

# Results from North Carolina's 1:1 Learning Initiative Pilot

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## Abstract

This evaluation study utilized a mixed methods approach to evaluate the implementation of a one-to-one (1:1) learning initiative across eight high schools. A combination of teacher and student surveys, focus groups and interviews, classroom observations, and analyses of existing school-level data was used. This study is part of a larger longitudinal project, and the goal of this paper is to present initial findings from the first year of the initiative. This paper shares the progress toward implementation of a 1:1 environment, identification of challenges to the successful implementation of 1:1 programs, strategies for meeting those challenges, and services and supports needed to enable successful 1:1 programs.

## Introduction

Research (Muir, Manchester, & Moulton, 2005) has identified important features that define a successful 1:1 learning environment in schools. These include providing every student and teacher with portable laptop computers with up-to-date software and access to the Internet through wireless networks at school (Penuel, 2006); and, a focus on using laptops for teaching and learning to meet certain goals (Bonifaz & Zucker, 2004) such as increased equity of access to technology, transformed quality of instruction, increased student engagement, improved academic achievement and technology literacy, increased economic competitiveness, and enhanced home-school connections.

Implementing successful 1:1 learning environments requires careful consideration of numerous supportive factors. Bonifaz and Zucker (2004) provide a summary of lessons learned about implementing 1:1 computing gathered from initiatives across several states. The lessons are organized in five categories: planning, training and professional development, hardware and software considerations, managing change, and monitoring and evaluation. Planning includes steps such as aligning the laptop initiative with school goals; building leadership teams at the local, district, and state levels; developing partnerships within and beyond the school system; considering sources for long-term funding; and being mindful of logistical details. Training and professional development should focus on technology integration instead of solely emphasizing technology skills. Hardware and software considerations involve providing necessary digital content and tools, building and maintaining infrastructure, and guaranteeing access to both onsite and offsite technical support. Managing change includes ensuring adequate time for implementation and making adjustments gradually. Monitoring and evaluation should be an ongoing part of laptop initiatives.

### *Background*

Schools across our nation face a number of challenges in their efforts to provide a 21<sup>st</sup> century education for our students. Among the challenges in education is the need to maintain traditional strengths and cultural roles of schools, while embracing and encouraging innovative approaches to teaching and learning. We must also help students develop skills that will enable them to be competitive

in a global market. In as much, schools must be provided with 21<sup>st</sup> century leadership, management, and tools to support and fully utilize information and communication technologies. In essence, educators must create future-ready schools that prepare future-ready students.

A central tenet of the 1:1 initiative under 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 (a) providing a laptop computer for every student and teacher; (b) ensuring broadband connectivity with wireless access at participating schools; (c) preparing teachers to use technology to enhance teaching and learning; (d) providing and supporting other technology resources; (e) integrating 21<sup>st</sup> century skills into the curriculum; (f) facilitating effective leadership and community support; and, (g) developing and implementing policies that support future-ready teaching and learning.

In the spring of 2008, the State Board of Education awarded a contract to a research institute at a large public university in the southeastern United States to conduct a 3-year evaluation of a 1:1 pilot initiative in eight high schools reaching approximately 2,000 students and 200 school staff.

The focus of this evaluation study was two-fold: to examine the extent to which the eight pilot schools implemented the 1:1 initiative strategies and achieved the 1:1 project objectives; and, to inform local and state decision-makers on future technology policy and funding. To achieve this, we followed seven Early College High Schools (ECHSs) implementing 1:1 computing, seven matched comparison ECHSs not implementing 1:1 computing, one large traditional high school implementing a 1:1 environment, and a matched traditional comparison school.

This school-based evaluation has three broad focus questions by year. In year 1, are school leaders, teachers, students, and parents ready to utilize laptops in instruction, and what implementation issues impact their readiness? In year 2, is classroom instruction changing? In year 3, what are the achievement outcomes of the initiative, and is the environment sustainable?

The purpose of the current report is to disseminate findings from the first year of implementation of the 1:1 initiative with an emphasis on the barriers, successes, and lessons learned during the early stages of transitioning to 1:1 computing.

## Results

This study is part of a larger longitudinal project, and the goal of this paper is to present initial findings from the first year of the initiative. This paper shares the progress toward implementation of a 1:1 environment, identification of challenges to the successful implementation of 1:1 programs, strategies for meeting those challenges, and services and supports needed to enable successful 1:1 programs.

