likely to agree that their principals encouraged them to pursue technology professional development and supported their efforts to integrate technology into the curriculum than the 1:1 Trad Cohort A high school and comparison school. However, the teachers at the 1:1 Trad Cohort A reported more satisfaction with the support they received from their TF response time (see Figure 3). The 1:1 traditional high school teachers had an increased expectation of support with unlimited access to technology in their classrooms.
Figure 3. Percent of 1:1 (n = 101), Non-1:1 (n = 59), and Baseline (n = 235) traditional high school teachers indicating agreement with their schools having various technology infrastructure components in place.

Note. *Significant differences in group means (p < .05)

Student Perspective
More than 80% of 1:1 EC students agreed (see Figure 4) that the infrastructure at their school was adequate to support their laptop use, and about 80% agreed that available software met their learning needs. Almost 70% of the students reported that they were pleased with the teachers’ use of laptops in the classroom and that their school helped them feel prepared to use their laptops.

Figure 4. Percent of 1:1 (n = 891) and Non-1:1 (n = 681) EC students indicating agreement with their schools having various technology infrastructure components in place.

Note. *Significant differences in group means (p < .05)
Students in the 1:1 Trad Cohort A were less likely to agree that (see Figure 5) that the infrastructure at their school was adequate to support their laptop use and available software met their learning needs than the comparison or the 1:1 Trad Cohort B schools. Overall, students in the 1:1 schools were more impressed with their teachers’ use of laptops, how frequently they learn to use new technology, and the preparation to use technology provided by their school than students at the comparison school.

**Figure 5.** Percent of 1:1 (*n* = 958), Non-1:1 (*n* = 885), and Baseline (*n* = 2821) students indicating agreement with their schools having various technology infrastructure components in place.

*Note.* *Significant differences in group means (*p* < .05)

**Hardware**
Staff at the 1:1 schools were pleased with progress of the infrastructure at their schools. Table 4 provides a summary of the current technical infrastructure (hardware, wireless access, and peripherals) at each of the pilot schools. The 1:1 pilot schools have wireless Internet access in 98.2% of their classrooms, projectors in 83.8% of their classrooms, printer access for more than 57.9% of their classrooms, and interactive whiteboards in 24.8% of their classrooms.

**Table 4.** Current inventory of technical infrastructure

<table>
<thead>
<tr>
<th>School</th>
<th>Number Teacher Laptops</th>
<th>Number of Student Laptops</th>
<th>Number of High School Classrooms</th>
<th>Classrooms with Wireless Internet Access</th>
<th>Classroom with Projectors</th>
<th>Classrooms with Printers</th>
<th>Classrooms with Interactive Whiteboards</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC1</td>
<td>5</td>
<td>115</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>EC2</td>
<td>8</td>
<td>125</td>
<td>10</td>
<td>10</td>
<td>5</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>EC3</td>
<td>6</td>
<td>121</td>
<td>9</td>
<td>9</td>
<td>7</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

NC 1:1 Learning Technology Initiative Evaluation Study: Year 2
<table>
<thead>
<tr>
<th>School</th>
<th>Number Teacher Laptops</th>
<th>Number of Student Laptops</th>
<th>Number of High School Classrooms</th>
<th>Classrooms with Wireless Internet Access</th>
<th>Classroom with Projectors</th>
<th>Classrooms with Printers</th>
<th>Classrooms with Interactive Whiteboards</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC4</td>
<td>13</td>
<td>227</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>EC5</td>
<td>6</td>
<td>154</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>EC6</td>
<td>9</td>
<td>158</td>
<td>9</td>
<td>9</td>
<td>7</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>EC7</td>
<td>14</td>
<td>220</td>
<td>10</td>
<td>10</td>
<td>0</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Trad HS1</td>
<td>89</td>
<td>1131</td>
<td>64</td>
<td>59*</td>
<td>64</td>
<td>64</td>
<td>34</td>
</tr>
<tr>
<td>Trad HS3</td>
<td>29</td>
<td>369</td>
<td>27</td>
<td>27</td>
<td>27</td>
<td>27</td>
<td>0</td>
</tr>
<tr>
<td>Trad HS4</td>
<td>60</td>
<td>952</td>
<td>61</td>
<td>61</td>
<td>49</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Trad HS5</td>
<td>48</td>
<td>729</td>
<td>65</td>
<td>65</td>
<td>51</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>Trad HS6</td>
<td>80</td>
<td>1650</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>40</td>
<td>8</td>
</tr>
<tr>
<td>Totals</td>
<td>367</td>
<td>5951</td>
<td>358</td>
<td>294</td>
<td>313</td>
<td>201</td>
<td>77</td>
</tr>
</tbody>
</table>

*District policy prevents wireless internet access in five mobile classrooms.

Stakeholders were asked on surveys if they agreed the technology infrastructure at their school was adequate to support laptop use (see Appendix A, Table A1-A2, A31-A32). More than 90% of teachers and 80% of students in 1:1 EC high schools agreed or strongly agreed the technology infrastructure was adequate. This figure dips slightly for 1:1 traditional schools where more than 60% of teachers, and more than 50% of students agreed or strongly agreed with statements regarding their school having adequate technology infrastructure.

Additional hardware was recommended by some schools to develop a comprehensive technology infrastructure that would support laptops. Digital cameras, flip video cameras, and scanners were recommended for the development of student multimedia projects. It was also recommended that students receive USB drives or teachers receive external hard drives to store backups of student work in lieu of a more robust school network for backing up student documents. To assist teachers, equipping every classroom with a interactive whiteboard and/or projector was recommended, in addition to printers in every classroom. Schools without tablet computers further recommended Wacom tablets or Interwrite pads to aid math students with writing equations, or purchasing a classroom set of tablet computers just for math classes.

Beyond hardware, staff and students at the 1:1 schools mentioned several supply items that must be budgeted for, including projector bulbs, additional batteries for laptops, additional styluses for tablets, and extra laptop bags to replace any bags with broken straps or tears.

**Laptop Repair Issues**

The 1:1 pilot schools were asked to submit a Laptop Repair Inventory for the spring semester. Table 5 provides a summary of the number of teacher and student laptops that were lost, stolen, or had to be repaired. Slightly more than 15% of the laptops had to have the hard drives reimaged during the school year due to viruses, software updates, and to remove inappropriate applications or files downloaded by students. This percentage was inflated due to the fact that every single Lenovo Tablet at EC2 had to be sent back to the manufacturer because of incompatibility between the new Microsoft operating system and the district’s current Microsoft operating system. Theft and loss of laptops was not a substantial issue. Approximately 25% of the student laptops required some repair. Repairs such as broken screens that require the machines be sent back to the manufacturer create a considerable wait time for processing, shipping, and repair. Fortunately, onsite technicians were able to resolve most issues locally.
### Table 5. Record of laptop loss and repairs for the spring semester 2009.

<table>
<thead>
<tr>
<th>School</th>
<th>Cohort</th>
<th>Type of Laptop</th>
<th><strong>TEACHER Laptops</strong></th>
<th><strong>STUDENT Laptops</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lost</td>
<td>Stolen</td>
</tr>
<tr>
<td>EC1</td>
<td>1:1 EC A</td>
<td>MacBooks</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>EC2</td>
<td>1:1 EC A</td>
<td>Lenovo T61</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>EC3</td>
<td>1:1 EC A</td>
<td>Lenovo T61</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>EC4</td>
<td>1:1 EC A</td>
<td>Lenovo Tablet X61</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>EC5</td>
<td>1:1 EC A</td>
<td>Lenovo Tablet X61</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>EC6</td>
<td>1:1 EC A</td>
<td>Lenovo T61</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>EC7</td>
<td>1:1 EC A</td>
<td>Lenovo T61</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trad HS1</td>
<td>1:1</td>
<td>Trad A</td>
<td>HP</td>
<td>0</td>
</tr>
<tr>
<td>Trad HS3</td>
<td>1:1</td>
<td>Trad B</td>
<td>Dell Latitude 5400</td>
<td>0</td>
</tr>
<tr>
<td>Trad HS4</td>
<td>1:1</td>
<td>Trad B</td>
<td>Dell Latitude 3500</td>
<td>0</td>
</tr>
<tr>
<td>Trad HS5</td>
<td>1:1</td>
<td>Trad B</td>
<td>Dell Latitude E5400</td>
<td>0</td>
</tr>
<tr>
<td>Trad HS 6</td>
<td>1:1</td>
<td>Trad B</td>
<td>MacBooks</td>
<td>0</td>
</tr>
</tbody>
</table>

*Total number of repairs not just laptops that needed repairs

Table 6 provides a summary of the most common laptop repair issues encountered by the 1:1 pilot schools. The single biggest problem continually reported by the schools with laptops was the durability of the screens. The schools with tablets also identified broken screen latches and broken battery and hard drive covers as the biggest problem areas. Schools with MacBooks cited broken screens and power cords as their most common issues. The 1:1 Trad Cohort B schools reported significant problems with the laptop bags.
Table 6. Record of most common repair issues for the spring semester 2009.

<table>
<thead>
<tr>
<th>School</th>
<th>Cohort</th>
<th>Type of Laptop</th>
<th>Most Common Repair Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Broken Screens</td>
</tr>
<tr>
<td>EC1</td>
<td>1:1 EC A</td>
<td>MacBooks</td>
<td>X</td>
</tr>
<tr>
<td>EC2</td>
<td>1:1 EC A</td>
<td>Lenovo T61</td>
<td>X</td>
</tr>
<tr>
<td>EC3</td>
<td>1:1 EC A</td>
<td>Lenovo T61</td>
<td>X</td>
</tr>
<tr>
<td>EC4</td>
<td>1:1 EC A</td>
<td>Lenovo Tablet X61</td>
<td></td>
</tr>
<tr>
<td>EC5</td>
<td>1:1 EC A</td>
<td>Lenovo Tablet X61</td>
<td></td>
</tr>
<tr>
<td>EC6</td>
<td>1:1 EC A</td>
<td>Lenovo T61</td>
<td>X</td>
</tr>
<tr>
<td>EC7</td>
<td>1:1 EC A</td>
<td>Lenovo T61</td>
<td>X</td>
</tr>
<tr>
<td>Trad HS1</td>
<td>1:1 Trad A</td>
<td>HP</td>
<td>X</td>
</tr>
<tr>
<td>Trad HS3</td>
<td>1:1 Trad B</td>
<td>Dell Latitude E5400</td>
<td>X</td>
</tr>
<tr>
<td>Trad HS4</td>
<td>1:1 Trad B</td>
<td>Dell Latitude E5400</td>
<td>X</td>
</tr>
<tr>
<td>Trad HS5</td>
<td>1:1 Trad B</td>
<td>Dell Latitude E5400</td>
<td>X</td>
</tr>
<tr>
<td>Trad HS6</td>
<td>1:1 Trad B</td>
<td>MacBooks</td>
<td>X</td>
</tr>
</tbody>
</table>

Teacher and student focus groups also generated data related to laptop repair issues. Similar to the findings from the Laptop Repair Checklist, the biggest repair issue discussed in the focus groups was broken screens, usually from students overloading a book bag and crushing the laptop, or accidents involving dropping the laptop. Other screen issues reported by some students included “black” screens, color fluctuations, vertical lines, and flickering images. A few students reported hard drive crashes, thus losing their work if a plan was not in place for students to back up work saved on their computers to a school network. Possibly related to hard drive crashes were problems reported with viruses at several schools, highlighting a need for virus protection. Beyond screen issues, a few issues were noted with broken latches on tablet-based computers, but these issues were not widespread. One person even noted they had fewer problems with latches than expected:

[TF] These Lenovo [tablets] have been great, we have had very few repairs with them, we've probably replaced four, five keyboards. I was a little worried about them being turned, how well that would hold up, but I don’t have one problem with it. No, that's not been an issue at all. I was afraid that they'd be easy to tear off, or something, but as much as they've been dropped, it's not even been a problem.

Laptop Maintenance
A few issues with maintaining laptops were noted by the schools. For one, tablet schools reported issues with lost or broken styluses used for writing, but replacements were cheap and readily available. Also, schools frequently discussed having issues with laptop batteries quickly losing their charge, but noted this particular problem was avoidable by training students to either frequently charge or bring their power cord to plug-in the laptop:

[Teacher] The biggest issue is batteries, people go home and forget to plug it in... the next day it’s dead... and it’s not even a problem, it’s something that can be prevented, and I know that everyone in here has done it at least once, and you go to the office and get a battery, but it’s not a big deal, especially if you carry around your power cord....
**Loaner Laptops**

When students need a loaner laptop because of repair or maintenance issues, or because they left their laptop at home, schools have different options available. Most schools described having some extra laptops on hand to loan students as needed. A general rule of thumb recommended by TFs was to order 5-10% more laptops than a school's needed inventory to keep laptops in students' hands when repair or maintenance issues surface. Not every school planned to buy loaner laptops, however, some chose to use older models or any laptops returned by students whose parents opted them out of the program.

The procedures for loaning laptops vary by school. At one school, negligence-related repair loans were not made until the student's family paid for any necessary insurance deductibles to cover the cost of repair (~$150). Also, schools expressed differences of opinion on where loaner laptops should reside and be checked out. A few schools mentioned it would be more efficient to have loaner laptops in classrooms, so students could retrieve them from teachers if needed, rather than tracking down the TF. On the other hand, one school suggested it was not cost-effective to store loaner laptops in every classroom since those laptops that would not get regular use and would just age and lose their value (i.e., waste of valuable resources).

**Selecting Tablets vs. Laptops**

Tablets were apparently more highly regarded by the schools that had them. They found tablets very convenient for some subjects, math for example, and considered repair issues to be minimal. Four schools that did not use tablets, however, expressed that they did not buy tablets because they feared tablets would require high maintenance and be prone to break. This negative perception of tablets may be worth overcoming, since several schools, including schools that ordered regular laptop, cited numerous benefits of tablets (see Table 7).

**Table 7. Benefits to tablet computers**

<table>
<thead>
<tr>
<th>Reason</th>
<th>Supporting Quotations from Teacher and Student Focus Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allows switching between writing or typing, gives poor typists another option</td>
<td>[Teacher] I like the tablet, because it’s like a computer and a notebook put together, so if they don’t want to type at one moment, they can just turn it over and just write it.</td>
</tr>
<tr>
<td>Helps students keep notes organized</td>
<td>[Teacher] I don’t know any advantage for not having the tablets. I think they’re so wonderful, and they keep the students engaged more because they’re taking their notes in them, they automatically save them, they file them, it keeps them organized... I wouldn’t trade the tablets for anything.</td>
</tr>
<tr>
<td></td>
<td>[Teacher] If I send a PowerPoint, they can write right on the PowerPoint slides, and add things, which is much easier with the stylus... they can underline in my PowerPoint, they can write right next to it, so it’s kind of annotating.</td>
</tr>
<tr>
<td>Supports coursework in science through visual representations</td>
<td>[Student] In Biology, you do a lot of diagramming and organizer things that it’s just quicker with the pen to do, rather than use a program to make it.</td>
</tr>
<tr>
<td>Supports coursework in English/Language Arts marking up and annotating e-books, editing writing</td>
<td>[Teacher] It not only improves comprehension, it gets them in to thinking about theme, because they find themselves writing in the margin, and they’re copying, because I do ‘yuck’ in the margin if I don’t like something or, and it could be anything from reacting to a plot event to the way kids ordered something, but they’ll, they’ll write reactions in the margin, not just underlining important points, and any time you get them to interact like that, they’re a little bit farther to being critical readers.</td>
</tr>
<tr>
<td>Reason</td>
<td>Supporting Quotations from Teacher and Student Focus Groups</td>
</tr>
<tr>
<td>--------</td>
<td>-------------------------------------------------------------</td>
</tr>
<tr>
<td>Supports coursework in Math through writing equations with OneNote</td>
<td>[Student] It really would have been a lot easier [to have a tablet], because instead of having to go through equation editor and having to do sub-scripts, or like concentration brackets, and it’s like so hard to keep doing that and being able to keep up, so it would have been easier to write it and then turn it in and just save it.</td>
</tr>
</tbody>
</table>

Software

In surveys and focus groups students, teachers, and administrators were asked to list frequently used software tools. Findings suggest Microsoft Office applications are still the most widely employed tools across all groups (i.e., Word, Excel, PowerPoint). However, data show a trend where students in some schools report exposure to a more diverse range of tools beyond Microsoft Office applications than students in other schools (e.g., iMovie, Garage Band, wikis). The degree of exposure likely depends on a number of factors such as teacher and TF experience, and professional development offered to teachers. Other than common Web 2.0 applications such as wikis and blogs, the data also suggests schools are only using a handful of the thousands of free Web 2.0 applications available. There is considerable room to increase student exposure to additional web tools. Lack of teacher awareness and lack of teacher time to experiment are the most likely barriers to greater use of these resources.

Satisfaction with available software on laptops runs high among stakeholders (see Appendix A, Table A1-A2, A31-A32). More than 80% teachers and students in 1:1 ECs agree or strongly agree they have adequate software. This figure dips somewhat for 1:1 traditional schools where more than 70% of teachers and more than 60% of students agree or strongly agree with adequate software.

Software Tools Used During School

As might be expected, administrators reported the fewest categories of tool use compared to teachers and students. Administrators primarily reported use of Microsoft Office software (Word, Excel, PowerPoint, Publisher), email applications, tools to access and manage school data (NC Wise), Web browsers, programs to make web pages, and calendar applications associated with school scheduling.

The primary applications teachers reported using included Microsoft Office, the Internet to support lessons with both static content as well as interactive online games and simulations, software that interfaced with classroom hardware such as Smartboards, assessment and study skills software, learning management systems, and classroom monitoring applications. Sample applications mentioned by teachers in these categories are listed below:

- MS Office and presentation tools (Word, Excel, PowerPoint, Publisher)
- Internet sites to retrieve content for lessons, such as downloadable lesson plans or student worksheets (abcteach), sites with teaching resources (United Streaming, Learn NC, SAS Curriculum Pathways, virtual museums)
- Internet sites that provide for student interactions, such as online lab simulations, sites with games and interactions for kids (Starfall, Brainpop, Funbrain)
- Software that interfaces with interactive classroom hardware (whiteboards/Smartboards, InterWrite, ActivStudio, classroom performance systems/clickers)
- Assessment software (Quia, Examview)
- Study skills software (Plato, Study Island)
- Learning management systems to store lessons/content/grades (EduPlatform, Angel)
- Monitoring software (SchoolVue, DyKnow)

Students reported use of the widest range of general applications suitable for use in any subject area, including: office and presentation tools; Internet browsers and search tools to aid in research; editing tools.
for video, audio, and web pages; note taking applications; learning management systems; email; and various utilities such as calendars. Sample applications mentioned by students in these categories are listed below:

- MS Office and presentation tools (Word, Excel, Publisher, Powerpoint, Keynote)
- Internet browsers and search tools (Firefox, Safari, IE, Google, Yahoo, Wikipedia)
- Video editing tools (iMovie, MovieMaker)
- Image editing and manipulation tools (iPhoto, Comic Life, Photoshop, Illustrator, Gimp, GoAnimate)
- Web page editors (including wikis, Wikispaces, Pb Wiki)
- Note taking applications (Formulate Pro, OneNote)
- Learning management systems to access teacher content/grades (Angel)
- Email applications (Gaggle, Yahoo)
- Utilities (calendar, electronic calculators, dictionaries, Adobe PDF Reader, QuickTime)

In addition to general applications, students also listed a number of specialized software tools most likely utilized in specific subjects, including:

- Map applications (Google Earth)
- Music applications (iTunes, Garage Band, Noteflight)
- Art-specific applications (Paintbrush)
- Math-specific applications (Geometer's Sketchpad)
- Study skills software (Study Island, Study Stack, Plato Web)
- Multimedia curriculum (Discovery Education, SAS in Schools)

**Software Tools Used at Home**

Students were asked to describe how they were using their laptops at home. Most students reported using the laptop for school-related work, including:

- Working on school projects such as creating presentations, conducting Internet research, writing (including blogs), contributing to class wikis, editing web pages, video, and audio
- Reading e-texts
- Taking online quizzes and tests
- Studying for end-of-course exams
- Downloading homework and checking grades

Students also listed personal uses of laptops in the home, including:

- Using the computer for personal advancement, such as conducting research on colleges, preparing college applications (including writing scholarship essays)
- Using the computer for personal interests, such as playing games, listening to music from iTunes, downloading pictures from cameras, browsing Internet for personal interests (e.g., sports, YouTube, social networks), using draw/paint applications

**Monitoring Software**

Administrators and teachers were asked on their surveys if teachers found it difficult to monitor inappropriate Internet use in their classrooms (see Appendix A, Table A13-A14). A little more than 30% of administrators and teachers in 1:1 ECs, and between 15 and 35% of administrators in 1:1 traditional schools agreed or strongly agreed that it was difficult. Near 60% of teachers in 1:1 traditional schools agreed or agreed it was difficult perhaps due to the fact that traditional schools have larger class sizes than EC schools. It is clear that some administrators and teachers have concerns over monitoring student computer use, especially around use of the Internet.
When comparing across time, teachers at the 1:1 EC reported slightly more and teachers at the 1:1 Trad Cohort A school reported slightly less difficulty in monitoring inappropriate Internet use in their classrooms in the spring 2009 versus fall 2008 (see Figure 6). Generally, more teachers in the traditional high school have difficulty monitoring their students’ Internet use.

