EMPOWERING TECHNOLOGY:

An Evaluation of the Project Lighthouse Program

A joint venture of Wake Education Partnership
& the Wake County Public School System

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An initiative of Wake Education Partnership and
the Wake County Public School System

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TABLE OF CONTENTS

Evaluation Highlights 5

Program Rationale and Overview 7

Summary of Evaluation Plan 9

Summary of Evaluation Results 10

Conclusions 47

References 49

Appendix A 50

Appendix B 50

PROJECT LIGHTHOUSE EVALUTION REPORT ABSTRACT

APRIL 2004

An evaluation of the Project Lighthouse technology program at Southeast Raleigh High School (SRHS) revealed that teachers, students and parents at SRHS report using technology more often, and in qualitatively different ways, than their counterparts at other high schools. An analysis of student achievement data, however, failed to find differences between SRHS and a matched comparison group of students. This may be due to the fact that enough time has not elapsed to detect differences in student performance, or that the types of academic data collected for this evaluation do not reflect the benefits to student learning which technology may provide.

PROJECT LIGHTHOUSE EVALUATION HIGHLIGHTS

APRIL 2004

Technology's Impact on Student Achievement:

1. No significant difference was observed between SRHS and Comparison Group students on:
   - End-of-Course tests required for graduation;
   - percentage of students taking Advanced Placement (AP) exams and AP scores; and
   - Scholastic Assessment Test (SAT) verbal or mathematics performance.

Technology Access, Functioning and Monitoring:

1. Students at SRHS were significantly more likely than Comparison Group students to report:
   - having time and opportunity to use technology;
   - that technology is down or not working a lot;
   - classroom use of technology rather than lab/media center use;
   - using the school-provided email account; and
   - awareness of their school's Acceptable Use Policy regarding technology.
2. Teachers at SRHS were significantly more likely than Comparison Site teachers to report that:
   - technology functions correctly most of the time;
   - students have sufficient access to technology;
   - computer labs have adequate numbers of computers and software;
   - they use technology in the classroom more often than in labs or the media center;
   - technical support is available when needed; and
   - technical support is knowledgeable and effective.
3. The administrator at SRHS reported fewer students per computer and other technologies and more computers equipped with sophisticated technological tools (e.g., web page design, multimedia) than administrators at Comparison Sites.
4. Teachers, students and administrators at Comparison Sites report needing more technological resources and staff to support the technology in their school.

Technology and Communication:

1. Students at SRHS were significantly more likely than Comparison Group students to report that:
   - technology helps them communicate with other students, teachers and online experts;
   - that three or more of their teachers have web sites containing information for students and parents; and
   - their teachers use technology to communicate with students and parents.

2. Teachers at SRHS were significantly more likely than Comparison Site teachers to report:
   - that technology helps them communicate with other teachers, students and parents; and
   - that they maintain an up-to-date web site containing information for students and parents.
3. Parents of SRHS students were significantly more likely than Comparison Group parents to report:
   - Using technology to view student grades, discipline and attendance information.
4. Parents of SRHS students were more positive than Comparison Group parents that technology at their child's school had improved their ability to communicate with the school environment, although the difference was not statistically significant.

Frequency of Technology Use

1. Students at SRHS report significantly more frequent use of computers and other technological tools than Comparison Group students.
2. Teachers at SRHS report significantly more frequent use of technological tools than Comparison Site teachers, and that they are better able to integrate technology into their teaching in many ways.
3. Parents of SRHS students were more likely than Comparison Group parents to report their child uses sophisticated technologies such as web page and graphic design software.

Teachers' Skill and Professional Development with Technology

1. Teachers at SRHS rated their knowledge of computers and other technology significantly more positively than teachers at Comparison Sites.
2. Teachers at SRHS were significantly more likely to report intermediate or advanced skill with using tool software, course-specific software, web page design, graphic design, multimedia and handheld technologies than teachers at Comparison Sites.
3. Teachers at SRHS were significantly more likely to report having attained very strong professional growth in the area of technology than Comparison Site teachers.
4. No significant differences were found regarding number of hours of technology-related professional development, although SRHS teachers were more likely to report receiving mentoring, online assistance and one-on-one instruction or help from a colleague or technology specialist.
5. The Lighthouse Beacon program at SRHS did not continue to fund Beacons (teacher technology leaders) beyond the initial year in 2001-02. Fewer than half of survey respondents at SRHS were aware of the program, and Beacons originally identified would like clearer expectations and more time to conduct professional development and develop technology-integrated lessons.