The implementation of the 1:1 initiative proceeded on different timelines for the traditional high school and the ECHSs. In the traditional school, teachers received their laptops in March 2007 and received professional development during the spring and summer of 2007. The technology and support infrastructure was also put into place during that same time period—installing the wireless network, imaging (i.e., loading standard software onto) the student laptops, hiring support personnel, developing policies, et cetera; so that the school was ready to distribute laptops to the 1,266 students in September 2007. The ECHSs gave teachers laptops and professional development in November 2007, and then schools worked to get the technology infrastructure, personnel, and policies in place. Informational sessions were held for parents, and laptops were distributed to students during March and April 2008. This implementation schedule created a great deal of pressure for the ECHSs and made the first year of the implementation much more challenging, when compared to the approach the traditional school was able to take. One clear recommendation is that schools should have at least 6 months planning and preparation time before distributing laptops to students. Furthermore, it is best if this can be done during the prior school year, so that teachers can plan for students to receive their laptops at the start of the new school year.

### Preparing for a 1:1 Environment

Much of the information in this section pertains to the ECHSs only, since the traditional high school had its infrastructure and technology staffing in place before the start of the evaluation.

#### *Connectivity to the School*

The 1:1 ECHSs underwent a technology evaluation that assessed their current infrastructure and made recommendations on how to move forward on upgrades and connectivity. Two of the schools

already had connectivity to their LEA wide area network. Each of the other sites secured metro-Ethernet connections from their preferred providers. This connection was brought to the community college campus to offset the additional bandwidth load created by the 1:1 laptop initiative, and to link students to the resources of their LEA and the state's Research and Education Network. In particular, one school in the western part of the state serves as a model for the future connectivity planning. The community college and the LEA were both part of the Western Educational Network and the state's Research and Education Network, which allowed network traffic to be logically separated without adding an additional connection.

#### *Wireless Network*

Wireless access points were added to the schools that did not already have them. One ECHS already had wireless coverage in the dedicated high school portion of the site, and another ECHS was in the process of installing wireless before this project was announced. Meetings were held with community college officials to ensure that the community college and high school networks would not interfere with each other. LEAs and community colleges were encouraged to interconnect their networks so students had network access while in college courses. Many LEAs chose not to take this approach, therefore leaving many students "stranded" while in their college courses. This remains a problem to be resolved so that ECHS students can use their computers while attending college courses. By the time student laptops were distributed, all but one of the ECHS schools had configured an adequate wireless network, meaning the teachers and students could access the school/district network while on the dedicated high school area of the campus. Due to some difficulties with a local Internet service provider, compounded by the age of the building, one ECHS was only able to provide access to the Internet in two classrooms.

#### *Hardware and Software Resources*

Lenovo and Apple were the laptop vendors for the ECHSs, selected through a bid process managed by the State Department of Public Instruction (DPI) and the New Schools Project (NSP). One school selected Apple Macbook computers, two selected Lenovo tablet PCs, and the other five ECHS schools received Lenovo laptops. The traditional high school selected Hewlett-Packard laptops for teachers and

students. All Windows-based districts received classroom management software, but after encountering many technical difficulties, one district has since decided to move to another classroom management solution starting with the 2008-2009 school year. Classroom management on the Apple laptops is done through Apple Remote Desktop. All schools received licenses for Microsoft Office, however one school has decided to move to OpenOffice as their school district moves toward 1:1 computing in all high schools in the 2008-2009 school year. All schools had access to the SAS Curriculum Pathways software under the state license. In addition to the Office Suite, districts installed their standard software loads on the laptops. Some schools also added additional educational software packages, such as Geometer Sketchpad, based on the focus of the ECHS.

### *School Policies and Procedures*

All schools in the 1:1 pilot enacted policies and procedures governing how the laptops were to be used. A survey of their policies and procedures showed that:

- All eight schools had acceptable use guidelines;
- All eight schools had guidelines for caring for the laptops;
- Six schools explicitly prohibited violent games and social networking sites;
- Six schools required original software to remain on the laptop and four schools prohibited students from installing anything on the laptop; three of these schools had random inspections to insure compliance;
- Seven schools collected insurance fees, ranging from \$10-\$50, from students;
- Seven schools allowed students to take their laptops home every day;
- Seven 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 get parental approval and commitment to support their children's use of the laptop;
- All eight schools required parental permission forms for students to receive a computer.

### *Professional Development*

During the 2007-2008 school year, a number of professional development experiences were available to teachers in the 1:1 pilot schools. The primary professional development offering consisted of a 2-day session for teachers grouped by content area (math, science, English/language arts, and social studies). At each of these sessions, the program included an introduction to the use of the computers and the classroom management software by the vendors, an introduction to the content-relevant SAS Curriculum Pathways software conducted by SAS staff, an introduction to other uses of technology in the content area by university faculty and staff of the research institute, and a visit to 1:1 classrooms at a local middle school or private school. In general, most teachers rated these professional development experiences as high quality, timely, meeting their needs, and furthering their understanding of integration of instructional technology into their classrooms. Some of the most valued topics included content-specific sessions focusing on project-based learning, managing change in the classroom, using the Internet in classroom instruction, new literacies, and student-generated content.