Figure 6. Percent of 1:1 EC Fall 08 \((n = 57)\) and Spring 09 \((n = 55)\), and 1:1 Trad Fall 08 \((n = 58)\) and Spring 09 \((n = 101)\) teachers from Cohort A finding it difficult to monitor inappropriate Internet use in their classrooms.

One special category of software used by most schools to address monitoring concerns is monitoring software. Classroom management systems being used by 1:1 schools include Crosstek SchoolVue, Apple Remote Desktop, DyKnow, NetOp, EduPlatform, and OneNote. These monitoring software packages typically have multiple functions, not only allowing teachers to sync and view a student's computer screen at any time to ensure they remain on task, but also allowing teaching to distribute assignments or notes electronically at the beginning of a class (useful if a student is absent or suspended), collect assignments at the end of a class, and display what is on the teacher's computer screen on every student's computer screen for presentations. One administrator commented that the engagement features of monitoring software were even more appealing to teachers than the monitoring features:

[Administrator] Like DyKnow, SchoolVue has two sides: You have the management and engagement, and to try to sell them on the management side is really tough, but to try to sell them on the surveys, where you can go in and collect work, they're into that.

When asked if they thought teachers needed to use monitoring software, students in focus groups usually agreed citing some students who would be off task otherwise.

[Student] I think they should, because some students here need to be monitored. I mean, there are some students who will put off work to play games, and that's not what you're at school for. I'd rather they not do it, but I know they need to do it.

[Student] I'll be checking my e-mail, not doing what I'm supposed to be doing in class. So they should monitor and make sure you're doing the right thing.

Most teachers agreed some degree of monitoring was useful as well, since the age-old method of walking around the classroom to monitor was not sufficient in larger classrooms when students could quickly change their screens as the teacher approached:

[Teacher] There are times where it would be useful. There are times when we're having a class discussion, where I'm delivering a bit of information to them, and the computers are
open, and you know, the fingers are flying. Are they taking notes? And they're good at changing screens fast; they're really good at that. Because by the time you think, okay, subtly walk behind them, well the minute you get very close, they're changing to something else....

[Teacher] When you're sitting with 30 to 35 kids in the class, you need more than that. We can't go around to this one over here, and this one over here.

A few teachers noted, however, that they would rather have a technician or TF monitor students from outside the classroom, so they could focus more on teaching. A few noted the threat of monitoring, even intermittently, was enough to keep most students on task.

[Teacher] If I'm watching my screen, I'm not teaching, and there comes a point where, okay, are you going to teach your class or are you going to sit there and stare at your screen for 90 minutes and see what sites they're clicking on?

[Teacher] There's better things I could be doing, like walking around and actually working with the kids, you know. I don't have time to be a watchdog at my laptop.

In lieu of formal monitoring, a few teachers praised the EduPlatform tool for allowing them to build lessons that students would be locked into during a class, so monitoring was not necessary. Also, DyKnow allowed teachers to lock students into OneNote for note taking only.

A number of technical issues were logged in terms of working with monitoring software. For one, several noted the programs were not easy to use without training:

[Teacher] CrossTec SchoolVue is a complicated program, which requires good training... I consider myself pretty computer-savvy, and that CrossTec stuff is very hard.

Also common were problems with monitoring software syncing correctly with the right students. In some cases the software would sync with only part of a class or with students' computers who were outside of the intended classroom:

[Teacher] One of the features of SchoolVue that I love is being able to project things on to their screens, but then there's always that one kid whose screen didn't get picked up.

[Teacher] We need monitoring software, but it's got a lot of glitches in it, and that is the single biggest slow-down, getting the black screen, you can't grab students, you have to try to enter their names in.

[Teacher] I grab computers in other classrooms, and then I project my presentation onto their screens, so it's U.S. History looking at my English stuff!

Part of the problem with syncing appears to be wireless classroom setups, where laptops don't have static IP addresses that software programs can "grab." It was noted that SchoolVue in particular was really designed for a wired lab setup.

**Technical Support Personnel**

**District Technology Staff**

In the 1:1 pilot districts, the number of full-time staff working in the district technology office ranges from 5 to 14. Some districts have contracts with as many as 14 network engineers. The typical district technology staff is comprised of a district technology director, wide area network (WAN) engineer, technicians, and instructional technology coaches.
**On-site Technicians**

Six of the 1:1 schools have a full-time technician on staff and four schools have part-time technicians funded through a combination of grant and local funds. Two of the pilot schools do not have any on-site technicians at their schools and must rely on the district technology staff for all their technical support needs. Major responsibilities of the technician include responding to teacher/student requests related to software, hardware, and network problems; installing new technology resources; acting as liaison with district technical staff; coordinating warranty and other technical information with hardware and software companies; and providing input on school technology purchases.

In focus groups conducted at 1:1 schools, staff was asked about various aspects of the technical support provided at their school. Analysis from those discussions indicated that onsite school technicians work in close cooperation with district personnel to deal with issues such as installing software, managing students’ laptops, and troubleshooting hardware and software, and direct more specialized service tasks (e.g., screen repairs and replacement) to an outside provider. Some districts have required that any service requests to the provider be channeled though the district which has caused delays in resolving problems. A streamlined processing of requests, an efficient service provider, and the ability for school personnel to contact the service provider directly represent some of the factors that can really help improve the quality of technical support at 1:1 schools:

> [TF] Going through [provider], I don’t know what the county paid for that kind of service, I’m sure it was expensive, but it makes a big difference, I would say anyone who’s going to do the [PC] look at the [service], it’s a good one.

> [TF] Instead of having to go in there and put in 65 tech requests for different machines, we’ll just put it in one time, they’ll call us, and we’ll say, we’ve got 65 machines with broken pens, well, just the buttons, the kids are still using them, and they’ll just send us 65 pens, and we’ll get them the next day, I can’t ask for better service than that. The keyboards, like I said, we ordered them, the last ones we ordered were, we ordered afternoon, probably about 1:00 on Thursday, they were in our office Friday morning.

**Student Tech Teams**

Five out of the eleven schools in 1:1 Cohorts A and B have some type of student teach team in place. In Cohort A, a traditional high school has a “club” (Technology Honor Society), four ECs have tech teams, and two more ECs are considering implementing them. None of the three traditional high schools in Cohort B have tech teams but technicians at the schools are planning to establish them. Tech teams perform tasks such as helping teachers set up equipment before class, troubleshoot equipment in their classroom, publish announcements on the school’s website, image laptops, and develop policies for the appropriate use of the laptops. According to a TF, even if they are not part of a formal group (tech team or club) some tech-savvy students enjoy offering informal technical support to teachers and students in their classroom.

The major challenge facing utilization of student tech teams is time. Adding the duties of the tech team to students’ already busy class schedule becomes difficult. Finding time to meet is also complicated—some teams have decided to meet during lunch hour or less frequently (e.g., every two weeks instead of every week).

An issue pointed out by administrators was how much access to the computers should be given to tech team members. To be able to perform some tasks on the laptops, tech team members need to have administrator rights, but giving them such rights poses the risk that they may misuse those privileges. So, when establishing a student teach team it is necessary to define their roles and responsibilities clearly, make sure that they are granted the right amount of access, and know that they can be trusted.
Instructional Support Personnel

Technology Facilitators

Teachers and administrators identified the Technology Facilitators (TF) as the critical component of their 1:1 project. The schools in this study utilized two different models for the TF where schools either hired a full-time instructional technology support staff or identified four lead teachers across the content areas to collectively act as the school TF. Table 8 provides a summary of how the TF models were employed at the 1:1 pilot schools.

Table 8. TF Model of implementation by school

<table>
<thead>
<tr>
<th>School</th>
<th>Cohort</th>
<th>TF Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Full-Time</td>
</tr>
<tr>
<td>EC1</td>
<td>1:1 EC A</td>
<td>X</td>
</tr>
<tr>
<td>EC2</td>
<td>1:1 EC A</td>
<td>X</td>
</tr>
<tr>
<td>EC3</td>
<td>1:1 EC A</td>
<td>X</td>
</tr>
<tr>
<td>EC4</td>
<td>1:1 EC A</td>
<td>X</td>
</tr>
<tr>
<td>EC5</td>
<td>1:1 EC A</td>
<td>X</td>
</tr>
<tr>
<td>EC6</td>
<td>1:1 EC A</td>
<td>X</td>
</tr>
<tr>
<td>EC7</td>
<td>1:1 EC A</td>
<td>X</td>
</tr>
<tr>
<td>Trad HS1</td>
<td>1:1 Trad A</td>
<td>X</td>
</tr>
<tr>
<td>Trad HS3</td>
<td>1:1 Trad B</td>
<td>X</td>
</tr>
<tr>
<td>Trad HS4</td>
<td>1:1 Trad B</td>
<td>X</td>
</tr>
<tr>
<td>Trad HS5</td>
<td>1:1 Trad B</td>
<td>X</td>
</tr>
<tr>
<td>Trad HS6</td>
<td>1:1 Trad B</td>
<td>X</td>
</tr>
</tbody>
</table>

The staff, and most teachers, at the schools where four teachers serve as TFs are very supportive of this new model. During the focus groups in these schools participants stated,

[TF] I am one of the Tech Facilitators. We split the position between four people. I have diligently worked with the people assigned to me although I feel that I need more training to be most effective.

[Teacher] The four TF model is working well. If you bring an outsider in, the teachers are reluctant to work with them and they have little expertise with content areas; think this model works better than one TF.

[TF] It's sort of everybody calls everybody, because of planning periods. If it’s a specific problem, whoever is got a planning period…if it’s an instructional thing, then it’s much more likely to be in the content area that they would look for help…. and the rest of the school that isn’t in one of the four is divided up amongst the four of us, so that it’s split evenly.

[Teacher] They are very knowledgeable and if they do not know the answer they will find it. I think a key to their success is that the position is divided among four teachers, each in different fields of study. They understand the pedagogy and how to apply laptops in the classroom and one of them is usually available and knows my content area.

A few teachers, however, felt that the four-teacher TF model at their school was not very helpful.

[Teacher] I am not sure of who my TF is specifically. There is only one of the teachers that we have that works effectively in my opinion. They do an excellent job. Also I get most of my help from an individual that is not a facilitator.
In both models, TFs have a variety of responsibilities to support the teachers and students in their schools. The TFs reported that their daily activities included conducting professional development, troubleshooting equipment and software issues, modeling technology use, and co-teaching. They also reported maintaining open communication with district technology staff as part of their regular routine. Some examples of their daily activities included facilitating collaborative planning sessions with teachers, providing teacher training after school if schedules prevented common planning time, using OneNote software for lesson-sharing, setting up a Google Blog to support collaboration among teachers, and coordinating parent nights to exhibit student work and provide parent technology training.

According to the TF at one of the EC Cohort A schools, the goal at his school is to maintain separate roles of the technician and the TF, where the technician solves technical issues and the TF supports teachers on integrating technology in the classroom:

[TF] It’s been nice having both [a TF and technician], because I can focus on professional development, and my principal is very good about that, that’s where she wants my focus to be, working with the teachers in the classrooms and the technician doing technician work.

[TF] We have so many issues with the Internet here, the most of our job this year has been helping people to overcome those problems rather than looking at instructional help.

[Teacher] Initially they did a lot of troubleshooting (e.g. printer connections) and now it is more instructional.

The majority of teachers in all 1:1 Cohorts believe that the TFs are essential for the success of the 1:1 program. Indeed, TFs have primarily been helping teachers in classrooms and training them on diverse applications.

[Teacher] He has been very helpful with working out all of the "bugs." He has also helped many teachers learn how to use the Cross-Tec software and its many applications. He has also repaired and/or solved problems with hundreds of teacher and student laptops already. The 1:1 initiative would be a failure without his help.

[Teacher] Every time I have had a question or problem related to the laptop or the programs that we are using, our TFs have been very quick and effective in helping resolve the issues.

[Teacher] She has made herself available to teachers during their planning or class times to help with programs, teach lessons and many other activities. She spent 3 blocks with me personally showing me how to use the FLIP camera to video students then transferring the information on to laptops so we could create commercials in iMovie.

Policy/Procedures
All schools in the 1:1 pilot enacted effective policies and procedures governing how the laptops were to be used. In the last report, the following summary of laptop policies and procedures was provided:

- All schools had acceptable use guidelines;
- All schools had guidelines for caring for the laptops;
- Nine schools explicitly prohibited violent games and social networking sites;
- Nine required original software to remain on the laptop and four prohibited students from installing anything on the laptop. Three of these schools had random inspections to insure compliance;
- Eight schools collected insurance fees, ranging from $10-$50, from students;
- Eleven allowed students to take their laptops home every day;
- Nine schools indicated they would collect the laptops during the summer, and
• Every school hosted one or more parent nights to provide information to parents about the 1:1 initiative, and to get parental approval and commitment to support their child’s use of the laptop;
• All schools required parental permission forms for students to receive a computer

**Laptop Misuse**

Administrators, teachers, and students in the three 1:1 Cohorts were asked whether students had been instructed on what will happen if they misuse their laptops. More than 95% of teachers and students from all participating 1:1 schools indicated that their students have been instructed on what will happen if they misuse their laptops.

Misuse resulted in laptops being taken away from some students (see Figure 7). According to the teacher and student surveys, there seemed to be a trend of increasing instances of removing students’ laptops from fall 08 to spring 09.

*Figure 7. Percent of 1:1 EC Cohort A fall 2008 (n = 57) and spring 2009 (n = 55), and 1:1 Trad Cohort A fall 2008 (n = 58) and spring 2009 (n = 103) teachers who had to take away a student’s laptop; and, 1:1 EC Cohort A fall 2008 (n = 901) and spring 2009 (n = 890), and 1:1 Trad Cohort A fall 2008 (n = 921) and spring 2009 (n = 951) students who had their laptops taken away for more than a class period.*

*Note. *Significant differences in group responses (*p < .05)*

Open-ended items on the survey provided opportunities for students, teachers, and administrators to share information on their experiences with policy issues related to the 1:1 initiative. Their responses focused on two areas: prevention and consequences.

• Prevention – All participating schools have official policies in place that are regularly reinforced and communicated to students through signs posted in classrooms, annual agreements signed by parent and student, and, or digital reminders that are sent to students and parents. Many schools have gotten input from students on revisions to their laptop policies related to defining appropriate use and identifying reasonable consequences for breaking rules. One of the major issues reported by students during focus groups is the lack of consistent enforcement of the policies among their teachers.
Consequences – There are a variety of consequences at the 1:1 schools for an infraction of the rules outlined in laptop policies. Consequences for breaking rules include staying after school, turning in extra assignments, or letters sent home to parents. Information from school students and staff indicated that the most effective tool is alerting parents to inappropriate behaviors. Letters sent home to parents has drastically reduced discipline issues. As a punishment for violating laptop use rules, administrators and teachers often take away laptops from students. The duration of the takeaway may be a single class period, a day, a week, or in severe circumstances, a semester. The reasons for taking away the laptop can also be diverse (e.g., accessing inappropriate websites, using the laptop when it is not required, and upon parents’ request). Some staff expressed concern that this type of punishment was equivalent to taking a students’ writing tools, “This is a problem that I have, because…I don’t like taking [the students’] computers as a discipline issue, that’s like saying I’m going to take your paper and pencil because you didn’t do your homework.”

Of particular interest to stakeholders was whether students and staff at the 1:1 schools observed higher instances of cheating or cyberbullying as a result of because of their participation in the project. Specific questions about these issues were included in the focus groups and surveys.

Cheating - Most teachers and students were in agreement that the presence of the laptops did not increase instances of cheating at their schools.

[Teacher] When I was in school, there were plenty of ways to cheat; the guy that’s going to cheat is going to cheat, I mean, he’s going to find a way to do it; if he didn’t have laptops, if he was going to cheat, there’s a way to do it without them, so, yea, I don’t think it adds, it’s not going to entice somebody who normally wouldn’t cheat into cheating.

Cyberbullying – Similarly, school staff and students reported no real increase in instances of cyberbullying or bullying of any kind with the introduction of the laptops (see Figures 8-9).

[TF] There has been normal gossipy stuff, just digital versions of hand written notes, mean stuff, but no threats or anything.

It is interesting to note that although the overall percentages are very low, less than 15%, more students in the non-1:1 schools reported being victims of cyberbullying. Perhaps this can be attributed to the fact that the staff at the 1:1 schools talked to students about appropriate use of their laptops whereas non-1:1 schools would not necessarily have taken the opportunity to address this issue with their students.

Figure 8. Percent of 1:1 EC Cohort A (n = 53), 1:1 Trad Cohort A (n = 97), and 1:1 Trad Cohort B (n = 181) teachers who have had at least one student come to them with cyberbullying concerns.
Figure 9. Percent of students from 1:1 EC Cohort A (n = 807), Non-1:1 EC Cohort A (n = 817), 1:1 Trad Cohort A (n = 660), non-1:1 Trad Cohort A (n = 824) and 1:1 Trad HS Cohort B (n = 2,410) who reported being victims of cyberbullying during spring 2009.

Blocked Sites
Focus group data and open-ended survey responses indicated that teachers, administrators, and students agreed that filtering/blocking of websites has been one of their major day-to-day challenges. Filters were blocking not only websites that provided general information (e.g., historical information) but also websites that serve a legitimate educational purpose (e.g., SAS resources). While both teachers and leaders acknowledged that this was an important issue that needed a prompt resolution, students expressed very strong opinions about it. This issue seems to be of critical concern, as it is hindering the pedagogical use of the technology. Schools and LEAs need to find a filtering solution that is flexible enough to allow teachers and students to access important Internet resources. TFs and teachers concede that too many legitimate educational websites are being blocked at the school:

[TF] Basically everything’s blocked that goes beyond Google.com, so the teachers have a lot of problems with it, because they go to the Friday Institute and they learn how to make Wikispaces, they develop wonderful curriculum with it, lessons that are just amazing instruction, they come back to the classroom and they find out that they can’t use them, and that’s really really frustrating.

Unblocking a site is usually done at the district but administrators and teachers are given some options at certain schools. One TF reported that at his schools teachers are allowed to unblock a site temporarily. If they need it for a longer period, they need to fill out a form that is sent to the administrator and kept as a record of CIPA compliance. The district has the last word on deciding whether to unblock a site. According to a TF, teachers planning to use blocked sites should plan and request that they be unblocked a few weeks in advance. Although blocked sites are a problem for teachers, some students have found ways to access them. Between 20 and 30% of students at 1:1 schools report using proxy sites that allow them to circumvent the filters; in ECs some students go to the college area, where sites are not blocked, to access them.

Leadership
Based on data collected for this evaluation during spring 2008 and fall 2009, the FI evaluation team identified a framework for effective leadership of a technology innovation project (see Appendix C). Using this new framework, survey items for schools in Cohort A collected data from teachers about whether their principal was demonstrating those specific leadership characteristics identified in the framework for the 1:1 initiative at their school.
For almost all leadership items, significantly more teachers in the 1:1 Cohort A EC high schools agreed that their principals were providing effective leadership for the 1:1 initiative (around 80-100% for most items) when compared to the teachers’ perceptions of leadership of the principal at the 1:1 Trad Cohort A high school. Since the quality of the school-level leader has been identified as one of the most important indicators in success of a 1:1 project, these results help to explain some of the differences found in the impact on teacher and student outcomes for these schools. Recently there has been a change in leadership at the 1:1 Trad Cohort A high school. A new principal will be leading their 1:1 initiative for the 2009-2010 school year.

Advocacy

Figure 10 shows significantly more teachers at the 1:1 EC Cohort A schools agree their principal secures funding for the 1:1 Initiative, takes steps to ensure the sustainability of the 1:1 Initiative, advocates for policies that support our 1:1 Initiative at the district level, and leverages strategic partnerships to support the 1:1 Initiative than at the 1:1 Trad Cohort A school.

Figure 10. Percent of 1:1 EC (n = 25) and 1:1 traditional (n = 42) teachers indicating agreement with various statements regarding their principal’s demonstration of advocacy for the 1:1 program.

Note. *Significant differences in group means (p < .05)

Evaluation

Figure 11 shows significantly more teachers at the 1:1 EC Cohort A schools compared to teachers at the 1:1 traditional school agree their principal uses clearly defined criteria for assessing 1:1 laptop integration, uses multiple sources of data for evaluating the impact of technology on student outcomes, communicates how teacher performance will be assessed, uses technology assessment data for improving teacher performance, evaluates the effectiveness of technical support provided to the school, involves teachers and students in evaluating 1:1 integration, assesses the technology skills of teachers, and shares technology assessment results with teachers.
Figure 11. Percent of 1:1 EC ($n = 25$) and 1:1 traditional ($n = 42$) teachers indicating agreement with various statements regarding their principal’s demonstration of evaluation of the 1:1 program.

*Significant differences in group means ($p < .05$)

Modeling Technology Use
Figure 12 shows significantly more teachers at the 1:1 EC Cohort A schools compared to teachers at the 1:1 traditional school agree their principal uses technology-based systems to support management and operations, effectively communicates with students via technology, uses technology to complete administrative tasks, effectively communicates with parents via technology, effectively communicates with teachers via technology, and promotes the legal and ethical use of information and technology. No significant difference was reported between the principals in the two cohorts for requesting that teachers submit documents electronically rather than on paper.
Figure 12. Percent of 1:1 EC (n = 25) and 1:1 traditional (n = 42) teachers indicating agreement with various statements regarding their principal’s modeling technology use associated with the 1:1 program.

Note. *significant differences in group means (p < .05)

Support for 1:1 Professional Development
Figure 13 shows significantly more teachers at the 1:1 EC Cohort A schools compared to teachers at the 1:1 traditional school agree their principal evaluates the effectiveness of professional development, provides resources such as substitutes, release time, etc., understands the professional development needs of teachers, ensures there is funding for professional development, uses results from teacher assessment to plan teachers’ professional development, participates in administrative professional development, and makes sure that opportunities for professional development are available.
Figure 13. Percent of 1:1 EC (n = 25) and 1:1 traditional (n = 42) teachers indicating agreement with various statements regarding their principal’s support for professional development associated with the 1:1 program.

Note. *Significant differences in group means (p < .05)

Psychosocial Support
Figure 14 shows significantly more teachers at the 1:1 EC Cohort A schools compared to teachers at the 1:1 traditional school agree their principal encourages teachers to incorporate innovative technology into their instructional strategies, understands that incorporating technology into the curriculum may take more time for some people, provides time for collaborative planning for technology integration, increases teacher awareness of emerging instructional technologies, and allows teachers time to experiment with integrating technology into their classroom.
Figure 14. Percent of 1:1 EC \((n = 25)\) and 1:1 traditional \((n = 42)\) teachers indicating agreement with various statements regarding their principal’s psychosocial support for teachers.

Note. *Significant differences in group means \((p < .05)\)

**Shared Decision-Making**

Figure 15 shows significantly more teachers at the 1:1 EC Cohort A schools compared to teachers at the 1:1 traditional school agree their principal collaborates with teachers in resolving technology problems, makes teachers feel comfortable in expressing concerns or opinions about the 1:1 initiative, provides time to solve problems as a team, values teacher input on the 1:1 Initiative, includes teachers in decisions about measuring student success in technology use, trusts teachers to make sound decisions about technology integration in instruction, involves teachers in decisions about school policies on student use of technology, includes teachers in decisions about measuring teacher success in technology integration, and requests feedback from teachers about the 1:1 Initiative.
Figure 15. Percent of 1:1 EC (n = 25) and 1:1 traditional (n = 42) teachers indicating agreement with various statements regarding their principal’s support of shared decision-making for the 1:1 program.

Note. *Significant differences in group means (p < .05)

Vision
Figure 16 shows significantly more teachers at the 1:1 EC Cohort A schools compared to teachers at the 1:1 traditional school agree their principal believes in the laptop initiative has articulated a vision for the school’s laptop initiative, has established clear objectives and goals for our school to meet on the 1:1 initiative, sets ambitious, yet realistic goals for integrating technology, and communicates how the laptop initiative supports the larger strategic plan for the school.

Figure 16. Percent of 1:1 EC (n = 25) and 1:1 traditional (n = 42) teachers indicating agreement with various statements regarding their principal’s demonstration of vision for the 1:1 program.
**Support for Infrastructure and Resources**

Figure 17 shows significantly more teachers at the 1:1 EC Cohort A schools compared to teachers at the 1:1 traditional school agree their principal makes sure school technologies are well maintained and updated, ensures that technology supplies are available at the school, designs policies for the appropriate use of technology, makes sure all students have access to technologies that facilitate student learning, makes sure teachers have access to technology tools that facilitates their work, ensures technical support is available, and ensures an appropriate infrastructure is maintained in the school.
Survey items for schools in Cohort B, which just started their laptop project, focused on who at the schools were providing effective leadership for their new 1:1 initiative. Teachers agreed that the district superintendent, school-level principal/assistant principal, and TF had been effective leaders of the 1:1 initiative at their school (see Table 9).

Table 9. Tally of Cohort B teachers’ open-ended responses to “Who are the individuals who are the driving forces behind your school's 1:1 Initiative?”

<table>
<thead>
<tr>
<th></th>
<th>Superintendent</th>
<th>Principal</th>
<th>Assistant Principal</th>
<th>TF</th>
<th>Media Specialist</th>
<th>Technician</th>
<th>Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>79</td>
<td>136</td>
<td>78</td>
<td>62</td>
<td>48</td>
<td>5</td>
<td>44</td>
</tr>
<tr>
<td>% of respondents</td>
<td>39.7%</td>
<td>68.3%</td>
<td>39.2%</td>
<td>31.2%</td>
<td>24.1%</td>
<td>2.5%</td>
<td>22.1%</td>
</tr>
</tbody>
</table>

76.1% of teachers at the 1:1 EC Cohort B schools agreed that the principal has been an effective leader of the 1:1 initiative. In open-ended survey items, respondents were asked to share examples that supported their ratings:

- Demonstrated advocacy for the 1:1 program
  - “Strong advocate for use; schedules professional development in connection with laptop usage.”
  - “She has provided numerous laptop distributions in an effort to meet the needs of the parents.”
  - “Outstanding planning of laptop distribution.”
• Modeled the effective use of technology
  o “Has encouraged us to use the laptop even in communicating between teachers.”
  o “She has actively participated in the training and the early implementation of the
    laptops.”
• Supported teacher professional development associated with the 1:1 program
  o “Provided relevant staff development for technology enriched lessons.”
  o “He has provided training opportunities for teachers as an encouragement to us.”
  o “He has provided many learning and development opportunities.”
• Provided psychosocial support for both teachers and students
  o “He visits classrooms to see how our new laptops are being used.”
  o “He is always very encouraging and has provided some time for us to explore the use
    of the laptops.”
  o “He is knowledgeable, a good listener, supportive, encouraging, and dependable.”
  o “Understands what the teachers are trying to do and is very supportive.”
• Demonstrated a clear vision for the 1:1 program
  o “Expectations were established for all staff to use the laptops.”
  o “She has been supportive of teacher concerns. She has also been clear in her
    expectations.”

77.1% of teachers at the 1:1 EC Cohort B agreed that the TF has been an effective leader of the 1:1
initiative.
• Provided appropriate resources
  o “We are NEVER without the technology needed to execute our mission.”
  o “She has helped me find web sites to use with my students.”
  o “She checks with me about concerns, needed updates, getting things for laptops, printers
    to use.”
  o “He often finds resources that are beneficial to other teachers to facilitate instruction.”
• Shared insight and knowledge
  o “Very helpful and knowledgeable, if she didn't know the answer to your question she
    would find out.”
  o “Very knowledgeable and provides assistance, demonstrations, etc.”
• Provided instructional support
  o “He offers assistance and support on a regular basis with all technology issues.”
  o “Has offered to assist in the classroom with lessons.”
  o “They showed us what to do and how.”
  o “She has been very willing to go to classrooms and help teachers implement ideas.”
  o “Worked with students during classroom instruction.”
• Available/accessible
  o “Always there when you need help.”
  o “She provides support and assistance at any time.”
  o “Endless patience! Wonderful working with teachers and students alike!”
  o “You have a problem? NO PROBLEM. He has the cure. 24/7...cheerful response to
    endless requests.”
• Helped troubleshoot
  o “Is very helpful in troubleshooting”
  o “The technology facilitator team has been instrumental in problem solving when
    necessary.”
Professional Development
During the spring semester of the 2008-2009 school year, teachers reported receiving professional
development from several sources to support the laptop initiative. This professional development ranged
from very general and not necessarily targeted toward 1:1 computing efforts to very specific and
completely targeted toward 1:1 computing efforts.

Local Professional Development
Both Cohort A and Cohort B 1:1 computing schools provided professional development on their own
campuses or in their districts between late fall 2008 and the end of the spring 2009 semester (for a
complete list see Appendix D). Teachers at the seven 1:1 EC in Cohort A were offered a total of 116
hours, teachers at the 1:1 traditional high school in Cohort A were offered 106 hours, and teachers at the
1:1 traditional high school in Cohort B were offered at least 173 hours. The professional development
opportunities included workshops on a variety of topics, such as DyKnow and SchoolVue monitoring
software, SecondLife, Google tools, SmartBoard, NCWise, and Movie Maker. The majority of the
professional development opportunities were facilitated by the school or district technology facilitator,
but other facilitators included teachers, New School Project coaches, textbook consultants, principals, and
guidance counselors.

Data from the teacher focus groups revealed that teachers preferred one-on-one support from each other
and their technology facilitator on an “as needed” basis. Teachers indicated that both face-to-face and
online were suitable methods for meeting their professional development needs. Some teachers expressed
concerns that local professional development opportunities are not always announced in a timely manner,
and several teachers commented some of the content is inappropriate for some teachers’ proficiency
levels or that it is irrelevant for their needs. One teacher suggested that a current teacher demonstrating a
lesson plan is most effective:

[Teacher] We’ve got a broad range of people, and you can’t cast a broad net with these
applications…. But even more specifically, I want a classroom teacher to show me best practices.
I don’t want somebody who’s not a teacher but was a teacher. And that’s sort of a fine line,
because…there’s this idea that once you were a teacher you can speak to teachers and that you
have street credibility, but that’s not the case because you can go into a demonstration and go into
professional development or workshop or conferences or the private sector or nonprofit,
and…there’s some perception gap that just happens almost immediately. The best professional
development we have gotten has been when you have an actual classroom teacher who said,
“Here’s how I use this in my classroom.”

One administrator commented that their school offers professional development in small-group settings
within teachers’ planning periods. This school has an instructor come to the school to assist teachers with
their lesson plans. Teachers appreciated professional development courses which take place during
planning periods, instead of after school, on weekends, or during the school day which interferes with
classes. Another administrator recognized that teachers receiving professional development during the
day meant that they would be out of the classroom all day and depending on substitute teachers
throughout the day. To deal with such issues, the school now offers short workshops after school for
teachers to learn more about specific technologies.

Interviews with the TFs at the 1:1 schools revealed a different perspective on local professional
development. Five technology facilitators found that based on teacher feedback, the most successful
professional development opportunities were ones which focused on how to directly incorporate the
material from the session into the classroom. One technology facilitator commented that informal learning
opportunities may have been the most effective,
[TF] The most successful moments have been the informal meetings that don't make this list. The-right-when-it-is-needed kind of training that may occur informally during or between classes when issues or questions arise.

[TF] introducing just technology without an example of application and without teachers creating a lesson ready to use when leaving the professional development was the least successful.

One TF mentioned that two teachers from his school attended training on copyright issues and trained other teachers after their return. He also pointed out that this train-the-trainer model has also been used at his school to share information on specific software, as well as, on how to integrate technology into specific subjects.

Also, students have been, and continue to be, trained on other areas pertinent to their use of computers and technology. During orientation, they receive training on copyright issues and continue receiving training on this topic throughout the year.

**Friday Institute Online Workshops**
The 1:1 Learning Collaborative offered three online workshops that teachers could take over six weeks during the spring 2009 semester, including sessions on Leading Schools in a Web 2.0 World \((n=4)\), Using Real data in the Math Classroom \((n=10)\), and Web 2.0 Tools \((n=11)\). Online workshops offered through the 1:1 Collaborative were well received by all participants. Greater than 95 percent of participants in the three workshops felt that the workshop met or exceeded their expectations and also felt that their facilitator was effective.

Online workshop participants commented that the most beneficial aspect to participation was learning about new tools and how to implement them into their schools, new resources, and discussing technology topics with peers.

_I learned more than just these valuable tools. I learned how I can use the same format to share these tools with teachers. Staff development is challenging because of the limits of time during and after the school day. Taking this course online asynchronously was wonderful--no time in the car traveling to a class and much less stress as I could use nights and weekends to complete the work._

_Connections made with folks in other districts; opportunity to use some of the tools I'd only read about!_

Participants were complimentary of facilitator qualities such as providing constructive feedback, modeling how to use technology, and course involvement:

_The teacher really helped me with things I found difficult. He also was very instrumental in helping me adapt the lessons to my unique situation._

_Our instructor was involved in every session and not just watching from afar..._

**(Summary)** Evaluation Question 1: How have school infrastructures and support systems evolved to meet staff and students’ 21st century needs?

**Infrastructure Summary**
Staff and students at the 1:1 schools were pleased with progress of the infrastructure at their schools. The 1:1 pilot schools have wireless Internet access in 98.2% of their classrooms, projectors in 83.8% of their classrooms, printer access for more than 57.9% of their classrooms, and interactive whiteboards in 24.8% of their classrooms.

NC 1:1 Learning Technology Initiative Evaluation Study: Year 2
• **Laptop Repairs.** Approximately 25% of the student laptops required some repair. Slightly more than 15% of the laptops had to have the hard drives reimaged during the school year due to viruses, software updates, and to remove inappropriate applications or files downloaded by students. Theft and loss of laptops was not to a substantial issue.

• **Tablets vs. Laptops.** Tablets were highly regarded by the schools that had them and found repair issues to be minimal. These school staff and students cited numerous benefits to having a tablet.

• **Software Tools Used During School.** The primary applications teachers reported using included MS Office software, the Internet to support lessons with both static content as well as interactive online games and simulations, software that interfaced with classroom hardware such as Smartboards, assessment and study skills software, learning management systems, and classroom monitoring applications. Students reported use of the widest range of general applications suitable for use in any subject area, including: MS Office and presentation tools; Internet browsers and search tools to aid in research; editing tools for video, audio, and Web pages; note taking applications; learning management systems; email; and various utilities such as calendars.

• **Monitoring.** Some administrators and teachers still have concerns over monitoring student computer use, especially around use of the Internet. One special category of software used by most schools to address monitoring concerns is monitoring software. Classroom management systems being used by 1:1 schools include Crosstek SchoolView, Apple Remote Desktop, DyKnow, NetOp, EduPlatform, and OneNote. A number of technical issues regarding monitoring software were noted, including: the programs were not easy to use without training and the monitoring software syncing correctly with the right students. Some teachers praised a few of the systems for including a course management tool that allowed them to build lessons that students would be locked into during a class, so monitoring was not necessary.

**Support Personnel Summary**
Most 1:1 staff and students (more than 80%) agreed that the technical and instructional support personnel at their school provided adequate assistance for successful use of their laptop for teaching and learning.

• **Technicians.** Major responsibilities of the technician include responding to teacher/student requests related to software, hardware, and network problems; installing new technology resources; acting as liaison with district technical staff; coordinating warranty and other technical information with hardware and software companies; and providing input on school technology purchases.

• **Student Tech Teams.** Tech teams perform tasks such as helping teachers set up equipment before class, troubleshooting equipment in their classroom, publishing announcements on the school’s website, imaging laptops, and developing policies for the appropriate use of the laptops.

• **Technology Facilitator.** Teachers and administrators identified the Technology Facilitators (TF) as the critical component of their 1:1 project. The schools in this study utilized two different models for the TF where schools either hired a full-time instructional technology support staff or identified four lead teachers across the content areas to collectively act as the school TF. In both models, TFs have a variety of responsibilities to support the teachers and students in their schools. The TFs reported that their daily activities included conducting professional development, troubleshooting equipment and software issues, modeling technology use, and co-teaching. They also reported maintaining open communication with district technology staff as part of their regular routine.

**Policy/Procedures Summary**
All schools in the 1:1 pilot enacted effective policies and procedures governing how the laptops were to be used.

• **Discipline/Misuse.** More than 95% of teachers and students from all participating 1:1 schools indicated that their students have been instructed on what will happen if they misuse their laptops.
There is a variety of consequences at the 1:1 schools for an infraction of the rules outlined in laptop policies. Consequences for breaking rules include staying after school, turning in extra assignments, or letters sent home to parents. As a punishment for violating laptop use rules, some administrators and teachers take away laptops from students. The duration of the takeaway may be a single class period, a day, a week, or in severe circumstances, a semester. However, some staff expressed concern that this type of punishment was equivalent to removing a student’s writing tool. Many schools have gotten input from students on revisions to their laptop policies related to defining appropriate use and identifying reasonable consequences for breaking rules. Of particular interest to stakeholders was whether students and staff at the 1:1 schools observed higher instances of cheating or cyberbullying because of participation in the project. Most teachers and students were in agreement that the presence of the laptops did not increase instances of cheating at their schools. Similarly, school staff and students reported no real increase in instances of cyberbullying or bullying of any kind with the introduction of the laptops.

- Blocked Sites. Focus group data and open-ended survey responses indicated that teachers, administrators, and students agreed that filtering/blocking of websites has been one of their major day-to-day challenges to successful use of the laptops for teaching and learning. This issue seems to be of critical concern, as it is hindering the pedagogical use of the technology. Schools and LEAs need to find a filtering solution that is flexible enough to allow teachers and students to access important Internet resources.

**Leadership Summary**

- **1:1 Cohort A Schools.** Surveys collected data from 1:1 Cohort A teachers to examine whether principals in those 1:1 schools were demonstrating specific leadership characteristics identified in the 1:1 leadership framework including advocacy, evaluation, modeling, support for professional development, psychosocial support, shared-decision making, vision, and support for infrastructure and resources. For almost all leadership survey items, significantly more teachers in the 1:1 cohort A EC high schools agreed that their principals were providing effective leadership for the 1:1 initiative (around 80-100% for most items) when compared to the teachers’ perceptions of leadership of the principal at the 1:1 cohort A Traditional high school. Since the quality of the school-level leader has been identified as one of the most important indicators in success of a 1:1 project, these results help to explain some of the differences found in the impact on teacher and student outcomes in this cohort.

- **1:1 Cohort B Schools.** Survey items for schools in cohort B, which just started their laptop project, focused on who at the schools were providing effective leadership for their new 1:1 initiative. Teachers agreed that the district superintendent, school-level principal/assistant principal, and TF had been effective leaders of the 1:1 initiative at their school.

**Professional Development Summary**

During the spring semester of the 2008-2009 school year, teachers reported receiving professional development from several sources to support the laptop initiative. This professional development ranged from very general and not necessarily targeted toward 1:1 computing efforts to very specific and completely targeted toward 1:1 computing efforts. Data from the teacher focus groups revealed that teachers preferred one-on-one support from each other and their technology facilitator on an “as needed” basis. The most successful professional development opportunities were ones that focused on how to directly incorporate the material from the session into the classroom.
Evaluation Question 2: How have teacher and student technology attitudes and skills changed over time?

Technology Attitudes and Skills

The 1:1 online survey was the primary data source used to investigate changes in staff and students' attitudes and skills related to the use of technology for teaching and learning. Some items on the survey asked staff and students to indicate their level of agreement about the impact of their use of technology. Other items asked respondents to indicate their comfort level (I do not know if I have done this - I have never done this - I can do this with some help - I can do this by myself - I can show someone how to do this) with basic and advanced education technology skills.