A one-day session was also provided for principals from the 1:1 pilot schools. This session introduced the use of the technology and ways in which it could be integrated into the classroom, as well as panel discussions with experienced principals from 1:1 schools about management and leadership issues. The 1:1 ECHS staff attended an additional day of training at the Summer Institute organized by the NSP focusing on special issues related to implementing a 1:1 project that included sessions on online literacy, NSP Instructional Objectives, lesson modeling, and fine-tuning of technology integrated lesson plans. Additional professional development was offered at the 1:1 schools by their technology facilitator or through the district technology staff. These sessions included training on calendar software, monitoring software, interactive whiteboard, Geometer's Sketchpad, iPhoto, Introduction to laptops and troubleshooting, Plato, video design and editing, podcasting, virtual learning environments, webpage design, and SAS Curriculum Pathways.

### *Technology Support Personnel*

In previous evaluations, such as the Project IMPACT Evaluation (Public Schools of North Carolina, 2005), we have consistently found that a skilled Technology Facilitator (TF) can provide significant

benefits to teachers and subsequently to students. An effective TF supports teachers' instructional needs related to technology by collaboratively developing technology-integrated lessons, modeling the use of technology for teaching and learning, and identifying useful digital resources to enhance lessons. This role is distinct from those of school-level technology directors or technicians who focus their efforts on addressing the school's technical needs— networking issues, troubleshooting hardware malfunctions, and acting as the liaison with district technology personnel. Five 1:1 schools identified and hired a TF by the end of the Fall 2007 semester. Two schools had some difficulty, but eventually found two local teachers with the appropriate mix of experience and interest to fill the role of TF during the Spring 2008 semester. One school took a unique approach and identified four lead teachers across the content areas to collectively act as TFs. Consistent with prior evaluation findings, the 1:1 teachers reported that TFs substantially assisted them in integrating their laptops into the curriculum.

#### Challenges and Recommendations

We conducted two site visits and one focus group with teachers and administrators at each of the eight schools, with a total of 71 participants in the focus groups. The focus group questions addressed the requirements necessary for a successful 1:1 program in the areas of management and technical infrastructure (including wireless network, hardware and software resources, and school procedures/policies), technology support personnel, professional development needs, and the use of the laptop by teachers and students leading to changes in instructional practices and student learning outcomes, as well as challenges and lessons learned. A series of challenges, needs, and recommendations emerged from the focus groups and interviews. The major findings are summarized in the following sections.

## Management and Technical Infrastructure

### *School Network*

- Some buildings were quite antiquated and needed to be retrofitted with the necessary electrical wiring to support the power needs of the laptops, projectors, whiteboards, printers, and other equipment.
- There was inconsistency in access to the wireless system across locations in some schools. Staff and students reported that the strength of the wireless system could be vastly different from room to room or within areas of a single room, which interferes with effective use of the laptops. Teachers noted that support staff could move or add wireless access points to address these problems effectively.
- In most cases, there was no space on the school-based or district-provided servers to support a virtual drive for storing student work. Students were instructed to save their work on flash drives or their laptop hard drive, which was not backed up on a regular basis. Teachers indicated that a central drive for students and teachers to save work and to back up important data is essential.

### *School Policy and Procedures*

- A major challenge reported by teachers was the limited battery life and the lack of easily accessible outlets for charging. Outlets were not easily accessible from student and teacher desks or workstations, and teachers cited safety concerns when power cords had to run across the classroom floor. Staff and students complained about a lack of outlets to charge laptops and suggested having charging carts available at school to address this issue, in addition to adding more outlets.
- Staff raised issues of security and storage for laptops when students are at school. Also identifying a reliable, easy-to-use tracking system for the laptops.

### *Process for Rollout*

- Teachers often expressed frustration at the timing of the laptop distribution, particularly where receipt of the laptops did not coincide with professional development in using them. Lack of sufficient training prior to receiving the laptops meant one of the biggest barriers was general lack of knowledge and familiarity with laptops, software, and Internet resources. A principal suggested that

“teachers get [the laptops] before school ends, they get all summer with the laptops to do professional development, and then students get them in the fall when they get back - that’s definitely the ideal.”

In considering future 1:1 computing programs, teachers and administrators agreed that it would be desirable to have extensive professional development *prior* to utilization of the laptops in the classroom.

- Building commitment to the project from everyone involved, including teachers, parents, students, community members, the community college, and district personnel is vital to successful project implementation and sustainability. Some teachers were concerned about a lack of buy-in from staff due, in part, to a lack of clear vision or understanding about the purpose of the project. One teacher said, “I think we really need more of a vision of what we want to do year one, year two. ...This is what is going to happen, consequences, action plan, deadlines, things like that.”
- Students suggested providing before or after school training to students about use of the laptop and various hardware, software, or digital resources; maintaining and keeping laptops up to date; and troubleshooting techniques.