Teacher Attitudes/Beliefs about Technology

*Item Analysis - Spring 2009*

Results from individual item analysis (See Appendix A, Figures A11-A14) reveal that most teachers in the study agree that the use of the laptops benefits their teaching, allows them to access up-to-date information and diverse resources, helps create instructional opportunities to better meet the NC Standard Course of Study, and explore topics more in depth. Teachers indicate that students are more actively involved in their own learning when using the laptops and that use of the laptops facilitates communication between students and their teachers. Teachers continue to be concerned that students’ limited keyboarding skills and lack of computer skills prevented them from fully implementing the laptops.

*Item Analysis - Across Time*

Individual item differences for teacher attitudes and beliefs have been reported for 1:1 and comparison groups in the two previous evaluation reports. In as much, this section of the report focuses on reporting changes and trends across time for the three available time points for participating 1:1 Cohort A teachers. Additionally, responses for 1:1 Trad Cohort B students are included for reference.

Figures 18 and 19 show a stable pattern across time where generally more 1:1 teachers agreed that use of the laptops is beneficial to their teaching, helps them access more up-to-date information and diverse teaching materials and resources. Over time, 1:1 teachers seem to have become more accustomed to the classroom management and workload required to be successful in a 1:1 classroom. There also appears to be a general increase in expectations for students’ work.

*Figure 18.* Percent of 1:1 EC Cohort A (Spr 08; n = 73), 1:1 EC Cohort A (Fall 08; n = 57), and 1:1 EC Cohort A (Spr 09; n = 57) teachers indicating agreement with various statements about their attitudes and beliefs regarding Teaching & Laptops.
Figure 19. Percent of 1:1 Trad Cohort A (Spr 08; n = 46), 1:1 Trad Cohort A (Fall 08; n = 58), 1:1 Trad Cohort A (Spr 09; n = 99), and 1:1 Trad Cohort B (Spr 09; n = 235) high school teachers indicating agreement with various statements about their attitudes and beliefs regarding Teaching & Laptops.

Figures 20 shows a stable pattern across time where generally more 1:1 EC teachers agree that use of the laptops enables students to better meet learning objectives, facilitates active student involvement in their own learning, increases communication with students, and increases student productivity and efficiency.

Figure 20. Percent of 1:1 EC Cohort A (Spr 08; n = 73), 1:1 EC Cohort A (Fall 08; n = 57), and 1:1 EC Cohort A (Spr 09; n = 57) teachers indicating agreement with various statements about their attitudes and beliefs regarding Learning & Laptops.

Figures 21 shows a stable pattern across time where most 1:1 traditional teachers agreed that use of the laptops facilitates active student involvement in their own learning. 1:1 Trad Cohort B teachers reported more positive attitudes and beliefs about the laptop initiative facilitating increased communication with students, and increased student productivity and efficiency that the 1:1 Trad Cohort A teachers.

NC 1:1 Learning Technology Initiative Evaluation Study: Year 2
Figure 21. Percent of 1:1 Trad Cohort A (Spr 08; \( n = 46 \)), 1:1 Trad Cohort A (Fall 08; \( n = 58 \)), 1:1 Trad Cohort A (Spr 09; \( n = 99 \)), and 1:1 Trad Cohort B (Spr 09; \( n = 235 \)) high school teachers indicating agreement with various statements about their attitudes and beliefs regarding Learning & Laptops.

Composite Scores – Spring 2009

Individual item differences for teacher attitudes and beliefs have been reported for 1:1 and comparison teachers in the two previous evaluation reports. In as much, researchers focused on reporting composite scores and predictions about how type of school, implementation stage and teacher technology proficiency might have an influence on overall attitudes and beliefs about teacher attitudes and beliefs about technology.

To form a composite score for teacher attitudes and beliefs towards technology, an exploratory factor analysis found the items on the survey represented one overall factor. This composite score was used in subsequent analyses to determine the factors or demographic items that predicted their attitude and beliefs, as well as determining if there were changes across time (fall 08 to spring 09) or differences among ethnicity.

Comparison and 1:1 teachers differed significantly on attitudes and beliefs. Generally, the teachers in the 1:1 schools were more realistic in their assessment of the benefits of technology in the classroom, as reflected in the composite score comparisons. Traditional and early college high school teachers significantly differed in Attitude and Beliefs, with early college teachers having a higher mean. Comparison and 1:1 also differed significantly on attitudes and beliefs (see Figures 22-23).
Figure 22. Mean composite attitude and belief score of 1:1 Cohort A spring 2009 ($n = 54$), non-1:1 Cohort A spring 2009 ($n = 35$) EC teachers.

Note. *Significant differences in group means ($p < .05$)

The researchers used membership at an EC or traditional high school, Implementation Stage (Cohort A or Cohort B), and self assessed technology skill level to predict teacher attitude and beliefs about technology. This enabled the researchers to know which things best improved teacher attitudes and

Figure 23. Mean composite attitude and belief score of 1:1 Cohort A spring 2009 ($n = 101$), non-1:1 Cohort A spring 2009 ($n = 58$), and 1:1 Cohort B spring 2009 ($n = 235$) traditional high school teachers.

Note. *Significant differences in group means ($p < .05$)
beliefs. Membership at an early college or traditional high school, implementation stage, and self-assessed technology skill level significantly predicted attitudes and beliefs. On average, teachers at traditional school had lower mean composite scores than EC teachers. Cohort A teachers had lower composite scores than Cohort B teachers.

As expected, teachers with higher self-assessed skill level had higher attitudes and beliefs toward technology in most Cohorts. Although this was not true for 1:1 EC Cohort A, in which intermediate self assessed skill level had higher attitudes and beliefs than the self assessed experts. (see Figures 24-25). 1:1 Trad Cohort A teachers self-assessed themselves as beginner (n = 2), intermediate (n = 50), advanced (n=35), expert (n =14) technology users. Non-1:1 Trad Cohort A teachers rated themselves as beginner (n = 2), intermediate (n = 25), advanced (n=24), expert (n =7) technology users. 1:1 Trad Cohort B teachers self-assessed themselves as novice (n = 1), beginner (n = 18), intermediate (n = 118), advanced (n=57), expert (n =41) technology users. Novice attitudes and beliefs were much lower in 1:1 Trad Cohort A where leadership was a major concern. These novice teachers need to be better supported in order have more positive attitudes about the 1:1 initiative, as was found in 1:1 Trad Cohort B schools.

1:1 EC teachers self-assessed themselves as beginner (n = 1), intermediate (n = 17), advanced (n=29), expert (n =7) technology users. Non-1:1 early college high school teachers rated themselves as beginner (n = 2), intermediate (n = 13), advanced (n=13), expert (n =7) technology users.

Figure 24. Mean composite attitude and belief score of 1:1 Cohort A spring 2009 (n = 54) and non-1:1 Cohort A spring 2009 (n = 35) EC teachers disaggregated by self-assessed computer skill level.
Figure 25. Mean composite attitude and belief score of 1:1 Cohort A spring 2009 (n = 101), non-1:1 Cohort A spring 2009 (n = 58), and 1:1 Trad Cohort B spring 2009 (n = 235) traditional high school teachers disaggregated by self-assessed computer skill level.

Composite Scores Across Time
Statistical analyses found teacher Attitude and Beliefs mean composite score to be statistically different across time for fall 2008 and spring 2009. Attitudes and Beliefs increased over time for all Cohorts. Figures 26-27 provide a pictorial representation of how the scores have changed for each Cohort.

Figure 26. Mean attitude and belief composite score of 1:1 Cohort A spring 2009 (n = 55), fall 2008 (n = 42), non-1:1 Cohort A spring 2009 (n = 32) and fall 2008 (n = 42) EC teachers across time.
**Figure 27.** Mean attitude and belief composite scores of 1:1 Cohort A spring 2009 \( (n = 96) \) and fall 2008 \( (n = 55) \) and non-1:1 Cohort A spring 2009 \( (n = 60) \) and fall 2008 \( (n = 68) \) traditional high school teachers disaggregated by self-assessed computer skill level.

---

**Student Attitudes/Beliefs about Technology**  
*Item Analysis – Spring 2009*

Individual item differences for student attitudes and beliefs have been reported for 1:1 and comparison groups in the two previous evaluation reports (see Appendix A for current survey item results). In as much, this section of the report focuses on reporting changes and trends across time for the three available time points for participating 1:1 Cohort A students. Additionally, responses for 1:1 Trad Cohort B students are included for reference.

*Item Analysis - Across Time*

Figures 28-30 show a stable pattern across time where generally more students agree that use of the laptops in school helps them to stay more organized, revise/edit their work, do more work, and get a good job. Fewer students agree the laptops help them be more involved in school, interact with their teachers more, or better understand their schoolwork. A higher percentage of EC students tend to agree with the statements than their traditional high school peers.
Figure 28. Percent of 1:1 EC (spring 2008; n = 771), 1:1 EC (fall 2008; n = 893), and 1:1 EC (spring 2009; n = 876) students indicating agreement with various statements regarding their attitudes and beliefs about technology.

Figure 29. Percent of 1:1 Trad Cohort A (spring 2008; n = 544), 1:1 Trad Cohort A (fall 2008; n = 903), 1:1 Trad Cohort A (spring 2009; n = 931), and 1:1 Trad Cohort B (spring 2009; n = 2731) high school students indicating agreement with various statements regarding their attitudes and beliefs about technology.
Figure 30. Percent of 1:1 EC (spring 2008; \(n = 771\)), 1:1 EC (fall 2008; \(n = 893\)), and 1:1 EC (spring 2009; \(n = 876\)), and 1:1 Trad Cohort B spring 2009 (\(n = 2731\)) students indicating agreement with various statements regarding their attitudes and beliefs about technology.

### Teacher Technology Knowledge/Skills

**Item Analysis – Spring 2009**

Results from individual item analysis (See Appendix A, Figures A23-A26) reveals that almost all 1:1 teachers are still most comfortable formatting text documents, creating multimedia presentations, creating and graphs and charts, using spreadsheets, and importing still images. More than 50% of 1:1 teachers indicate that they independently do or teach others, create and update a blog, contribute to a collaborative wiki, create a webpage, and participate in professional online networking.

**Item Analysis – Across Time**

This section of the report focuses on reporting changes and trends across time for the three available time points for participating 1:1 Cohort A teachers. Additionally, responses for 1:1 Trad Cohort B students are included for reference.

Figures 31-34 show a stable pattern across time where generally more 1:1 teachers reported increased confidence in their technology skills since the 1:1 project began. Teachers at both the EC and traditional...
high schools tend to be most comfortable with creating graphs and charts and multimedia presentations, and creating blogs. Teachers across groups and across time are least confident in their abilities to create and update a database, import and edit digital videos, and create a podcast.

*Figure 31.* Percent of 1:1 EC Cohort A (spring 08; \(n = 73\)), 1:1 EC Cohort A (fall 08; \(n = 57\)), and 1:1 EC Cohort A (spring 09; \(n = 57\)) teachers reporting the ability to independently do or teach others various technology skills.

*Figure 32.* Percent of 1:1 Trad Cohort A (spring 08; \(n = 46\)), 1:1 Trad Cohort A (fall 08; \(n = 58\)), 1:1 Trad Cohort A (spring 09; \(n = 99\)), and 1:1 Trad Cohort B (spring 09; \(n = 235\)) high school teachers reporting the ability to independently do or teach others various technology skills.
Composite Scores – Spring 2009

To form a composite score for teacher technology skills, an exploratory factor analysis found the items on the survey represented two overall factors. Teachers at 1:1 schools differed significantly in their advanced technology skills from teachers at comparison schools ($p < .001$), but not in basic skills. Early college and traditional high school teachers did not differ in their basic skills or advanced skills. See Figures 35-36 for graphs displaying the means in basic technology skills and advanced technology skills for each group of schools.
Figure 35. Mean composite attitude and belief score of 1:1 Cohort A spring 2009 \((n = 56)\), non-1:1 Cohort A spring 2009 \((n = 33)\) EC teachers.

Note. *Significant differences in group means \((p < .05)\)

Figure 36. Mean technology skill scores of 1:1 Cohort A spring 2009 \((n = 96)\), non-1:1 Cohort A spring 2009 \((n = 59)\), and 1:1 Cohort B spring 2009 \((n = 233)\) traditional high school teachers.

Note. *Significant differences in group means \((p < .05)\)
Student Technology Knowledge/Skills
Item Analysis – Across Time
Students were asked to indicate their overall skill level in the use of a laptop or computer. Figures 37-38 show a significant increasing trend in students’ perception of their overall skill level when compared to a year ago.

*Note. *Significant differences in group means (p < .05)

Figure 37. Percent of 1:1 Cohort A spring 2008 (n = 777) and 1:1 Cohort A spring 2009 (n = 902) EC students indicating either advanced or expert overall skill level in the use of a laptop or computer.

Individual item differences for student attitudes and beliefs have been reported for 1:1 and comparison groups in the two previous evaluation reports and all item-level graphs are included in Appendix A for current survey results. In as much, for this section of the report focuses on reporting changes and trends across time for the three available time points for participating 1:1 Cohort A students.
Figures 39-42 show a stable pattern across time where generally students are reporting increased confidence in their technology skills since the 1:1 project began. Students at both the EC and traditional high schools tend to be most comfortable with creating graphs and charts, multimedia presentations, and blogs. Students across groups and across time are least confident in their abilities to create a webpage and import and edit digital videos. These findings parallel the results from the teacher surveys.

*Figure 39.* Percent of 1:1 EC (spring 2008; *n* = 752), 1:1 EC (fall 2008; *n* = 870), and 1:1 EC (spring 2009; *n* = 850) students reporting the ability to independently do or teach others various technology skills.

*Figure 40.* Percent of 1:1 Trad Cohort A (spring 2008; *n* = 521), 1:1 Trad Cohort A (fall 2008; *n* = 836), 1:1 Trad Cohort A (spring 2009; *n* = 873), and 1:1 Trad Cohort B (spring 2009; *n* = 2731) high school students reporting the ability to independently do or teach others various technology skills.
Figure 41. Percent of 1:1 EC (spring 2008; \(n = 752\)), 1:1 EC (fall 2008; \(n = 870\)), and 1:1 EC (spring 2009; \(n = 850\)) students reporting the ability to independently do or teach others various technology skills.

Figure 42. Percent of 1:1 Trad Cohort A (spring 2008; \(n = 521\)), 1:1 Trad Cohort A (fall 2008; \(n = 836\)), 1:1 Trad Cohort A (spring 2009; \(n = 873\)), and 1:1 Trad Cohort B (spring 2009; \(n = 2731\)) high school students reporting the ability to independently do or teach others various technology skills.

(Summary) Evaluation Question 2: How have teacher and student technology attitudes and skills changed over time?

Attitudes and Beliefs Summary

Teacher Attitudes and Beliefs about Technology

Most teachers in the study agree their teaching benefits from use of the laptops, allows them to access up-to-date information and diverse resources, helps create instructional opportunities to better meet the NC Standard Course of Study, and explore topics more in depth. Teachers indicated that students are more actively involved in their own learning when they use the laptops and that use of the laptops facilitates
communication between students and their teachers. Over time, 1:1 teachers seem to have become more accustomed to the classroom management and the workload required to be successful in a 1:1 classroom. There also appears to be a general increase in expectations for students’ work.

Analysis of composite scores for attitudes and beliefs revealed that teachers with higher self-assessed skill level had higher attitudes and beliefs toward technology in most cohorts. Novice attitudes and beliefs were much lower in 1:1 Trad Cohort A where leadership was a major concern. These novice teachers need to be better supported in order to have more positive attitudes about the 1:1 initiative, as was found in 1:1 Trad Cohort B schools. Statistical analyses found teacher Attitude and Beliefs mean composite scores to be statistically different across time for fall 2008 and spring 2009 where Attitudes and Beliefs increased over time for all cohorts.

**Student Attitudes and Beliefs about Technology**
A stable pattern across time for student survey responses emerged where generally more students agree that use of the laptops in school helps them to stay more organized, revise/edit their work, do more work, and get a good job. Fewer students agree the laptops help them be more involved in school, interact with their teachers more, or better understand their schoolwork.

**Technology Knowledge/Skills Summary**

**Teacher Technology Knowledge Skills**
Survey data revealed that generally 1:1 teachers reported increased confidence in their technology skills since the 1:1 project began. Although most 1:1 teachers are still most comfortable formatting text documents, creating multimedia presentations, creating and graphs and charts, using spreadsheets, and importing still images. More than 50% of 1:1 teachers indicate that they independently do or teach others, create and update a blog, contribute to a collaborative wiki, create a webpage, and participate in professional online networking. Analysis of composite scores showed that teachers at 1:1 schools differed significantly in their advanced technology skills from teachers at comparison schools, but not in basic skills.

**Student Technology Knowledge Skills**
Analysis of survey data showed a significant increasing trend in students’ perception of their overall technology skill level when compared to a year ago. Additionally, analysis of student responses to the 1:1 survey over time revealed a stable pattern across time where generally students are reporting increased confidence in specific technology skills since the 1:1 project began. Students at both the EC and traditional high schools tend to be most comfortable with creating graphs and charts, multimedia presentations, and blogs. Students across groups and across time are least confident in their abilities to create a webpage and import and edit digital videos. These findings parallel the results from the teacher surveys.
Evaluation Question 3: How have teachers’ instructional practices changed over time?
A variety of data sources were analyzed to determine how technology was being used for teaching and learning. One section in the 1:1 online survey for school staff addressed important components of technology use by teachers related to the use of laptops/technology for planning and instruction; and technology use by students related to the use of laptops/technology for learning. Respondents were asked to indicate the frequency of use (daily – weekly – monthly – never – once per semester – I don’t know) for each item. LoFTI, a classroom observation protocol was utilized during site visits to collect data on whether certain technology hardware and software were in use by teachers and/or students. TFs identified and shared exemplary lesson plans from teachers in their schools. Finally, discussions during staff and student focus groups addressed changes in technology use in the classroom.

Technology Use for Teaching and Learning

Teacher Technology Use
Item Analysis – Spring 2009
Teachers were asked to report the frequency with which they participated in various classroom management or planning activities such as planning instructional materials, grading student work, and communicating with parents (see Appendix A, Tables A19-A20). Overall, a greater percentage of teachers in 1:1 early colleges and traditional schools reported developing instructional materials and homework assignments daily compared to teachers in non-1:1 early colleges and traditional schools. It is logical that teachers in 1:1 environments might find it easier to diversify and create new classroom materials and homework when every student has a laptop and can receive and work with electronic content efficiently.

On other management/planning tasks, the results were mixed. In 1:1 early colleges, a greater percentage of teachers reported participating in all but one management task compared to teachers in non-1:1 early colleges. In 1:1 traditional schools, however, a smaller percentage of teachers reported grading student work, managing student information, communicating with parents and students electronically, and collecting formative assessment data from students, compared to teachers in non-1:1 traditional schools. These results were unexpected and might suggest particularly strong teachers in traditional schools were selected for comparison, or a sluggish transition by teachers in 1:1 traditional schools to 1:1 computing compared to teachers in 1:1 early colleges. With more students to grade and more parents to communicate with, it would not be surprising if teachers in 1:1 traditional schools appropriated their laptops for management/planning tasks at a slower rate compared to teachers in 1:1 early colleges with fewer students.

Teachers were also asked to report the frequency with which they employed various technology-supported instructional activities in their classrooms such as presenting content, visiting virtual museums, and utilizing online labs (see Appendix A, Tables A21-A22). Overall, teachers in both 1:1 early colleges and 1:1 traditional schools reported more frequent use of most of the technology-supported instructional activities listed, compared to teachers in non-1:1 schools. The instructional activities with the most use in 1:1 schools included: presenting curriculum content, providing directions for activities, utilizing online textbooks, maintaining web sites, and using media for presentations.

Item Analysis - Across Time
Individual item differences for teacher attitudes and beliefs have been reported for 1:1 and comparison groups in the two previous evaluation reports. In as much, this section of the report focuses on reporting changes and trends across time for the three available time points for participating 1:1 Cohort A teachers. Additionally, responses for 1:1 Trad Cohort B students are included for reference.

Figures 43-44 show a stable pattern across time where participating 1:1 teachers reported using the laptops more frequently compared to the fall semester but less frequently than when the project first
started for planning activities. EC and traditional 1:1 teachers reported a use the laptops most often on a
daily basis for planning activities such as creating instructional materials and managing information.
There seems to be a drop in daily communication with parents over time.

Figure 43. Percent of 1:1 EC Cohort A (Spr 08; \( n = 73 \)), 1:1 EC Cohort A (Fall 08; \( n = 57 \)), and 1:1 EC
Cohort A (Spr 09; \( n = 57 \)) teachers indicating daily use of various planning activities.

Figure 44. Percent of 1:1 Trad Cohort A (Spr 08; \( n = 46 \)), 1:1 Trad Cohort A (Fall 08; \( n = 58 \)), 1:1 Trad
Cohort A (Spr 09; \( n = 99 \)), and 1:1 Trad Cohort B (Spr 09; \( n = 235 \)) high school teachers indicating daily
use of various planning activities.

Figures 45-46 show a stable pattern across time where participating 1:1 teachers reported using the
laptops more frequently compared to earlier semesters for instructional activities. EC and traditional 1:1
teachers reported a use the laptops most often on a daily basis for presenting content, providing directions,
and accessing online textbook resources. Teachers are often not giving online quizzes, taking virtual field trips, or participating in labs on a daily basis.

*Figure 45.* Percent of 1:1 EC Cohort A (Spr 08; \( n = 73 \)), 1:1 EC Cohort A (Fall 08; \( n = 57 \)), and 1:1 EC Cohort A (Spr 09; \( n = 57 \)) teachers indicating daily use of various instructional activities.

*Figure 46.* Percent of 1:1 Trad Cohort A (Spr 08; \( n = 46 \)), 1:1 Trad Cohort A (Fall 08; \( n = 58 \)), 1:1 Trad Cohort A (Spr 09; \( n = 99 \)), and 1:1 Trad Cohort B (Spr 09; \( n = 235 \)) high school teachers indicating daily use of various instructional activities.

**Observing Teacher Technology Use**
Visits to the schools supported these self-reported survey results. Use of productivity software (e.g., database, presentation, spreadsheet, word processing) for teaching and learning was observed in 10 out of 11 of the participating 1:1 schools. Other popular uses of software include hardware-embedded (e.g.
digital whiteboard, GPS/GIS, digital interactive response system), web browser (e.g., MS Internet Explorer, Netscape, Firefox), administrative (e.g., grading, record-keeping), and assessment/testing. Researchers also observed the use of web applications including wikis, libraries/e-publications, and course management software.

Additionally, site visits to schools allowed for observing how teachers were using their laptops during class. The most frequently observed teacher activities with laptops in the 1:1 schools included: advanced organizers, facilitation, and questioning. Teachers were least frequently observed using laptops for differentiated instruction, setting objectives, and summarizing. Figure 47-48 provide a summary of observations for the last three site visits to the participating 1:1 schools.

Figure 47. Percent of 1:1 high school courses observed in which teachers were performing various activities using technology in spring 2008 (n = 46), fall 2008 (n = 41), and spring 2009 (n = 41) for cohort A school and spring 2009 (n = 17) for cohort B schools.
Changing Lesson Plans

During focus groups, teachers were asked how the laptop initiative changed the lesson plans they developed. Teachers report having more organized lesson plans since the laptop initiative began. They enjoy not having to keep up with so many essays, homework assignments, and in-class worksheets. Teachers also enjoy how much paper is saved when students can simply visit a link to discover a learning resource. The resources teachers most commonly used have changed as well. Teachers were excited about using United Streaming, EduPlatform, TeacherTube.com, iCal, and Google Earth. Creating a link to lesson plans on their teacher web sites was also found to be beneficial for absent students. One teacher also likes that his students’ parents can view his lesson plans and therefore feel more tuned in to what their student is accomplishing during the day. There was a mix of responses that indicated lesson plans are enhanced and improved by the laptop initiative. Some examples of comments heard from teachers:

[Teacher] I have a lot of fun now redoing my lesson plans on the weekends, I just love it, because the web is right there at my fingertips to pull in examples that I need, that before I just talked about, or you say “open up the textbooks,” and now it’s just, you can pull it all together in one presentation.

[Teacher] My lessons are more organic. It’s sort of like ivy, you start it off, and you use the laptop, and all of a sudden, you’ve got these tendrils going out in other areas where students say, ‘I’m reading about Pearl Harbor, and is that ship still sunk there?’ And we can go off in that unexpected direction.
[Teacher] It exposes them to the world, I mean, I’m just telling you, more than I can ever tell them or teach them in my lifetime, they can learn, that’s why I like it.

[Teacher] I think it has, in terms of giving me more ability to differentiate, you know, using things with SAS, being able to put them on where they can check their math work, step-by-step, where I don’t necessarily have to be there checking their steps, where I can be more focused on the students who really need my attention, I think just with that, the differentiation, for me, it has definitely helped me in that area, therefore all of our students are reaching the level that they need to be at.

Exemplary Lessons
TFs identified and shared exemplary lesson plans from teachers in their schools. One goal of the 1:1 project is to increase students’ 21st century skills, including life and career skills, learning and innovation skills, technology literacy, information literacy, civic literacy, global knowledge, and group collaboration. In their review of seven exemplary lesson plans, evaluators noted whether or not each one addressed these seven skills. All reviewed lesson plans touched on multiple skills, and all skills were addressed by at least one lesson. Three of the skills were addressed by every lesson plan. Table 10 shows the results of this review.

Table 10. Number of reviewed lesson plans addressing 21st Century Skills

<table>
<thead>
<tr>
<th>21st Century Career Skill</th>
<th>Number of lesson plans addressing skill (n=7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life and Career Skills (e.g., self-direction, social skills, responsibility)</td>
<td>7</td>
</tr>
<tr>
<td>Learning and Innovation Skills (e.g., creativity, critical thinking, problem solving)</td>
<td>7</td>
</tr>
<tr>
<td>Technology Literacy (e.g., use of Word, Excel, Powerpoint, Web development software, audio/video editors, photo editors)</td>
<td>7</td>
</tr>
<tr>
<td>Information Literacy (e.g., gathering appropriate source data to inform studies)</td>
<td>4</td>
</tr>
<tr>
<td>Civic Literacy (e.g., current events, ethical practices, and the roles of governments)</td>
<td>3</td>
</tr>
<tr>
<td>Global Knowledge (e.g interacting with students and experts around the globe, using and/or creating maps, studying global current events)</td>
<td>1</td>
</tr>
<tr>
<td>Group Collaboration (e.g., peer groups, group projects, discussion boards, wikis, web conferencing)</td>
<td>6</td>
</tr>
</tbody>
</table>

The following provides a selected sample of lessons for each content area:

- **English/Language Arts.** Students created a multimedia presentation of The Scarlet Letter and essential elements as a part of class discussion. Students engaged in periodic quick writes using their computers to submit writing into a digital drop box. Finally, students participated in periodic informational scavenger hunts, looking up important information on the internet.

  Students read Macbeth previously in class. Then they used flip video cameras (over several class periods) to record their interpretation of Macbeth in groups. They used video editing software to compile their movie and present it to the class.
• History. Students created a digital narrative of the events that led up to the turbulence of the 1920s. The students broke into four groups with each group responsible for a particular set of phenomena - cultural, social, economic, and other. Each group researched their section and developed a storyboard, storyline, images and possibly music to illustrate their own particular goals and interests with respect to the issues involved in this project. Students created digital historical narratives in groups. By creating a story board at the beginning of the project, students can better manage their time and divide up the labor if they work in groups. Creating a narrative is a great way to enhance student understanding of a unit of study. Students are often very excited to share their work with each other and enjoy the opportunity to design their own movies.

Each student drew the name of a woman who has made an impact on her society and answered the question, “If she were alive today, what impact might she make on today’s society?” The students were to research the dates, historical and cultural influences of the time period in which the woman lived, write a paper and present a power point to their peers. They were also to pick a piece of music which seemed to reflect this woman and imbed it into the power point.

One plan combined history with health issues. The teacher had students view a wiki with a linked Web page about Japanese internment camps, having them compare internment camps in different countries. Students were asked to create a two-column table in Word or on paper to contrast German and U.S. camps, in preparation for a class discussion. Students will be writing down everything they eat in the next 24 hours to use a Google calorie counter and compare their diet with the food eaten in concentration camps.

• Science. Using Microsoft Publisher, students created a newsletter containing Darwin’s modern obituary. Students were allowed to include up to three pictures that highlight the main ideas of their writing. They had to write in complete sentences and proofread their obituary for grammatical and mechanical errors. Websites were provided for them to use for research through EduPlatform.

• Math. Students utilized an “Out of this World” WebQuest to review quadratic function concepts and apply them in the analysis of gravity’s effect on the motion of a basketball. As students completed assignments, they were better able to analyze an interplanetary basketball league. The WebQuest helped students to review concepts such as finding the vertex of a quadratic function, axis of symmetry, solving by graphing, and factoring and completing the square.

In pairs, students viewed a PowerPoint for Rhombi and Squares and then discussed what they saw. Next, students read a story called “The Fairy Tale of Two Parallelograms.” After reading the story together, pairs completed a graphic organizer from a link on the teacher's web site and then got into larger groups to debrief.

• Electives. One teacher brought the world of business into the classroom. Students used textbooks to work on a "business simulation" that required them to type a block style business letter. The teacher said the textbook provider had a deal with an actual company that allowed students to e-mail and communicate with people in the business.

Use of Technology for Assessment
Some of the survey items address how technology is used for assessing student learning. Most teachers utilized some form of online or electronic assessment either through email, Curriculum Pathways, AVID, Activevote (similar to clickers), ClassScapes, online quizzes, Glinko.com, OneNote, games, Promethean boards, live chat, Study Island, blogs, electronic rubrics, and online textbook resources. Teachers
especially liked being able to project anonymous, immediate assessments through polling during class to
discover if students comprehended the material.

Over 50% of 1:1 EC teachers reported that they used technology to assess and grade student work,
compared with less than 30% of Non-1:1 EC teachers. 1:1 EC teachers report more technology use for
formative assessment than Non-1:1 EC teachers (see Appendix A, Tables A19-A20).

1:1 teachers report higher percentages of daily technology use for collecting formative assessment data
and assigning/grading student work than Non-1:1 teachers. Less than 10% of 1:1 teachers report using
technology daily to administer online quizzes or tests compared to 0% of Non-1:1 teachers. Over 30% of
1:1 teachers create and/or maintain website(s) and/or blogs for instructional purposes, whereas 5% of
Non-1:1 teachers use the technology for this purpose (see Appendix A, Tables A21-A22).

22% of 1:1 EC teachers indicate that students use technology daily to evaluate their own learning,
compared to 5% of Non-1:1 EC teachers. The pattern is similar for 1:1 traditional teachers compared with
Non-1:1 traditional teachers. A greater number of 1:1 EC teachers indicate that students use technology
daily to submit assignments electronically compared with Non-1:1 EC teachers. 1:1 traditional teachers
also report greater agreement that students use technology daily to submit assignments electronically than
Non-1:1 traditional teachers (see Appendix A, Tables A27-A28).

Use of Laptops for Communication – School Staff Perspective

Teacher focus groups asked about communication with laptops. Many teachers indicated that the overall
level of communication has improved because of the laptops. One teacher mentioned using Google Talk
to communicate with colleagues instead of using school phones. Teachers also commented that having
students submit assignments online has its advantages, especially for students who did not get a chance to
complete an assignment during class. Another teacher mentioned that using email to communicate
provides documentation of a conversation, which holds everyone accountable for the information that has
been communicated, including timestamps.

Parents are also able to access some school and course websites to view the assignments their children are
working on:

[Teacher] All of our assignments are posted on e-Chalk, so with, what the parents come in, is they
can view their child’s homework, so if the child goes home and says, “I don’t have homework,”
well, according to e-Chalk, you have homework in Biology, so you need to do your homework,
let me see your homework, so that opens up the lines of communication between parents,
teachers, and students.

[Teacher] As we say, there’s no excuse to not know what’s happening, …that’s how we do a lot
of our memos, or things that are going out for staff, but also dialogue between teachers and
students, and teachers and parents. I think it helps keep them more aware than a traditional memo
that goes home to the parents in the mail.

An administrator commented that using some Google services has facilitated communication between and
among students, parents, and school personnel. Another administrator also echoed some teachers’
comments that parents have better access to students’ assignments:

[Administrator] I think that’s an area where we have gained, communication overall is better,
when we have assignments posted on our homepage or the teacher’s homepage, it’s hard to say,
“Well, I didn’t know this,” because our TF coordinates that communication through wikis to the
parents, and she’s good about updating that and keeping parents informed, so I think the
communication part has been improved with the laptops.
Student Technology Use

Item Analysis – Spring 2009

Students were asked to report the frequency with which they use technology for various learning activities such as planning learning, searching for information, and one and two-way communication (see Appendix A, Tables A37-A38). Overall, a greater percentage of students in 1:1 early colleges and traditional schools reported developing searching for information and creating a product daily compared to students in non-1:1 early colleges and traditional schools. It is logical that students in 1:1 environments might find it more effective to use technology for their learning when every student has a laptop and teachers are creating learning activities that reflect this.

Item Analysis – Across Time

Individual item differences for student technology use have been reported for 1:1 and comparison groups in the two previous evaluation reports. In as much, for this section of the report focuses on reporting changes and trends across time for the three available time points for participating 1:1 Cohort A students. Additionally, responses for 1:1 Trad Cohort B students are included for reference.

Figures 49 shows a stable pattern across time where generally EC students indicate they are using their laptops most frequently for searching for new information, two-way communication with teachers and peers, and submitting assignments electronically. Fewer students indicate they are using the laptops daily to plan learning activities, analyze information, and track their own progress. A higher percentage of EC students tend to agree with the statements than their traditional high school peers.

Figure 49. Percent of 1:1 EC Cohort A (spring 2008; \(n=752\)), 1:1 EC Cohort A (fall 2008; \(n=848\)), and 1:1 EC Cohort A (spring 2009; \(n=872\)) students indicating daily use of laptops/computers in various learning activities.

Figures 50 shows an inconsistent pattern across time. Cohort A 1:1 traditional high students indicate they are using their laptops most frequently for searching for new information, two-way communication with teachers and peers, and submitting assignments electronically. Fewer students indicate they are using the laptops daily to plan learning activities, analyze information, and track their own progress. Responses indicate a drop in the frequency of use during the fall 2008 semester, and an increase in frequency of use
for the spring 2009 semester. Students in 1:1 Trad Cohort B seem to be using the laptop on a daily basis for these learning activities more frequently than then Cohort A peers.

Figure 50. Percent of 1:1 Trad Cohort A (spring 2008; n = 521), 1:1 Trad Cohort A (fall 2008; n = 836), 1:1 Trad Cohort A (spring 2009; n = 919), and 1:1 Trad Cohort B (spring 2009; n = 2731) high school students indicating daily use of laptops/computers in various learning activities.

In comparison with their non-1:1 EC counterparts, those in 1:1 ECs reported significantly more frequent laptop use in all courses (see Table 11). Students in 1:1 Trad Cohort A (Spr 09) reported significantly more frequent laptop use in all courses than students in non-1:1 Trad Cohort A (Spr 09). Students in 1:1 Trad Cohort B (Spr 09) reported using laptops most frequently in English and Science courses.

Table 11. Percent of students indicating weekly/daily use of laptops/computers in various classes

<table>
<thead>
<tr>
<th></th>
<th>English % (n)</th>
<th>Math % (n)</th>
<th>Science % (n)</th>
<th>Social Studies % (n)</th>
<th>Foreign Languages % (n)</th>
<th>Electives % (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:1 EC Cohort A</td>
<td>85.4% (738)</td>
<td>62.7% (699)</td>
<td>88.5% (583)</td>
<td>87.1% (603)</td>
<td>71.9% (249)</td>
<td>62% (205)</td>
</tr>
<tr>
<td>(Spr 09)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-1:1 EC Cohort A</td>
<td>52.8% (641)</td>
<td>21.8% (699)</td>
<td>52.5% (635)</td>
<td>41.2% (573)</td>
<td>33.5% (313)</td>
<td>24.9% (313)</td>
</tr>
<tr>
<td>(Spr 09)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:1 Trad Cohort A</td>
<td>51.5% (810)</td>
<td>44.3% (808)</td>
<td>52.5% (761)</td>
<td>59.5% (757)</td>
<td>24.5% (482)</td>
<td>46.5% (661)</td>
</tr>
<tr>
<td>(Spr 09)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-1:1 Trad Cohort A</td>
<td>30.3% (844)</td>
<td>9.3% (808)</td>
<td>23.5% (755)</td>
<td>27.8% (719)</td>
<td>13.9% (430)</td>
<td>19.8% (593)</td>
</tr>
<tr>
<td>(Spr 09)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:1 Trad Cohort B</td>
<td>88.6% (2,053)</td>
<td>53.6% (1,937)</td>
<td>87.9% (1,674)</td>
<td>79.5% (1,564)</td>
<td>68.6% (935)</td>
<td>73% (1,925)</td>
</tr>
<tr>
<td>(Spr 09)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Among 1:1 EC Cohort A (Spr 09), over 90% of students reported using laptops for homework in English, Science, and Social Studies classes (see Table 12). Among students in 1:1 Trad Cohort A (Spr 09), a greater proportion of students reported using laptops for homework for English classes than in other courses. A larger percentage of students in 1:1 Trad Cohort B (Spr 09) reported using laptops for homework in their English classes than in other courses.
Table 12. Percent of students indicating use of laptops/computers for homework in various classes

<table>
<thead>
<tr>
<th></th>
<th>English % (n)</th>
<th>Math % (n)</th>
<th>Science % (n)</th>
<th>Social Studies % (n)</th>
<th>Foreign Languages % (n)</th>
<th>Electives % (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:1 EC Cohort A</td>
<td>93.5% (756)</td>
<td>76.5% (671)</td>
<td>91.1% (607)</td>
<td>90.9% (634)</td>
<td>77.2% (268)</td>
<td>62.4% (229)</td>
</tr>
<tr>
<td>(Spr 09)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-1:1 EC Cohort A</td>
<td>88.6% (624)</td>
<td>43.1% (776)</td>
<td>85.8% (562)</td>
<td>82.4% (311)</td>
<td>63.7% (231)</td>
<td>62.4% (229)</td>
</tr>
<tr>
<td>(Spr 09)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:1 Trad Cohort A</td>
<td>74.5% (819)</td>
<td>51.2% (716)</td>
<td>64.8% (634)</td>
<td>69.4% (268)</td>
<td>48.4% (231)</td>
<td>47.1% (229)</td>
</tr>
<tr>
<td>(Spr 09)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-1:1 Trad Cohort A</td>
<td>72.5% (859)</td>
<td>20.1% (822)</td>
<td>62.7% (735)</td>
<td>73.5% (434)</td>
<td>40.8% (231)</td>
<td>31.6% (229)</td>
</tr>
<tr>
<td>(Spr 09)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:1 Trad Cohort B</td>
<td>83.7% (2,073)</td>
<td>44.5% (1,971)</td>
<td>71.7% (1,720)</td>
<td>73.5% (1,608)</td>
<td>58.2% (997)</td>
<td>49.2% (1,992)</td>
</tr>
<tr>
<td>(Spr 09)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figures 51-52 examine student reported frequency of use of laptops in their core content areas across time for 1:1 EC Cohort A and 1:1 Trad Cohort A schools. These graphs show a similar pattern across time where the laptops were used most frequently during the fall 2008 semester, with a slight drop for spring 2009. Since the fall 2008 survey, the 1:1 EC students report frequent use of their laptops for English, Social Studies, and science classes. 1:1 Traditional students report they use their laptops most often in English and Social Studies. All groups consistently report using their laptops least often in math class. This finding is most likely related to the difficulty many students and teachers report with lack of efficiency with typing math problems and equations. Schools with tablets or USB-connected interwrite tablets report more frequent use of the laptops in their math courses.

Figure 51. Percent of 1:1 EC Cohort A students reporting weekly/daily use of laptops in core classes over time.