#### *Laptop Care*

- In some instances, a significant barrier was having one or more students in a class without a laptop due to maintenance, forgetfulness, or (in some schools) their family not paying the required insurance or other fee. Teachers suggested that schools should purchase loaner laptops for students to borrow so they can plan for all students to have laptops available during each class.
- Teachers mentioned that their students seemed over-burdened with backpacks, laptop cases, purses, et cetera. Most of these schools did not have lockers available for students so there are some issues with students safely storing laptops during breaks (e.g., lunch). Limited access to the laptops for some of the students was a constant concern due to maintenance, repair, discipline, or neglecting to bring laptops to class. One student suggested an option could be “a [laptop] case that rolls for people who have a hard time carrying it because of all the weight of all my school supplies.” In addition, schools

might be able to eliminate the need for carrying textbooks and notebooks with electronic textbook adoption and adoption of easy-to-use software for note taking and organizing.

#### *Hardware and Software Resources Needed*

- Hardware, equipment, and supplies that support effective use of laptops for teaching and learning, including storage carts designed for battery recharging, additional batteries, interactive whiteboards with remote slates, projectors, printers/toner/paper, science-specific peripherals (e.g., digital microscopes and digital devices for measuring temperature, chemical composition, motion), web cameras, microphones, speakers, external hard drives, and flash drives.
- Software that supports effective use of laptops for teaching and learning, including online textbooks; video editing software; course management software (e.g., Blackboard and Moodle); content-specific software for math, science, foreign language, history, English, geography, grammar; student e-mail; TI calculator integrator; audio books; and, podcasting/video hosting capability.

#### Professional Development

During focus groups, teachers identified a large set of specific professional development needs, which included the following:

- Content -specific professional development on the use of technology to enhance teaching and learning in each core discipline (math, science, social studies, and English/language arts). Teachers recommended that this training introduce specific tools applicable to the subject area that prepare teachers to use technology to support project-based learning activities.
- Hands-on activities that provide opportunities for teachers to engage with the technology as learners themselves in order to help prepare them to incorporate the technology into their teaching. These activities should introduce basic technology skills as well as classroom uses of specific resources such as OneNote, SAS Curriculum Pathways, formative assessment tools, blogs, wikis, podcasts, digital video tools, GoogleEarth, Geometer's Sketchpad, course management systems (e.g., Moodle and Blackboard), and content-specific, web-based resources.

- Instructional strategies to help them address students' multiple learning styles with the laptops and create a paperless classroom.
- Lesson planning sessions that provide guidance and time to develop classroom activities that integrate curriculum content and technology. Teachers recommended that these sessions focus on real-world applications and enable teachers to work together.
- Site visits to 1:1 classrooms and interactions with teachers who have experience teaching in 1:1 environments.
- Assessment with technology including tools for planning, developing, creating, storing, and assessing e-portfolios.
- Level of professional development to address teachers at different degrees of fluency with technology and experience integrating technology into the curriculum.
- Classroom management and policy issues including acceptable use, student safety, cyber-bullying, copyright, laptop storage, battery charging, and technology to monitor student use.
- Opportunities to interact and collaborate with other teachers to share best practices, lessons learned, and effective resources for the use of laptops in given content areas, and with different students' learning styles.
- On-going support through social networks that allow teachers to communicate with other 1:1 teachers in their subject area and share lessons, resources, and experiences.
- Teachers felt they were expected to implement dramatic changes to their instructional practices and lessons, but were not provided time to plan to do so. They expressed a need for planning time to build their technology skills with the new hardware and software, locate resources, collaborate with other teachers to build cross-curricular lessons and projects, and create new lessons that effectively integrate technology.

Note that the professional development opportunities provided during the first year of implementation began to address many of these needs, but the teachers found that the time available was too limited and

that professional development needed to be ongoing in order to address the full range of elements required to ensure success of the 1:1 programs.

#### Technology Support Personnel

- As mentioned earlier, in previous evaluations, such as for Project IMPACT, we have found that a skilled Technology Facilitator can have significant benefits to teachers and subsequently to students. Consistent with this prior finding, the 1:1 teachers reported that Technology Facilitators substantially assisted them in integrating their laptops into the curriculum and that having time with a Technology Facilitator available on a regular basis is an important support for teachers integrating technology into classroom practices.
- Although most staff and students recognized that their technology support personnel were working hard, a large number of comments indicated that the overall support they received this first year was inadequate.
- Some schools have found that creating a “Student Technology Team” that addresses minor troubleshooting issues during the school day can be effective and enable the professional technology support staff to focus on the more complex problems.

#### Student Recommendations

Students were eager:

- To utilize their laptops every day in every class;
- For increased access to engaging educational websites and digital resources and games;
- For studying assistance (test prep software and textbook electronic resources);
- For more opportunities to interact with their peers using the computer for class (for group projects, collaborative lessons, and research projects); and
- For each teacher to have a website for their courses where students could go for announcements, links to course-specific websites, downloading presentations and notes, and submitting assignments.

## Discussion

In the first year these schools appear to have implemented the critical building blocks of an effective 1:1 computing environment. Teachers received professional development in important areas and had time to acclimate to their laptops before students received theirs; school infrastructures, policies, and staff were put into place; parents were informed about the 1:1 initiative and agreed to their responsibilities; students appear to have been relatively well prepared to receive and use their laptops; technology facilitators played an important role in helping teachers integrate these new technologies into the instructional life of the classroom; and students and teachers have begun using the computers in a wide variety of ways to support teaching and learning.

With this progress, many lessons have been learned that can inform other school and districts that may implement 1:1 environments in the future. The largest overall lesson is that *laying the groundwork for students to receive their laptops takes time*. Preparing teachers to integrate the technology into instruction and preparing all the other essentials for a successful 1:1 initiative (e.g., getting the wireless infrastructure in place, developing the needed policies and preparing for their implementation and enforcement, engaging parents, hiring technology facilitators and technicians, and acquiring the necessary software and hardware to go with the laptops) needs to be done before a school is ready to distribute student laptops. Teachers and administrators agreed it would be best to plan to distribute student computers at the start of a school year, so the planning and preparation have to begin during the prior school year.

## Figures

Figure 1

Percent of 1:1 ( $n = 47$ ) and non-1:1 ( $n = 28$ ) ECHS teachers reporting daily use of computers for various planning activities.

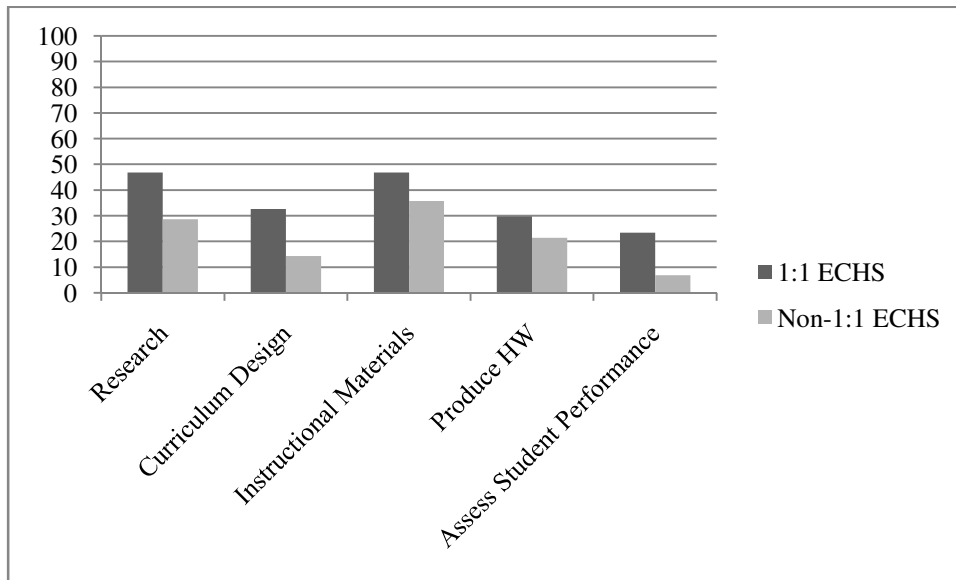


Figure 2

Percent of 1:1 ( $n = 47$ ) and non-1:1 ECHS ( $n = 28$ ) teachers reporting daily use of computers for various instructional activities.