Note.  
English Spring 08 n = 756, Fall 08 n = 650, Spring 09 n = 732  
Math Spring 08 n = 756, Fall 08 n = 671, Spring 09 n = 699  
Science Spring 08 n = 756, Fall 08 n = 522, Spring 09 n = 583  
Social Studies Spring 08 n = 756, Fall 08 n = 513, Spring 09 n = 603
Figure 52. Percent of 1:1 Traditional Cohort A reporting weekly/daily use of laptops in core classes over time.

Note. English Spring 08 \( n = 529 \), Fall 08 \( n = 446 \), Spring 09 \( n = 810 \)
Math Spring 08 \( n = 529 \), Fall 08 \( n = 500 \), Spring 09 \( n = 699 \)
Science Spring 08 \( n = 529 \), Fall 08 \( n = 412 \), Spring 09 \( n = 761 \)
Social Studies Spring 08 \( n = 529 \), Fall 08 \( n = 413 \), Spring 09 \( n = 757 \)

Observing Student Technology Use
Beyond surveys, the Looking for Technology Integration (LoFTI) observation tool also helped to inform how students were using their laptops for coursework. The most frequently observed student activities with laptops in the 1:1 schools included: research and communication. Students were least frequently observed using laptops for personal development (e.g. time management, calendar). Figure 53 provides a summary of observations for the last three site visits to the participating 1:1 schools.

Figure 53. Percent of 1:1 high school courses observed in which students were performing various activities using technology in spring 2008 \( n = 46 \), fall 2008 \( n = 41 \), and spring 2009 \( n = 41 \) for cohort A school and spring 2009 \( n = 17 \) for cohort B schools.
Use of Laptops for Communication – Student Perspectives

Students were asked in focus groups whether having laptops has increased communication between school teachers, staff, administrators, and students and parents. Most students indicated that they do use their laptops to email teachers assignments, but they do not have that kind of relationship with all teachers. Other students indicated that they are able to communicate with their teachers using the synchronous chat function that comes with their classroom monitoring software. Students appreciated the immediate feedback they received from their teachers regarding their assignments and class work.

[Student] If you have a question in class, you can always e-mail them, and you don’t always have time when you have a question, and it helps with that as well, and sometimes you look around and think, but you can e-mail them a question or comment.

[Student] A lot of communication between your instructors and administrative staff is almost instant, because a lot of people now, especially on the college level and even on our level, carry around blackberries and carry around their computers, so as soon as you send that e-mail they get it and they respond to you, you don’t have to wait until next week to go talk to them, because next week might be too late, and you can just send them an e-mail and probably get a response back from them within the hour, no problem. It just makes things so much easier and so much quicker.

[Student] Student-teacher communication is definitely improved, and if you have a question about something that may have happened in the class when you were absent, you can e-mail your instructor or a fellow student and immediately get a reply, and so you know what to study, and one of my teachers sends reminders about homework and tests coming up straight to the e-mail address, and so it’s very easy to stay on top of things, as well.

One group of students discussed how much easier it is to group projects using their laptops:

[Student] If we don’t have each other’s phone numbers, but we have each other’s e-mail addresses, it helps us communicate better, or, like, “I’ve done this part, have you done your part?” type deal. And then you can put it together, all together, in, um, in something like Google documents, you can put everything together.

Some students indicated that communication with school administrators is also better facilitated through computers, “They’ll send an e-mail throughout the whole school about current events.” School personnel also have convenient access to parents, and have emailed parents regarding poor performance on assignments. Students did mention that while having their laptops means increased access to teacher communication, some aspects meant increased responsibility to check electronic messages regularly, “If you don’t check your e-Chalk], you’ll miss everything—everything, announcements, everything is on [there].”

Some items on the survey asked students and teachers whether they used instant message or email to communicate with peers about school-related topics (see Figures 54-55). Over time, we see a dramatic increase in the use of these communication tools after school hours.
Figure 54. Percent of 1:1 EC high school students from cohort A fall 2008 ($n = 906$) and spring 2009 ($n = 886$), and 1:1 EC high school teachers from cohort A fall 2008 ($n = 59$) and spring 2009 ($n = 58$) indicating participation in various communication related activities at home.

Note. *Significant differences in group means ($p < .05$)

Figure 55. Percent of 1:1 traditional high school students from cohort A fall 2008 ($n = 952$) and spring 2009 ($n = 983$), and 1:1 traditional high school teachers from cohort A fall 2008 ($n = 59$) and spring 2009 ($n = 105$) indicating participation in various communication related activities at home.

Note. *Significant differences in group means ($p < .05$)
One specialized activity researchers asked 1:1 students and staff about was group projects and the extent to which they were collaborating with each other using their laptops. Students in the 1:1 Trad Cohort B schools focus groups reported their work was still primarily independent, however, students and teachers at the 1:1 EC and Trad Cohort A schools described different modes of collaboration enabled by the laptops, specific tools in use that enabled collaboration, and benefits to collaboration in being able to access needed information at any time.

Students, teachers, and administrators all made comments during focus groups to suggest laptops were enabling different modes of collaboration. One common mode was in-class collaboration around a common resource such as an electronically-distributed worksheet, online quiz, web site, or web resource:

[Student] The teacher will transmit a worksheet on her computer, and we’ll fill out the worksheet as a group, and we’ll be researching stuff on the Internet, it’s like, an Internet search, and we’ll be filling out the worksheet together.

[Teacher] One of the things that I do with the computer is I pair my kids up by twos, the quizzes are 10 questions, and I’ll put them in groups of two and assign them questions on Classscapes, and then I make them pull out a piece of paper, and they tell me why A’s right, B’s wrong... they collaborate, and they choose their answer, and of course it gives them if they’re right or not... they become responsible for teaching one another.

[Teacher] I have my kids do group projects, and they usually do like a moviemaker or a PowerPoint, and they can actually get on, you know, their own computer, and maybe one of them is going to find, you know, the book with the information, one of them is going to find some pictures, one of them is going to do something else, and then they can send that all to one computer and work together in that way, so, that’s one thing I’ve done.

Additionally, one of the most common student responses when asked about laptop-supported collaboration was how laptops made it much easier for students to collaborate outside of the classroom and send pieces of a shared project back and forth:

[Student] You used to have to go over to someone’s house or meet them at the library or something, now you can just e-mail them, so it makes it a lot easier to stay in contact with them if you’re doing a group project over a period of time. Or you can do a OneNote live sharing session, where you have a blank screen, and just everybody writes on the same screen

[Student] If we don’t have each other’s phone numbers, but we have each other’s e-mail addresses, it helps us communicate better, or, like, “I’ve done this part, have you done your part?” type deal. And then you can put it together... in something like Google Documents....

Students and teachers mentioned several tools that were used to support collaboration, including the OneNote screen sharing tool at schools with tablets. The most commonly mentioned tools, however, were discussion boards, wikis, and blogs:

[Student] She had blogs, and we would have to go there and we would have to watch a video and have to give our opinion.

[Student] We do these quotes of the week... we just discuss, using a discussion board, and sometimes you have to depend on other people to do their discussion so you can get your points by responding to someone’s post... they tell us in career fields you have to learn to work with other people, so we do a lot of group work.
One tool type that was not prompted in surveys or discussed by many teachers was social networking. Tools like Myspace and Facebook are largely banned in schools, and some schools have begun to look at the Ning platform for locally-hosted social networks. As one teacher noted, it may be worth leveraging student interest in social networking to the benefit of building communities or collaborations:

One of the things that I think would be really cool if we could figure out how to do it, would be to do some kind of social network within our school, to keep outsiders out of, but still allow, because they all use Myspace and Facebook all of the time in their home, and if we had something that was legit and safe here that we could use I think it would be really fascinating to see how it could be used as a community-building tool in the school. Because they all communicate with each other all of the time using the social network, and when they’re out of the school, they’re on that.

One key benefit to laptop-supported collaboration noted by students and teachers was the ability to access needed information when physically separate from others who have that information. Several examples of this benefit were noted, including the ability for students to seek help from classmates when they are outside of the classroom and have a question they need answered:

[Student] I like it, because sometime on projects that we have to do, we might not know how to do something on the computer, and one of our friends does, we can ask for help and can help each other out, and can do projects on it

Students also noted if they had to miss school, they could easily retrieve notes from classmates or assignments from teachers posted on a common network drive:

[Student] If you miss a day, someone who took notes on their laptop can e-mail them to you. It’s no hassle, you don’t lose any notes, you don’t miss a beat.

[Student] There is a program in OneNote that, it’s like, a notebook for your group, and you can write on it and everyone else can see it, so I think in that way, it’s really useful for that.

Interestingly, students at one school also noted laptops were beneficial when their teacher had to miss school, as they could stay in touch remotely:

[Student] It’s really cool, I know one day Miss Pritchard was out on Geometry, and we was on OneNote, and someone was having trouble or something, I guess, and she was like monitoring, just was from her house writing instructions on how to do it.

[Student] Yeah, Miss Wiggins had a chat open in DyKnow one day... when she wasn't in.

(Summary) Evaluation Question 3: How have teachers’ instructional practices changed over time?

Technology Use Summary

- **Teacher Technology Use.** Analysis of teacher responses to the 1:1 survey over time showed two different patterns for use of laptops for planning and instruction. For planning purposes, 1:1 teachers reported using the laptops least frequently during the spring 2008 (Time 1), most frequently during fall 2008 (Time 2), and then use leveled out during spring 2009 (Time 3). Use of the laptops for instruction continued to climb over time, where teachers used it least frequently during the spring 2008 (Time 1), a little more frequently during fall 2008 (Time 2), and most frequently during spring 2009 (Time 3). Teachers reported having more organized lesson plans since the laptop initiative began. Students in 1:1 schools were impressed with their teachers’ use of laptops. Teachers reported using the laptops most often on a daily basis for presenting content, providing directions, and accessing online textbook resources. Teachers are not giving online
quizzes, taking virtual field trips, or participating in labs on a daily basis. Additionally, during site visits teachers were observed using their laptops during class. The most frequently observed teacher activities with laptops in the 1:1 schools included: activating prior knowledge, advanced organizers, and facilitation. Teachers were least frequently observed using laptops for differentiated instruction.

- **Use of Technology for Assessment.** Some of the survey items address how technology is used for assessing student learning. Most teachers utilized some form of online or electronic assessment either through email, Curriculum Pathways, AVID, Activevote (similar to clickers), ClassScapes, online quizzes, Glinko.com, OneNote, games, Promethean boards, live chat, Study Island, blogs, electronic rubrics, and online textbook resources. Teachers liked being able to project anonymous, immediate assessments through polling during class to discover if students comprehended the material.

- **Student Technology Use.** 1:1 students indicate they are using their laptops most frequently for searching for new information, two-way communication with teachers and peers, and submitting assignments electronically. Fewer students indicate they are using the laptops daily to plan learning activities, analyze information, and track their own progress. Responses indicate a drop in the frequency of use during the fall 2008 semester, and an increase in frequency of use for the spring 2009 semester. 1:1 students in this study reported using laptops most frequently in English, Science, and Social Studies courses. The most frequently observed student activities with laptops in the 1:1 schools included: research and communication. Students were observed using laptops for personal development (e.g. time management, calendar).

- **Communication Summary.** Teacher and student focus groups asked about communication with laptops. Teachers and students reported that having laptops has increased communication between school teachers, staff, administrators, and students and parents. Staff and students use their laptops to email assignments and questions. Others indicated that they use synchronous chat programs that comes with their classroom monitoring software to facilitate communicate with administrators, teachers, and other students. Communication with school administrators is also better facilitated through computers. School personnel also have convenient access to parents, and have emailed parents regarding poor performance on assignments. Some items on the survey asked students and teachers whether they used instant message or email to communicate with peers about school-related topics. Over time, we see a dramatic increase in the use of these communication tools after school hours.

- **Collaboration Summary.** Students, teachers, and administrators all made comments during focus groups to suggest laptops were enabling different modes of collaboration. Students in the 1:1 Trad Cohort B schools focus groups reported their work was still primarily independent, however, students and teachers at the 1:1 EC and Trad Cohort A schools described different modes of collaboration enabled by the laptops, specific tools in use that enabled collaboration, and benefits to collaboration in being able to access needed information at any time. This finding indicates that as teachers become more comfortable with using the technology in class they move from requiring independent work from students to more collaborative, project-based activities.
Evaluation Question 4: How have student learning and achievement in core academic subjects changed over time?
A variety of data sources were analyzed to determine how the 1:1 Learning Technology Initiative has impacted student learning outcomes. Archival data from North Carolina Department of Public Instruction (NCDPI) and North Carolina Education Research Data Center (NCERDC) focused on attendance, and percent passing the NC Computer Skills Test and End-of-Course Tests. Sections in the 1:1 online survey addressed important components of the student engagement, development of students’ 21st century skills. LoFTI, a classroom observation protocol utilized during site visits, recorded whether the laptops were being used for 21st century learning activities and the percentage of students showing positive indicators of engagement. Finally, discussions during staff and student focus groups addressed changes in student learning, engagement, and 21st century skills.

Student Learning Outcomes

Student Attendance
Analysis of attendance data showed overall high rates of attendance at each of the 1:1 pilot high schools and comparison schools for the past two years. Student attendance rates across 1:1 schools and their comparisons for the 2006-07 and 2007-08 school years were all above 90% and remained virtually unchanged over the two-year period (see Table 13).

Table 13. Average percent of students who attend school daily among all 1:1 schools and their non-1:1 comparisons.

<table>
<thead>
<tr>
<th>School Code</th>
<th>1:1 High School Attendance</th>
<th>Non-1:1 High School Attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC1</td>
<td>A 98</td>
<td>98</td>
</tr>
<tr>
<td>EC2</td>
<td>A 97</td>
<td>98</td>
</tr>
<tr>
<td>EC3</td>
<td>A 96</td>
<td>96</td>
</tr>
<tr>
<td>EC4</td>
<td>A 97</td>
<td>97</td>
</tr>
<tr>
<td>EC5</td>
<td>A 97</td>
<td>97</td>
</tr>
<tr>
<td>EC6</td>
<td>A 98</td>
<td>97</td>
</tr>
<tr>
<td>EC7</td>
<td>A 95</td>
<td>98</td>
</tr>
<tr>
<td>TradHS1</td>
<td>A 94</td>
<td>94</td>
</tr>
<tr>
<td>TradHS3</td>
<td>B 94</td>
<td>93</td>
</tr>
<tr>
<td>TradHS4</td>
<td>B 93</td>
<td>92</td>
</tr>
<tr>
<td>TradHS5</td>
<td>B 93</td>
<td>93</td>
</tr>
<tr>
<td>TradHS6</td>
<td>B 94</td>
<td>95</td>
</tr>
</tbody>
</table>

Student Participation on Online Courses
Another student outcome of interest to stakeholders was the number of students participating in online courses. Data gathered from the surveys revealed a small percentage, between 10-20%, of students self-reported being involved with online teaching and learning, while no teachers reported teaching online courses. A higher percentage of students in the 1:1 EC schools are participating in online courses than in non-1:1 EC schools (see Figure 56). Less students in the 1:1 traditional high schools are participating in online courses than their comparison school counterparts (see Figure 57). Administrators and teachers in the 1:1 schools should emphasize use of the laptops to access online courses, such as NCVPS, and encourage students to participate in online courses.
Student Engagement
Survey results indicated that students and staff at the 1:1 schools generally agreed the use of the laptops for teaching and learning increased student engagement (see Figure 58-61).

Teacher Item Analysis
When surveyed in fall 2008, a little over 90% of 1:1 EC Cohort A teachers agreed or strongly agreed that their students are more actively involved in their own learning when using the laptops. The proportion for this group expressing agreement or strong agreement dropped to 80.8% in spring 2009. In both fall 2008 and spring 2009, about 80% of teachers agreed or strongly agreed that students are more engaged when using the laptops (see Figure 58).
The percentage of 1:1 Trad Cohort A teachers indicating agreement or strong agreement that students are more actively involved in their own learning when using the laptops decreased from 64.9% in fall 2008 to 54.4% in spring 2009. A small decrease was also noted for the item asking about student engagement and laptop use with 59.2% expressing agreement or strong agreement in fall 2008 as compared to 52.1% in spring 2009. Among 1:1 Trad Cohort B teachers, 75.7% indicated agreement or strong agreement that students are more actively involved in their own learning when using the laptops. Just over 68% expressed agreement or strong agreement that their students are more engaged when using the laptops (see Figure 59).

Figure 58. Percent of 1:1 EC Cohort A fall 2008 (n = 56) and 1:1 EC Cohort A spring 2009 (n = 57) teachers indicating agreement that students are more actively involved and engaged when using laptops

Figure 59. Percent of 1:1 Trad Cohort A fall 2008 (n = 57), 1:1 Trad Cohort A spring 2009 (n = 98), and 1:1 Trad Cohort B spring 2009 (n = 234) teachers indicating agreement that students are more actively involved and engaged when using laptops.
**Student Item Analysis**

As shown in Figure 60, little difference emerged in students’ responses to the survey item asking about laptop/computer use and interest in school. When asked to report their degree of agreement that the more teachers use laptops/computers the more they enjoy school, more students in 1:1 ECs reported either agreement (38.2%) or strong agreement (24.2%) than non-1:1 EC students (35.8% and 19.5%, respectively). One to one EC students’ average rating for this item was significantly higher than their non-1:1 counterparts.

**Figure 60.** Percent of 1:1 Cohort A spring 2009 (n = 788) and non-1:1 Cohort A spring 2009 (n = 665) EC students indicating agreement with survey items measuring student engagement.

---

Survey results from students in 1:1 Trad Cohort A schools show a slight increase in the proportion of those indicating agreement or strong agreement on items related to engagement from fall 2008 to spring 2009 (see Figure 61). Fall 2008 results showed that 48.1% of students agreed or strongly agreed that they are more interested in school when their teachers use the laptops, while 52% expressed this sentiment in spring 2009. Survey responses from fall 2008 indicated that 46.3% of students felt that their interest in school related to laptop use compared to 54.3% in spring 2009. Among students in 1:1 baseline traditional high schools, over half (55.8%) indicated agreement (37.8%) or strong agreement (18.0%) that they are more interested in school when their teachers use the laptops. Likewise, more than half (53.7%) reported agreement (37.2%) or strong agreement (16.5%) that the more their teachers use technology, the more they enjoy school.

**Figure 61.** Percent of 1:1 Cohort A spring fall 2008 (n = 903), 1:1 Cohort A spring 2009 (n = 773), and 1:1 Cohort B spring 2009 (n = 2572) traditional high school students indicating agreement with survey items measuring student engagement.

*Note.* Significant difference in group means, *p* < .05
Survey results indicated that staff and students at the 1:1 schools believed the use of the laptops for teaching and learning increased student engagement. Data from the classroom visits supported those results (see Figure 62). There was an increase in the frequency of observations in which all the students in the classroom showed a positive indicator of engagement such as sustained behavioral involvement, positive emotional tone, and exertion of effort and concentration.

During our classroom observations, we looked for the percentage of students using technology who demonstrated positive indicators of student engagement including sustained behavioral involvement, positive emotional tone (e.g., cheerful, calm, communicative), and exertion of effort and concentration. Data gathered from spring 2008 was compared to data gathered from spring 2009 to explore how observations have changed over time. As shown by Figure 62, 100% of students using technology demonstrated sustained behavioral involvement in almost 60% of courses observed during spring 2008, while this was true in 50% of courses observed in spring 2009. For two of the indicators (positive emotional tone and exertion of effort) a slightly larger percentage of spring 2009 observations indicated 100% of students demonstrating these behaviors than spring 2008.

**Figure 62.** Percent of 1:1 EC Cohort A spring 2008 ($n = 34$) and 1:1 EC Cohort A spring 2009 ($n = 36$) courses observed in which 100% of students showed positive student engagement.
In looking at the 1:1 Trad Cohort A results, a clear pattern emerged showing that a greater proportion of courses were observed in spring 2009, as compared to that observed in spring 2008, in which 100% of students showed positive student engagement (see Figure 63). While the increase appears to be substantial, it was not found to be statistically significant. Observations in 1:1 Trad Cohort B spring 2009 courses showed just over 70% having all students demonstrating positive student engagement.

Figure 63. Percent of 1:1 Cohort A spring 2008 ($n = 12$), 1:1 Cohort A spring 2009 ($n = 5$), and 1:1 Cohort B spring 2009 ($n = 17$) courses observed in which 100% of students showed positive student engagement.