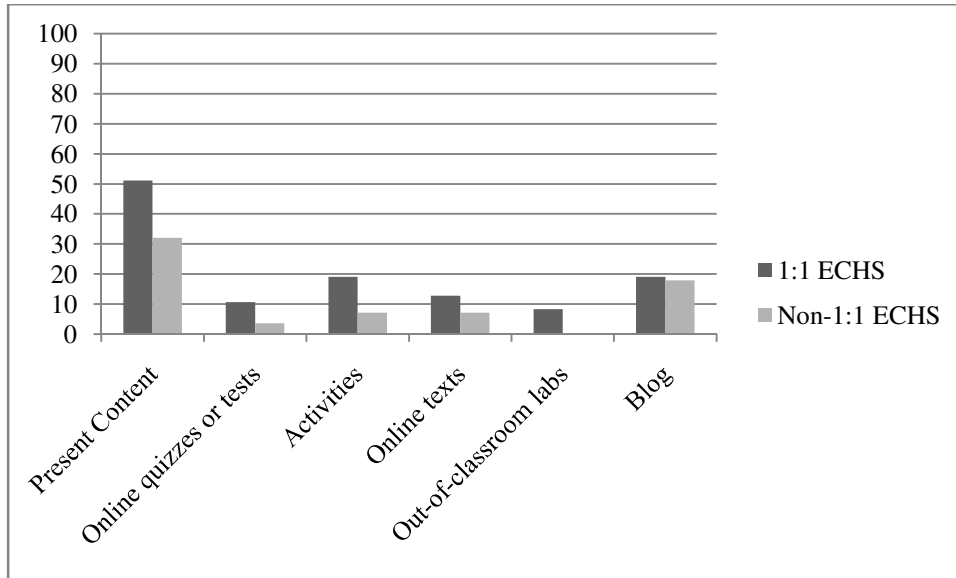


Figure 3

Percent of 1:1 ( $n = 42$ ) and non-1:1 ( $n = 102$ ) traditional high school teachers reporting daily use of computers for various planning activities.

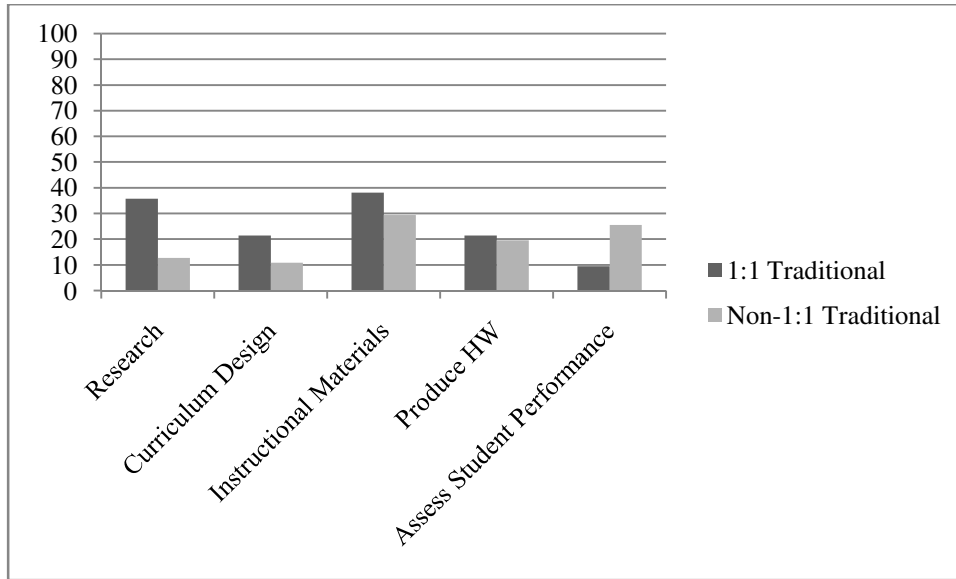


Figure 4

Percent of 1:1 ( $n = 42$ ) and non-1:1 ( $n = 102$ ) traditional high school teachers reporting daily use of computers for various instructional activities

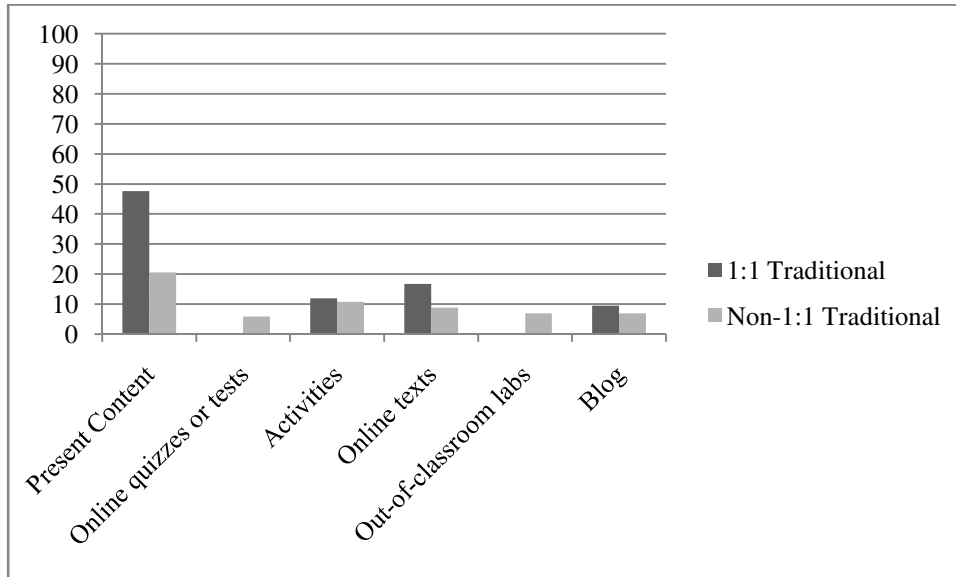


Figure 5

Percent of 1:1 ( $n = 756$ ) and Non-1:1 ( $n = 860$ ) ECHS students reporting daily use of computers in the core content courses.

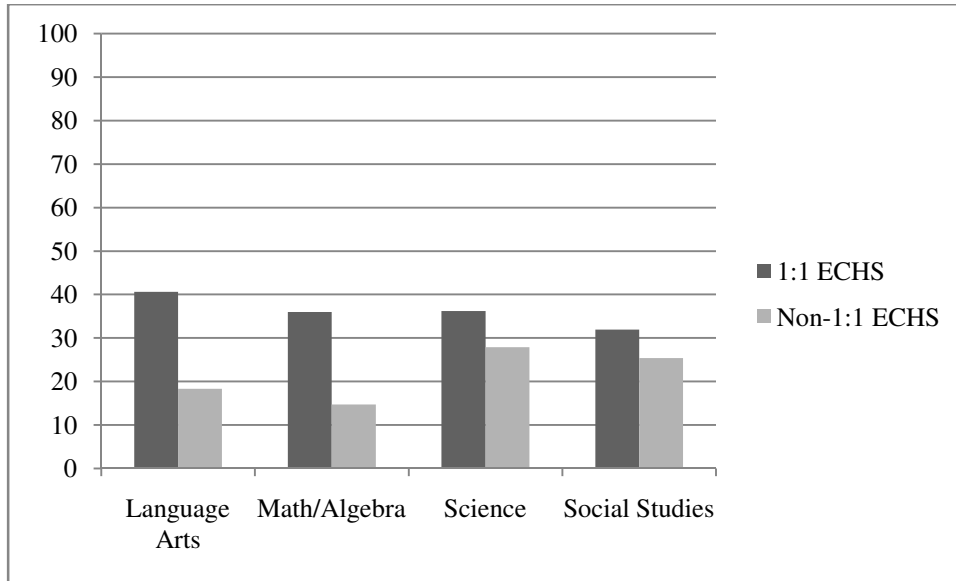


Figure 6

Percent of 1:1 ( $n = 529$ ) and non 1:1 ( $n = 81$ ) traditional high school students reporting daily use of computers in the core content courses.

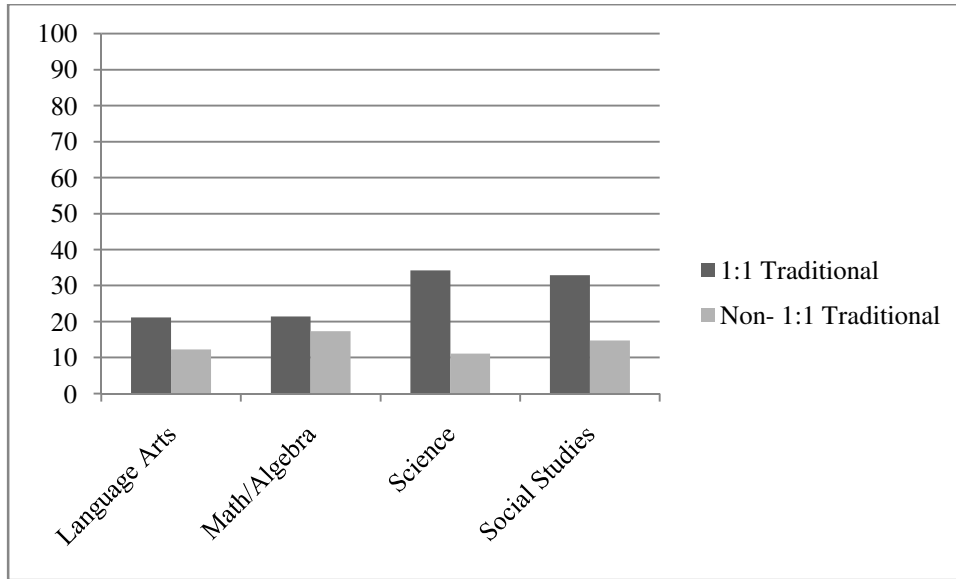


Figure 7

Percent of 1:1 ( $n = 768$ ) and Non-1:1 ( $n = 856$ ) ECHS students reporting using computers in various learning activities.