Discussions about Student Engagement

In focus group interviews, students, teachers and administrators at 1:1 schools were asked whether they believed that laptops had impacted student motivation and engagement. Despite some concerns about students’ tendency to be distracted by nonacademic uses for the computers, the responses were overwhelmingly positive. Both teachers and administrators noted that students seemed more engaged and on-task than they had been before they had the laptops.

Focus group participants provided several reasons why the laptops might increase student engagement. Some noted that students tend to be technologically savvy when they enter the classroom, so the laptops allow students to learn in a familiar environment. For students who are not traditionally strong in school, this familiarity can lead to increased confidence and a stronger desire to learn. In addition, having their own laptops provides students with a sense of ownership of their learning. For example, one teacher stated:

[Teacher] There are kids who are poor in English, but they’re excellent in technology. If they feel like they’re good at something, even when … that content area is not their strength, but they’re capable in technology and it makes them feel better about themselves.

Several focus group participants suggested that having immediate access to information is itself engaging. With Internet access at their fingertips, students are able to look up answers to questions that interest them, find alternate perspectives to those presented in the textbook, and access the latest news about a changing topic. Typical responses included:

[Student] I feel like that if a topic is mentioned during class that I don’t really understand, I can just go straight on my computer right then and pull it up and later look at it and say, “Oh, so this is why this connects to this,” and it helps us better connect things.
[Teacher] I like the laptops for the teachable moments... something will come up and I’ll say, “Well, what if...? Or where can we find some more information about this guy or this writer?” and they’re right there, somebody is trying to beat somebody else to the information.

Another way in which technology engages students is by providing a wide variety of possible teaching strategies, which allows teachers to differentiate instruction and reach more students. Students reported being disengaged in classes where they largely use the laptops to create PowerPoint presentations, but very motivated when they have opportunities to make multimedia presentations and research topics that interest them. For example, comments included:

[Student] The laptop opens up a lot more possibilities, because books are invaluable, but with the Internet and the technology, we have so many more possibilities - we can go on the Internet, we can have access to things that are beyond just basic PowerPoint presentations - we can make multimedia videos, we can do all kinds of other things to express what we’ve learned; we also have new ways to learn. So that helps engage people by opening up new possibilities of ways to learn.

[Student] I feel like the laptops make people want to learn. Instead of looking at textbooks all of the time, we actually go online, and actually look at stuff that makes people want to learn stuff, instead of looking at a textbook all day long, and writing using pencil.

Students also noted that convenience is a major factor in their motivation. The laptops help keep students engaged because they provide an easy way to stay organized; rather than having to keep track of textbooks and binders full of paper, students are able to keep all of their school work in folders on a flash drive or on the computer itself. Laptops also allow students to take notes by typing instead of using pencils and paper, a mode which students report that they prefer, and laptops also provide easy access to teachers’ notes that the students may have missed. Finally, having their own laptops means that students can do work anywhere at any time, including during down time in class or in quiet areas with fewer distractions than a computer lab.

Despite all of these positive aspects to the laptops, many students reported that they do not believe they are any more motivated to learn than they were before the 1:1 initiative. Several noted that easy access to e-mail and the Internet provides too many potential distractions, and others indicated that the temptation to copy and paste, rather than processing information, is too great. A few students even stated that they learn more by listening to a teacher impart information than they do by doing Internet searches and making PowerPoints. In the words of these students:

[Student] It doesn’t really motivate me at all, actually, like the notes, in the class, they’ll already be there, so it’ll make me feel lazy.

[Student] Most of the time, it gets me distracted, because you’re like, in places you’re not supposed to, like you check your e-mail.

[Student] Instead of helping sometimes it is kind of hurtful, especially like test-taking time, because we don’t really absorb what we learn from making PowerPoints as much as we would from [the teacher] lecturing us.

As with any instructional tool, laptops can be more or less effective depending on how a teacher chooses to use them. Comments such as those above indicate that teachers may need more training on how to use technology to promote student learning, beyond copying teachers’ notes or creating PowerPoint presentations. As an additional caution, teachers who had been using laptops for more than a year reported that the novelty wore off quickly. The laptops themselves were engaging at first, they noted, but
once they had become a part of the school’s culture teachers needed to be more strategic about how they used them.

[Teacher] When we got the laptops it was like total immersion for students and staff, to the point where it was like that became our world, and I think we kind of saw coming back this year they kind of lost some of that engagement value, because the kids had them every day, every class, it kind of lost some of its luster, so we really had to kind of readjust as a staff and think a little more strategically, how can we use these for projects and things in a unique and new way so the kids are excited about them again.

**Student 21st Century Skills**

*Teacher Item Analysis*

As shown in figure 64, decreases in the percentages of 1:1 EC Cohort A teachers indicating that their students utilize technology to complete a variety of activities were seen when comparing responses over time. A significant decrease from 86.8% in fall 2008 to 59% in spring 2009 was noted for the use of technology to create a product.

*Figure 64. Percent of 1:1 EC Cohort A fall 2008 (n = 54) and 1:1 EC Cohort A spring 2009 (n = 56) teachers indicating students’ daily/weekly use of technology for activities related to 21st century skills.*

Note. * indicates significant difference in group means, $p < .05$.

In general, a larger percentage of 1:1 Trad Cohort A (Spr 09) teachers indicated that their students use technology at least weekly to complete tasks related to 21st century skills than their non-1:1 counterparts. A significant difference was found for one item (search for information) indicating that the average rating on this item was significantly higher for the 1:1 group than the non-1:1 group. With regard to 1:1 Trad Cohort B (Spr 09) teacher responses, over half indicated that students use the laptops at least weekly to plan activities, create a product, and submit assignments electronically (see Figure 65). More than 80% report that their students use the laptops to search for information on a weekly or daily basis. Just under 50% said that their students use the laptops to evaluate their own learning at least weekly.
Figure 65. Percent of 1:1 Trad Cohort A spring 2009 \(n = 95\) and non-1:1 Trad Cohort A spring 2009 \(n = 59\) teachers indicating students’ daily/weekly use of technology for activities relate to 21st century skills.

Note. *Significant difference in 1:1 Trad Cohort A and Non-1:1 Trad Cohort A group means, \(p < .05\).

Student Item Analysis
More than half of all EC students surveyed indicated agreement or strong agreement that use of a laptop/computer at their school helps them to develop key 21st century skills. One to one EC students had significantly greater mean scores than non-1:1 EC students on five of the eight items related to 21st century skills (see Figure 66). Nearly 80% of students in 1:1 ECs and non-1:1 ECs expressed agreement that using a laptop/computer at school helps develop their technology literacy by using tools such as word processing, spreadsheets, and presentations. Just over 75% of students in 1:1 ECs and non-1:1 ECs agreed that using a laptop/computer at school develops their information literacy by helping them research and gather data through such means as WebQuests and online labs/exercises.
In general, a larger percentage of non-1:1 traditional cohort A (spring 09) students indicated agreement that use of a computer at school was helping them develop key 21st century skills than 1:1 traditional cohort A (spring 09) students (see Figure 67). Significant differences in group means were found for six of the eight items related to 21st century skills with the means for the non-1:1 traditional cohort A (spring 09) students being greater than those in the 1:1 traditional cohort A (spring 09). Less than half of students in either type of traditional school expressed agreement that use of a laptop/computer at school was helping them learn life and career skills, or helping to develop their civic literacy and understanding of the global world. Likewise, fewer than 50% of students agreed that use of a laptop/computer at school supports group collaboration.

Also shown in Figure 68 are the results from the 1:1 traditional cohort B (spring 09) students. More than half of the students in this group indicated agreement that they would be able to get a good job if they learn how to use a computer. Similarly, over 50% of these respondents agreed that use of a laptop at school helped them to develop life and career skills, technology literacy, and information literacy. More than half also agreed that use of a laptop at school supports group collaboration.
Figure 67. Percent of 1:1 cohort A spring 2009 (n = 860), non-1:1 cohort A spring 2009 (n = 874), and 1:1 cohort B spring 2009 (n = 2,619) traditional high school students indicating agreement that use of a laptop/computer at school is helping them learn 21st century skills.

Note. *Indicates significant difference in group means for 1:1 Trad Cohort A and Non-1:1 Trad Cohort A

Discussions on 21st Century Skills
During focus group interviews, students, teachers, and administrators at 1:1 schools were asked how they thought laptops helped students to acquire three types of 21st century skills: life and career skills (e.g., responsibility, self-direction, social skills); learning and innovation skills (e.g., creativity, critical thinking, problem solving); and information, media, and technology skills. Some focus groups also discussed the skill of working cooperatively in groups.

Life and Career Skills
Students, teachers, and administrators all agreed that using laptops in school now will help students as they enter the workforce. Because we live in an increasingly technological society, basic computer skills will be essential. Students were as aware as administrators that having skills such as typing and giving presentations will be critical to their future success. A few focus group participants noted that learning computer skills is especially important to low-income students and those who will not go to college, because they may not have opportunities to gain these skills in other ways. Typical comments included:

[Admin] One of the things that is a big deal to me when you talk about that as a staff is that all of our kids, when they leave here, they have presentation skills and they’re not afraid to be up in front of people and talking, those presenting skills, and the laptops give a lot of opportunity for that.

[Student] We’re exposed to technology that you’re likely to use later, such as maybe PowerPoint presentations for a meeting, things like that, and it’s very important that you have those skills beforehand … A lot of workplaces now require you to know how to type, and if you don’t know how, it’s like not knowing how to read.

Several focus group participants noted that the laptops are helping to teach students responsibility. Not only do students need to avoid losing or breaking the computers, but they also need to learn to use them responsibly, for example by exercising self-control when using the Internet. For example:
[Student] I think it has helped me, because I know it’s worth money, and I take care of it more, and that helps me be more careful with other things, not just my laptop, so it, I become a little bit more responsible than before.

[Student] It is a responsibility to carry this thing around, keep up with it, don’t lose it, don’t break it, don’t do what you shouldn’t be doing with it, use it for what it’s for...Most jobs use computers now and in office buildings and stuff you are monitored on your computer the same way, and if you are using it for something that’s not for work, you can get into trouble with that the same way.

Another aspect of responsibility is the ability to be self-motivated. The project-based work made possible by laptops often requires students to be able to set their own deadlines and dictate their own work habits. In addition, those taking online classes need to be very organized and remain on top of their work without having a teacher present to remind them. Students are most likely to be self-directed if they have strong organization skills. Teachers and administrators reported that students are becoming more organized as a result of having the laptops, because they are able to keep their work in file folders on a computer or flash drive rather than dealing with loose papers and large binders. This ability to organize their work digitally will be essential in the workplace:

[Student] In binders and stuff you may lose papers here and there, and everywhere, but you’ve got it on your computer or a flash drive, so you can keep up with it.

[Teacher] Hopefully by the time they reach that corporate world, it is going to be more computer-based, and just having an understanding of organizing information [will be very useful].

Another 21st century life skill that focus group participants discussed was the importance of understanding communication norms when using technology. For example, the use of online discussions in the classroom has helped students to learn appropriate ways of disagreeing with others in a formal setting, and of providing justification for agreeing. Additionally, students are learning when e-mail is and is not an appropriate medium for communication. In the words of three focus group participants:

[Admin] They’re learning how to respond to someone, and in some of those cases, this is, how do you respond to someone who disagrees with everything you just said? And how do you do it in a respectful manner? How do you agree to disagree? And also, how do you justify agreeing with someone, and not just saying, “I agree, period.” What’s your reasoning? So it teaches them higher-order thinking skills, justification, thinking out of the box, working through real-life situations.

[Teacher] I think we have gotten in the habit of teaching them the appropriate use of e-mail and that and what it’s really there for, communicating on the computer, that whatever they put there is always there, don’t say anything negative, or that you wouldn’t say directly to that person’s face.

Innovation and Learning Skills
Students, teachers, and administrators all reported that the use of laptops allows for a greater variety of assignments. Because the Internet allows them access to more resources as well as more ways of expressing themselves, teachers can give students choices about how they find and present information. Many teachers and administrators indicated that students are rising to the challenge, using their problem-solving skills to find the information and using their creativity to present it. For example, students are figuring out how to include music or graphics in PowerPoint presentations, and teaching each other these skills. Several teachers and students also reported seeing a certain amount of friendly competition, which leads to innovation as students try to outdo each other. A few teachers noted that technology allows them to assign real-world problems to students, which increases engagement and also helps students build their problem-solving skills. As one teacher described such an assignment:
[Teacher] I have the students choose a career, and I give them a salary with that career, and they go online and buy themselves from Kelly Blue Book a car, and go to realtor.com and buy a house, and then we use our algorithms to figure out, “Can I afford this?” So it’s a real reality check for them, it’s not just, “Oh, she’s giving me a word problem that says I’m buying this house,” they can actually choose, and especially with today’s economy, that’s, they have a real reality check.

Despite the potential for innovation that technology provides, many teachers are finding that they are hampered in their attempts to encourage students’ creativity. Those who are teaching classes that will be tested on the EOC reported that they simply do not have the time to do long-term projects and also cover all of the necessary content. In addition, some students reported that the security policies at their schools were inhibiting their ability to do research, because many sites with good information or images are blocked.

[Teacher] I’m finding that the 21st century skills are not necessarily [compatible] with the EOC tests, that is grammar and editing, and how do you read for meaning…And that’s, creativity is not part of that; problem solving is not part of that.

[Student] it’s frustrating to have the images I want to edit blocked, when we’re doing cyber café, those websites are blocked, but then if I do get a picture into the picture editing software, I can’t get it onto my laptop, which, it’s easier for me just to go home and do it, there’s a lot less distraction, but I don’t have that editing software, I have to use the basic Paint.

Information/Media/Technology Skills
Teachers and administrators reported that simply using the laptops on a regular basis has helped students to learn important skills related to information gathering and technology use. Students tended to disagree, stating that they had been using computers for so long that they didn’t believe they were gaining any new skills by having them at school. Teacher comments suggest that students may not be as savvy as they think they are. Although many students can figure out how to use complex tools involving music and video, they often do not have fundamental skills such as word processing. Some teachers are finding that they need to instruct students in basic computer skills before they can move on to using the laptops as tools to teach content. This need for technology coaching has cut into instructional time. For example:

[Teacher] We had them make a personal newsletter using Microsoft Publisher, and boy was that a mistake, because the assumption that we made was that they would have more of these skills under their belt already, and what we found was that our instructional focus shifted to helping them format the document.

[Teacher] I have students who, they save a file and they can’t find a file when they saved it, they don’t know basic functions like a control-C is copy, everything that students do they pull down menus to make it happen, it slows them down.

Aside from the basic ins and outs of hardware and software, teachers are finding that they need to teach some advanced concepts related to media use. For example, many teachers reported that their students are struggling with conducting meaningful searches. Although they know how to type a question into a search engine, they need to learn how to use appropriate key words, narrow their searches, and sift through the results to find good information. Moreover, students often abandon on their searches too quickly, asking for the teachers’ help if they do not find the answer on the first page of their first search.

In addition to performing meaningful searches, teachers reported that they have to instruct students on how to identify a reliable source. In addition, students have a hard time understanding that not everything they find on the Internet is true. As students described what they had learned this past year:
[Student] Now we can look more as to where you can get the sources and which sources are more useful on the web, and which are better on text, so I think I have a better idea of where to look for things.

[Student] We know now that [the web address] should end in like EDU or .GOV.

Once they have found their information, students need assistance with how to present it in a report. Plagiarism has become a major issue in the schools, because students are unaware that information on the Internet needs to even be cited, let alone processed and written in their own words. Many teachers and administrators reported that they have had to discuss rules for proper use of information with their students, and that they were surprised that students did not understand concepts such as plagiarism and copyright infringement. Three teachers stated:

[Teacher] Even just the citation of sources…knowing that just because it’s on the Internet doesn’t make it yours, it’s still somebody’s work, and as soon as it gets up there, as soon as it’s there, it’s automatically copyrighted, those are amazing 21st century skills to learn.

Another problem with cutting and pasting information, aside from its being unethical, is that it does not lead to understanding. It is important for students with laptops to learn the skill of processing information for deeper understanding. Teachers related stories of students presenting PowerPoints full of information about a topic, but then being unable to answer any questions about that topic even moments later. One teacher stated that “They think if they can look it up, they know it,” and that this mentality is leading to lower grades.

Group Work/Cooperative Learning
Another 21st Century skill discussed by some focus groups is the ability to work in groups and learn cooperatively. Several focus groups reported that the laptops have led to more collaboration among students, as teachers are assigning more group projects and students are sharing tricks and tools with each other.

[Teacher] I really wasn’t a big fan of collaborative work before coming here, but I do a lot of it now, and we need to work with that, because they really need to develop the ability to collaborate and understand the concept of synergy, and it really gives them an opportunity to see where their strengths and weaknesses are, and almost all of my students are much better at group work now than they were.

NC Computer Skills
The North Carolina Online Test of Computer Skills is administered to all eighth grade students and is a graduation requirement. Students are given at least one opportunity per academic year to retake the test should they not meet proficiency. The computer skills test assesses students’ competencies of the K-8 computer skills curriculum from the North Carolina Standard Course of Study. The test includes items from six strands: societal/ethical issues, database, spreadsheet, keyboard utilization/WP/DTP, multimedia/presentation, and telecommunications/Internet. Students in the 1:1 Trad Cohort A received their laptops in September of 2007, thus the computer skills data for the 2006-07 school year could be considered baseline data for that Cohort. Students in the 1:1 EC Cohort A received their laptops in March of 2008, thus the data shown for the 2006-2007 and 2007-2008 could largely be considered pre-implementation and baseline. At the time of this report, data was not yet available for the 2008-2009 school year and therefore the 1:1 Cohort B schools are not included in this analysis.

Students in the 1:1 EC Cohort A received their laptops in March of 2008, thus the data shown in figure 69 could largely be considered baseline. In looking at incoming freshmen for the 2006-07 school year, almost 80% of 1:1 EC Cohort A students had already met proficiency on the computer skills test, while more than 85% of non-1:1 EC Cohort A students had done so. By the end of ninth grade, over 90% of
ninth grade students in both types of schools had passed the computer skills test. With regard to the 2007-08 school year, more than 90% of incoming freshmen had already passed the computer skills test. By the end of ninth grade, slightly over 80% of students had met proficiency on the test. The decline from incoming to end of grade is a result of changes in the number of students tested.

*Figure 69.* Percent of 1:1 Cohort A and non-1:1 Cohort A EC students proficient on the computer skills test upon entering grade 9 and by the end of grade 9 for 2006-07 and 2007-08 school years.

In comparing 1:1 and non-1:1 Trad Cohort A high school students, figure 70 shows that a slightly larger percentage of non-1:1 incoming freshmen were proficient on the computer skills test during the 2006-07 school year, and by the end of that year a larger percentage of students in the 1:1 school had been successful on the assessment than non-1:1 students. For the 2007-08 school year, a greater percentage of incoming freshmen in the 1:1 school had passed the computer skills test than those in the non-1:1 school, and by the end of the year the percentages were nearly equal.

*Figure 70.* Percent of 1:1 Cohort A and non-1:1 Trad Cohort A high school students proficient on the computer skills test upon entering grade 9 and by the end of grade 9 for 2006-07 and 2007-08 school years.
To examine trends in computer skills test proficiency by the end of grade nine among ethnic subgroups within the different types of schools, percentages were pulled from the NC Computer Skills Test data from NCDPI. The ECs reflect average percents for each subgroup across the seven participating schools (see Table 14). Examining data from the 2006-07 school year, it appears that a larger percentage of Black and Hispanic students in the early college high schools, regardless of 1:1 status, were proficient on the computer skills test by the end of ninth grade than those in traditional high schools. Data for the 2007-08 school year reveals several interesting trends with regard to participation in 1:1 programs. Across all subgroups, a larger percentage of 1:1 EC Cohort A students had demonstrated proficiency on the computer skills test by the end of grade nine than non-1:1 EC Cohort A students. Differences in percent proficient among students in 1:1 Trad Cohort A and non-1:1 Trad Cohort A were not as large as those among the early college high schools.

Table 14. Average percent of students proficient on the Computer skills Test by the end of grade 9 across ethnic groups for the 2006-07 and 2007-08 school years.