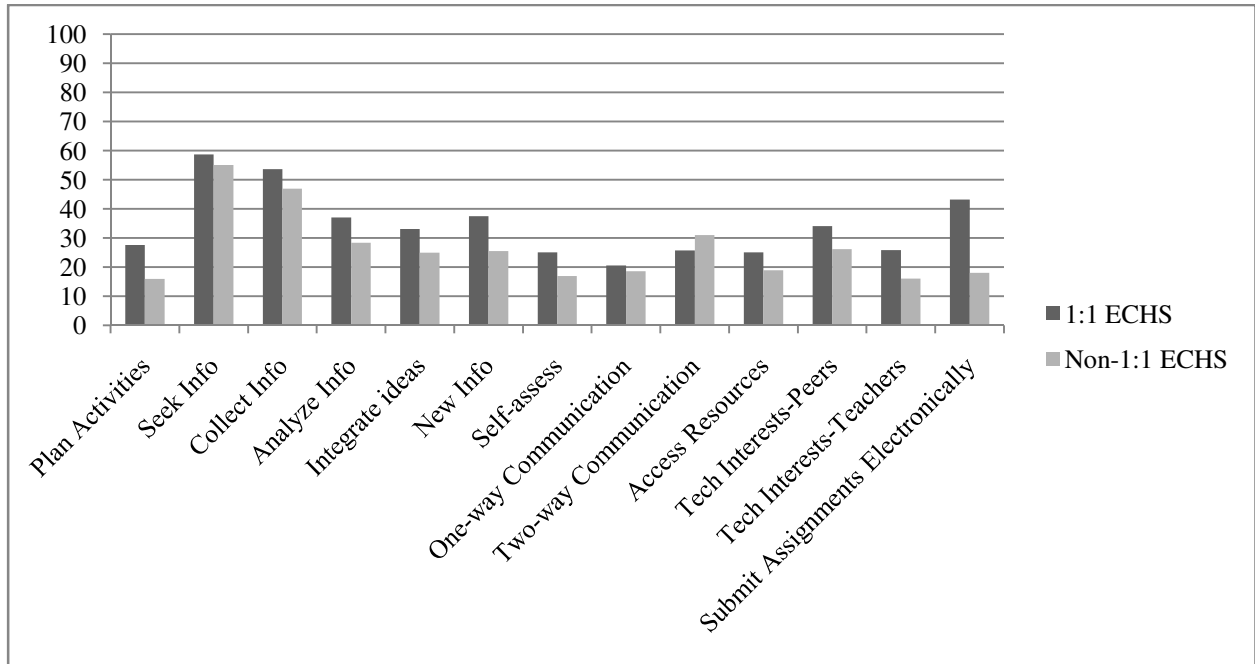
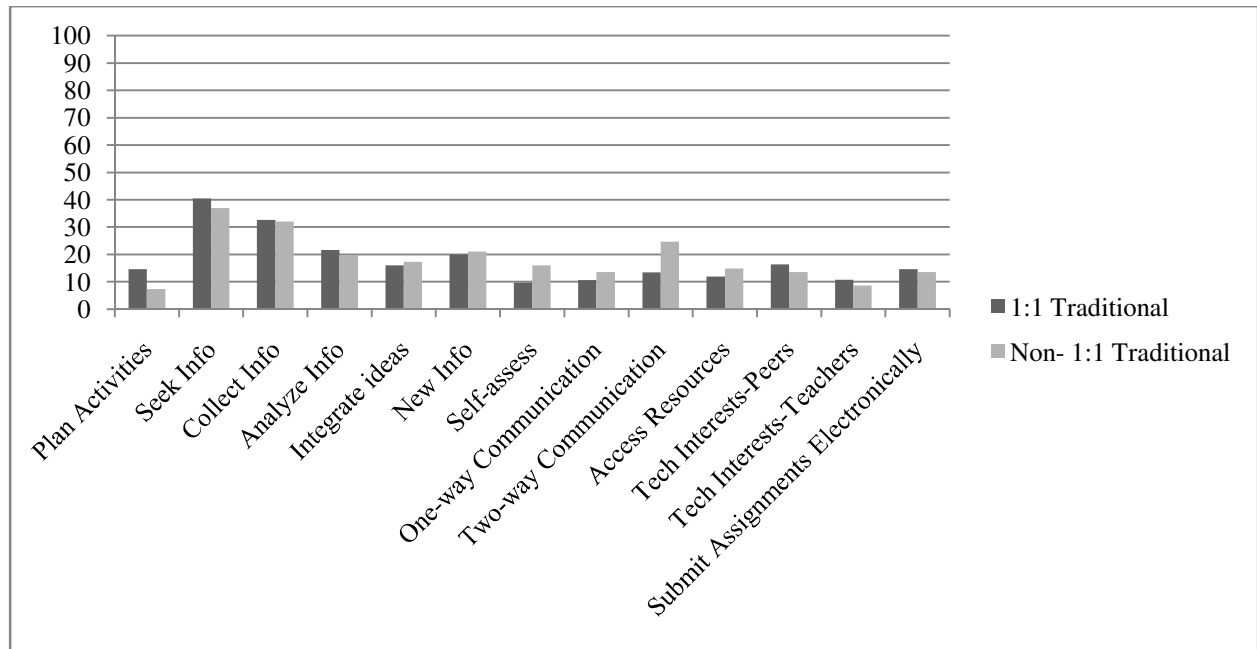


Figure 8

Percent of 1:1 ( $n = 536$ ) and non-1:1 ( $n = 81$ ) traditional high school students reporting using computers in various learning activities.



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