<table>
<thead>
<tr>
<th></th>
<th>2006-07</th>
<th></th>
<th></th>
<th>2007-08</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AI&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Asian</td>
<td>Black</td>
<td>Hisp&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Multi&lt;sup&gt;c&lt;/sup&gt;</td>
<td>White</td>
</tr>
<tr>
<td>1:1 EC Cohort A</td>
<td>100</td>
<td>90.2</td>
<td>100</td>
<td>66.7</td>
<td>93.75</td>
<td>98.2</td>
</tr>
<tr>
<td>Non-1:1 EC</td>
<td>89.2</td>
<td>84.0</td>
<td></td>
<td>95.2</td>
<td>67.5</td>
<td>81.5</td>
</tr>
<tr>
<td>1:1 Trad Cohort A</td>
<td>72.4</td>
<td>73.9</td>
<td>100</td>
<td>92.9</td>
<td>82.6</td>
<td>82.4</td>
</tr>
<tr>
<td>Non-1:1 Trad Cohort A</td>
<td>88.9</td>
<td>71.3</td>
<td>80</td>
<td>92.3</td>
<td>88.2</td>
<td>100</td>
</tr>
</tbody>
</table>

<sup>a</sup>American Indian  <sup>b</sup>Hispanic  <sup>c</sup>Multi-racial

End-of-Course (EOC) Tests

Binomial Logistic Regression is a way to determine the probability of being in one group or another based on other variables. In this case, binary logistic regression was used to determine the probability of passing the 2007-2008 and 2008-2009 school year Algebra I, Algebra II, Geometry, English I, Civics, US History, and Biology end-of-course (EOC) exams based upon membership in a 1:1 school. Logistic regression determines if a predictor variable (1:1 membership) is significant in determining the probability of passing an EOC exam when all other variables are considered equal. Relative risk ratios were calculated for each subject, and are presented below as percentage of students in 1:1 schools being likely to pass as compared to non-1:1 students. 1:1 Trad Cohort B school results are presented below as well. It is important to note that 2008 scores for Cohort B were prior to any student computers being released, and 2009 scores are after computers have only been in the classroom for less than one semester.

The data used for these analyses come from the EVAAS data from SAS. A SAS analytical consultant ran the analyses for the evaluation team since they have access to the current 2009 data at this time. All results presented below, including the state averages, are those from the EVAAS data set provided by DPI. Only the first time a student takes a test in their high school in a given semester included in this data. Thus, no scores from middle school are included in this data. In essence, the Math scores will be lower than what is reported for AYP since are only including students who take EOC’s in the project schools and comparison schools. In addition, scores are reported to SAS without an attendance filter, thus all students taking a test are included in the analysis.

Mathematics Cohort A EOC scores. When all other variables in the analysis were considered to be equal, membership in a 1:1 school vs. a comparison school significantly predicted the odds of passing mathematics EOC exams. These analyses looked specifically at Algebra I, Algebra II, and Geometry. In 2008, students in 1:1 schools were 31% less likely to pass the Algebra I EOC than students at non-1:1
schools. In 2009, students in 1:1 schools were only 11% less likely to pass the Algebra I exam EOC than students at non-1:1 schools. For Algebra II, students in 2008 were 23% less likely to pass the EOC, whereas in 2009, students were 26% less likely to be proficient EOC than students at non-1:1 schools. In 2008, students in 1:1 schools were 17% less likely to pass Geometry EOC than students at non-1:1 schools, yet 1:1 students were only 7% less likely to pass in 2009.

Mathematics Cohort B EOC scores. When all other variables in the analysis were considered to be equal, membership in a 1:1 school vs. a comparison school significantly predicted the odds of passing mathematics EOC exams. These analyses looked specifically at Algebra I, Algebra II, and Geometry. In 2008, students in 1:1 schools were 12% more likely to pass the Algebra I EOC than students at non-1:1 schools. In 2009, students in 1:1 schools were only 10% less likely to pass the Algebra I exam EOC than students at non-1:1 schools. For Algebra II, students in 2008 were 10% less likely to pass the EOC, whereas in 2009, students were 6% more likely to be proficient EOC than students at non-1:1 schools. There were no significant differences between Cohort B 1:1 schools and non-1:1 schools in Geometry EOC scores for 2008 or 2009.

English Cohort A EOC scores. When all other variables in the analysis were considered to be equal, students in 1:1 schools and comparison schools were equally as likely to pass the English I exam. In 2009, there was a slight decrease in scores, and students in 1:1 schools were 6% less likely to pass the English I EOC than students in non-1:1 comparison schools.

English Cohort B EOC scores. When all other variables in the analysis were considered to be equal, students in Cohort B 1:1 schools and comparison schools were equally as likely to pass the English I exam in 2008 and 2009.

Biology Cohort A EOC scores. When all other variables in the analysis were considered to be equal, students in a 1:1 school were 12% less likely to pass biology than students in non-1:1 comparison schools. In 2009, the likelihood of passing was very similar with 1:1 students being 11% less likely to pass biology.

Biology Cohort B EOC scores. When all other variables in the analysis were considered to be equal, students in Cohort B 1:1 schools were equally 7% more likely to pass the Biology EOC compared to students in non-1:1 school. However, in 2009 students in Cohort B 1:1 schools and comparison schools were equally as likely to pass the Biology exam.

Civics and Economics Cohort A EOC scores. When all other variables in the analysis were considered to be equal, students in a 1:1 school were 14% less likely to pass civics and economics as compared to students in non 1:1 comparison schools. The trend continued for civics and economics, with students being 12% less likely to pass civics and economics as compared to students in non 1:1 comparison schools.

Civics and Economics Cohort B EOC scores. When all other variables in the analysis were considered to be equal, students in Cohort B 1:1 schools and comparison schools were equally as likely to pass the Civics and Economics exam in 2008 and 2009.

US History Cohort A EOC scores. When all other variables in the analysis were considered to be equal, students in a 1:1 school were 17% less likely to pass US History compared to students in non-1:1 schools. In 2009, students in a 1:1 school were 19% less likely to pass US History compared to students in non-1:1 schools. This increase in less likelihood to pass comes not from decreases in passing rates for 1:1 schools, but an increase in proficiency in comparison schools. In reality, the proficiency rates at 1:1 schools remained the same across the two years.
US History Cohort B EOC scores. When all other variables in the analysis were considered to be equal, students in a 1:1 school were 9% less likely to pass US History compared to students in non-1:1 schools. In 2009, students in a 1:1 school were 8% less likely to pass US History compared to students in non-1:1 schools.

Tables 15-16 provide the percentage of students passing the EOC’s within each category for 2008 and 2009 Cohort A. The state passing rate is indicated. These passing rates may differ from those reported by DPI due to criteria adjustments made to report passing scores, such as passing a test in 8th grade or being in the school for 140 days. The EVAAS system does not have access to the number of days a student has been at the school in which they are tested.

Table 15. Percent passing 2007-2008 EOC for 1:1 traditional vs. non-1:1 traditional, 1:1 EC vs. non-1:1 EC for Cohort A schools.

<table>
<thead>
<tr>
<th>EOC</th>
<th>State</th>
<th>1:1 Trad</th>
<th>non-1:1 Trad</th>
<th>1:1 EC</th>
<th>non-1:1 EC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algebra I</td>
<td>64.28</td>
<td>37.67</td>
<td>80.86</td>
<td>74.27</td>
<td>83.96</td>
</tr>
<tr>
<td>Algebra II</td>
<td>66.73</td>
<td>56.09</td>
<td>92.53</td>
<td>72.73</td>
<td>76.56</td>
</tr>
<tr>
<td>Biology</td>
<td>67.80</td>
<td>59.26</td>
<td>72.16</td>
<td>76.86</td>
<td>84.62</td>
</tr>
<tr>
<td>Civics</td>
<td>67.98</td>
<td>58.08</td>
<td>69.54</td>
<td>78.88</td>
<td>85.99</td>
</tr>
<tr>
<td>English I</td>
<td>72.53</td>
<td>71.39</td>
<td>75.86</td>
<td>93.77</td>
<td>91.29</td>
</tr>
<tr>
<td>Geometry</td>
<td>67.30</td>
<td>59.82</td>
<td>83.49</td>
<td>72.66</td>
<td>82.41</td>
</tr>
<tr>
<td>US History</td>
<td>65.97</td>
<td>62.02</td>
<td>72.99</td>
<td>68.60</td>
<td>87.50</td>
</tr>
</tbody>
</table>

Table 16. Percent passing 2008-2009 EOC for 1:1 traditional vs. non-1:1 traditional, 1:1 EC vs. non-1:1 EC for all EOCs for Cohort A schools.

<table>
<thead>
<tr>
<th>EOC</th>
<th>State</th>
<th>1:1 Trad</th>
<th>non-1:1 Trad</th>
<th>1:1 EC</th>
<th>non-1:1 EC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algebra I</td>
<td>66.59</td>
<td>36.39</td>
<td>60.73</td>
<td>80.22</td>
<td>84.38</td>
</tr>
<tr>
<td>Algebra II</td>
<td>71.96</td>
<td>61.09</td>
<td>92.35</td>
<td>74.91</td>
<td>81.40</td>
</tr>
<tr>
<td>Biology</td>
<td>70.51</td>
<td>61.38</td>
<td>78.95</td>
<td>86.88</td>
<td>88.86</td>
</tr>
<tr>
<td>Civics</td>
<td>70.50</td>
<td>57.07</td>
<td>72.87</td>
<td>83.00</td>
<td>89.85</td>
</tr>
<tr>
<td>English I</td>
<td>73.28</td>
<td>64.66</td>
<td>77.91</td>
<td>93.87</td>
<td>93.20</td>
</tr>
<tr>
<td>Geometry</td>
<td>72.69</td>
<td>62.50</td>
<td>76.19</td>
<td>83.79</td>
<td>84.91</td>
</tr>
<tr>
<td>US History</td>
<td>70.71</td>
<td>59.44</td>
<td>77.24</td>
<td>70.59</td>
<td>83.77</td>
</tr>
</tbody>
</table>

Table 17 and Table 18 provide the percentage of students passing the EOC’s within each category for Cohort B. The state passing rate is provided for each subject, using the EVAAS data. These passing rates may differ from those reported by DPI due to criteria adjustments made to report passing scores, such as passing a test in 8th grade or being in the school for 140 days. The EVAAS system does not have access to the number of days a student has been at the school in which they are tested. The 2008 data for the year prior to the implementation of 1:1 and the 2009 data is for the first year of implementation, with students receiving the laptops during the spring semester.

Table 17. Percent passing 2007-2008 EOC for 1:1 traditional vs. non-1:1 traditional Cohort B schools.

<table>
<thead>
<tr>
<th>EOC</th>
<th>State</th>
<th>1:1 Trad</th>
<th>non-1:1 Trad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algebra I</td>
<td>64.28</td>
<td>57.18</td>
<td>55.21</td>
</tr>
<tr>
<td>Algebra II</td>
<td>66.73</td>
<td>70.11</td>
<td>82.08</td>
</tr>
<tr>
<td>Biology</td>
<td>67.80</td>
<td>65.77</td>
<td>70.31</td>
</tr>
<tr>
<td>Civics</td>
<td>67.98</td>
<td>70.13</td>
<td>77.55</td>
</tr>
<tr>
<td>English I</td>
<td>72.53</td>
<td>71.87</td>
<td>77.26</td>
</tr>
<tr>
<td>Geometry</td>
<td>67.30</td>
<td>63.41</td>
<td>73.96</td>
</tr>
</tbody>
</table>
Table 18. Percent passing 2008-2009 EOC for 1:1 traditional vs. non-1:1 traditional Cohort B schools.

<table>
<thead>
<tr>
<th>EOC</th>
<th>State</th>
<th>1:1 Trad</th>
<th>non-1:1 Trad</th>
</tr>
</thead>
<tbody>
<tr>
<td>US History</td>
<td>65.97</td>
<td>56.35</td>
<td>69.39</td>
</tr>
</tbody>
</table>

Figure 71 to Figure 77 provide a pictorial representation of the 2008 and 2009 EOC scores for Cohorts A and B.

Figure 71. Algebra I 2008-2009 proficiency rates for 1:1 Trad Cohort A; 1:1 EC Cohort A; and 1:1 Trad Cohort B.
Figure 72. Algebra II 2008-2009 proficiency rates for 1:1 Trad Cohort A; 1:1 EC Cohort A; and 1:1 Trad Cohort B.

Figure 73. Biology 2008-2009 proficiency rates for 1:1 Trad Cohort A; 1:1 EC Cohort A; and 1:1 Trad Cohort B.
Figure 74. Civics and Economics 2008-2009 proficiency rates for 1:1 Trad Cohort A; 1:1 EC Cohort A; and 1:1 Trad Cohort B.

Figure 75. English I 2008-2009 proficiency rates for 1:1 Trad Cohort A; 1:1 EC Cohort A; and 1:1 Trad Cohort B.
Many administrators and teachers agreed that it is still too early to tell if the laptops are affecting test scores, since most of these projects have only been in full implementation for a single school year.

[Teacher] I think it’s probably too early to tell, I think that will be something that would show up in maybe a 2, 3, 5-year trend, and I don’t know - the only data that I can compare that to is EOC scores from one year to the next.

**SAS Value Added Assessments**

Since the 2005-2006 school year, SAS® EVAAS® has provided value-added analyses for all public schools in the state of North Carolina (Sanders, 2006). The value-added analyses follow the progress of individual students over time and measure each school’s educational influence on its students’ academic progress, as compared to all schools in the state. The EVAAS school effect is considered to be a value-
added metric. By definition, an average school has a school effect of 0.0. A school with an effect greater than 0.0 would be considered more effective than the average school while a school with an effect less than 0.0 would be considered less effective than the average school.

In Figure 78 the 2009 Algebra I school effects for all schools in the state are plotted as black dots, with a vertical line extending above and below each dot. The vertical line length represents the school effect plus or minus two standard errors. The 1:1 Pilot High Schools are highlighted on the plot in red, while the Comparison High Schools are highlighted in blue. Figures 79 to 84 show similar plots for the other End of Course subjects.

For most subjects, the school effects for the 1:1 Pilot High Schools and Comparison High Schools are spread across the range of school effects. In other words, there are 1:1 schools and Comparison schools at the low, middle, and high ends of the distribution in terms of effectiveness. However, it is interesting to note that the 1:1 Pilot High Schools tend to have high value-added effects for End of Course English I. Five of the eight 1:1 Pilot High Schools are in the upper end of the distribution, while only two are in the lower end. In contrast, for End of Course US History, six of the eight 1:1 Pilot High Schools are in the lower end of the distribution, while only one is in the upper end.

---

1 A standard error specific to each school effect is also reported. The standard error is a function of the quantity and quality of longitudinal student test data available for the students taught at the school.
Figure 78. EVAAS 2009 school effect estimates for 1:1 Trad Cohort A; 1:1 EC Cohort A; and 1:1 Trad Cohort B vs. their comparison schools for EOC Algebra I.
Figure 79. EVAAS 2009 school effect estimates for 1:1 Trad Cohort A; 1:1 EC Cohort A; and 1:1 Trad Cohort B vs. their comparison schools for EOC Algebra II.

NOTE: Black lines represent all schools that taught this subject in the state distribution.
NOTE: Red lines represent 1:1 Pilot High Schools.
NOTE: Blue lines represent Comparison High Schools.
NOTE: Each line represents the school estimate plus or minus 2 standard errors.
Figure 80. EVAAS 2009 school effect estimates for 1:1 Trad Cohort A; 1:1 EC Cohort A; and 1:1 Trad Cohort B vs. their comparison schools for EOC Biology.

NOTE: Black lines represent all schools that taught this subject in the state distribution.
NOTE: Red lines represent 1:1 Pilot High Schools.
NOTE: Blue lines represent Comparison High Schools.
NOTE: Each line represents the school estimate plus or minus 2 standard errors.
Figure 81. EVAAS 2009 school effect estimates for 1:1 Trad Cohort A; 1:1 EC Cohort A; and 1:1 Trad Cohort B vs. their comparison schools for EOC Civics and Economics.
Figure 82. EVAAS 2009 school effect estimates for 1:1 Trad Cohort A; 1:1 EC Cohort A; and 1:1 Trad Cohort B vs. their comparison schools for EOC English I.

NOTE: Black lines represent all schools that taught this subject in the state distribution.
NOTE: Red lines represent 1:1 Pilot High Schools.
NOTE: Blue lines represent Comparison High Schools.
NOTE: Each line represents the school estimate plus or minus 2 standard errors.
Figure 83. EVAAS 2009 school effect estimates for 1:1 Trad Cohort A; 1:1 EC Cohort A; and 1:1 Trad Cohort B vs. their comparison schools for EOC Geometry.

NOTE: Black lines represent all schools that taught this subject in the state distribution.
NOTE: Red lines represent 1:1 Pilot High Schools.
NOTE: Blue lines represent Comparison High Schools.
NOTE: Each line represents the school estimate plus or minus 2 standard errors.
Figure 84. EVAAS 2009 school effect estimates for 1:1 Trad Cohort A; 1:1 EC Cohort A; and 1:1 Trad Cohort B vs. their comparison schools for EOC US History.

NOTE: Black lines represent all schools that taught this subject in the state distribution.
NOTE: Red lines represent 1:1 Pilot High Schools.
NOTE: Blue lines represent Comparison High Schools.
NOTE: Each line represents the school estimate plus or minus 2 standard errors.
(Summary) Evaluation Question 4: How have student learning and achievement in core academic subjects changed over time?

Student Learning Outcomes Summary

- **Student Attendance.** Analysis of attendance data showed overall high rates of attendance at each of the 1:1 pilot high schools and comparison schools for the past two years. Student attendance rates across 1:1 schools and their comparisons for the 2006-07 and 2007-08 school years were all very high (above 90%) and remained virtually unchanged over the two-year period.

- **Student Participation on Online Courses.** Another student outcome of interest to stakeholders was the number of students participating in online courses. Data gathered from the surveys revealed a small percentage, between 10-20%, of students self-reported being involved with online teaching and learning, while no teachers reported teaching online courses.

- **Student Engagement.** Survey results indicated that staff at the 1:1 schools generally agreed (about 80% of 1:1 EC teachers and about 65% of 1:1 Traditional teachers) that the use of laptops for teaching and learning increased student engagement. Likewise, students generally agreed that the more teachers use laptops/computers the more they are interested in and enjoy school. School visits in the spring 2009 semester found an increase in the frequency of observations in which all the students in the classroom showed a positive indicator of engagement such as sustained behavioral involvement, positive emotional tone, and exertion of effort and concentration. In focus group interviews, students, teachers and administrators at 1:1 schools were asked whether they believed that laptops had impacted student motivation and engagement. Despite some concerns about students’ tendency to be distracted by nonacademic uses for the computers, the responses were overwhelmingly positive. Both teachers and administrators noted that students seemed more engaged and on-task than they had been before they had the laptops.

- **Student 21st Century Skills.** Teachers in the 1:1 schools indicated that their students use technology at least weekly to complete tasks related to 21st century skills. More than half of all 1:1 students surveyed indicated agreement or strong agreement that use of a laptop/computer at their school helps them to develop key 21st century skills. During focus group discussions, students, teachers, and administrators all agreed that using laptops in school now will help students as they enter the workforce, helping to teach students responsibility, self-direction, communication skills, creativity and problem-solving, information literacy skills, and collaboration.

- **NC Computer Skills Test.** Ninth grade students at 1:1 schools made greater gains where a greater percentage of incoming freshmen in the non-1:1 schools had passed the computer skills test than those in the 1:1 schools, and by the end of the year the percentages were nearly equal. Additionally, looking across all ethnic subgroups, a larger percentage of 1:1 EC Cohort A students demonstrated proficiency on the computer skills test by the end of grade nine than non-1:1 EC Cohort A students.

- **EOCs.** Binary logistic regression was used to determine the probability of passing the 2007-2008 and 2008-2009 school year Algebra I, Algebra II, Geometry, English I, Civics, US History, and Biology end-of-course (EOC) exams based upon membership in a 1:1 school. Analysis showed that for most EOC tests, attending a 1:1 school did not increase the likelihood of passing the state standardized test. Many of the 1:1 schools did show an increase in the percentage of students passing when comparing 2008 results to 2009. Additionally SAS EVAAS analysis revealed that the 1:1 schools tended to have high value-added effects for EOC English I in 2009.

This report presented the evaluation of progress at the end of the second year in the planned three-year evaluation. These pilot schools, including seven Early College (EC) high schools and five large traditional high schools, continue to build on the critical components of an effective 1:1 computing environment.
References