Perceived Impact of Technology on Students

1. No significant differences were observed regarding SRHS and Comparison Group students' perceptions of technology's impact on their school performance and job/career preparation.
2. SRHS teachers were significantly more likely than Comparison Site teachers to indicate that technology had:
   - fostered students' understanding of course materials and test performance and had sharpened their higher-level thinking skills;
   - helped their students become more engaged and interested, collect and present information, perform experiments or simulations, and engage in cooperative learning; and
   - helped their students prepare for college and explore different career paths.
3. Parents of SRHS students were significantly more likely to report that the school's technology had resulted in their child becoming more interested and engaged with academics.

EVALUATION REPORT:
PROJECT LIGHTHOUSE PROGRAM AT SOUTHEAST RALEIGH HIGH SCHOOL

WAKE EDUCATION PARTNERSHIP, APRIL 2004

PROGRAM RATIONALE AND OVERVIEW

Research on Technology's Impact on Students

Few argue that today's students must be prepared to successfully function in a technology-rich environment. The pervasive use of technology across almost all aspects of modern life justifies concerted efforts on the part of educators to prepare students for participation in an increasingly technological world. Correspondingly, the value and use of technology in K-12th grade education has been a topic of a great deal of research throughout the past decade. Generally, most studies have shown positive results when examining issues such as technology's impact on student achievement, attitudes, engagement, and higher order thinking skills. Schacter (1999) concluded after reviewing seven large-scale studies that educational technology is associated with positive gains in achievement on both standardized and national tests. In addition, a recent meta-analysis conducted on 40 studies published since 1997 addressing the effectiveness of teaching and learning with technology on enhancing student outcomes showed a positive effect size of .410, with results generalizable across a wide variety of teaching and technology characteristics (Waxman, Lin & Michko, 2003).

An example of specific research on technology's impact showed that the use of computers to perform tasks which require the application of higher order concepts resulted in better National Assessment of Education Progress (NAEP) mathematics performance for fourth and eighth graders (Wenglinsky, 1998). Another study found that students who experienced technology integrated into their writing instruction were more engaged, writing more per minute and using more descriptive vocabulary than they could without technology (Salpeter, 1998). The research also documented that the use of technology resulted in a more collaborative learning environment for teachers and students. This finding illustrates the complexity of measuring changes in achievement as a result of educational technologies. When a new technology is introduced in a classroom, other changes may occur as a result of that technology; for example, the learning environment may become more collaborative. Because technology often becomes part of a complex network of changes, it then becomes difficult to discern whether changes in student achievement are due to the technology or to changes towards a more collaborative learning environment (North Central Regional Educational Laboratory, 1999).

Research also suggests that technology use in classrooms is moving away from focusing on isolated, skills-based uses of technology towards promoting a variety of technology resources that are integrated across the curriculum and promote higher-order learning (Eisenberg & Johnson, 1996). Goldman, Cole and Syer (1999) note that, "At its best, technology can facilitate deep exploration and integration of information, high-level thinking, and profound engagement by allowing students to design, explore, experiment, access information, and model complex phenomena."

While the use of technology can positively impact student learning and motivation, many teachers report barriers to technology use such as lack of adequate equipment, training opportunities, technical support or advice and support regarding ways to integrate technology into the curriculum (National Center for Education Statistics, 1999). In order to promote systemic change in the use of educational technologies in schools, research suggests that school systems and schools engage in the following practices (adapted from North Central Regional Educational Laboratory, 1999):

Determine educational goals and a vision of learning through technology. Convene a technology planning team consisting of administrators, teachers, parents, students and other community representatives to develop a clear set of goals, expectations and criteria for student learning through technology. The planning team ensures that particular educational objectives can be achieved more efficiently, in more depth, or with more flexibility through technology.

Provide support for teachers in their efforts to use technology. Teachers need in-depth ***sustained*** assistance not only in the use of the technology but also in their efforts to integrate technology into the curriculum. They need time and opportunity for professional collaboration with educators in similar situations and others who have experience with the technology.

Make structural changes in the school day. Sufficient time must be built into the daily schedule to allow teachers time to collaborate and work with their students. Longer class periods may allow for more engaged and in-depth learning through technology and more team teaching and interdisciplinary planning.

Provide technical infrastructure and support. School districts must provide not only basic access to computers and networks, but should provide access that is robust enough to support use of technology in ways that can truly impact classroom instruction. Technical support personnel must also be available to teachers for troubleshooting as they incorporate technology into their lesson plans.

These considerations in part formed the basis for the development of a district-wide technology plan in Wake County Public Schools, and subsequently for the creation of a technology demonstration site, the Project Lighthouse program.

Making Technology a Priority in Wake County Public Schools

In 1994, Wake Education Partnership, in collaboration with the Wake County Public School System (WCPSS) conducted an evaluation to assess the system's technology needs and to devise strategies to create technologically "smart" schools. Recommendations made in the SmartSchools Report included hiring key school system personnel to provide technology leadership, school development of five-year technology plans, increased technology staff development for all teachers and administrative staff and providing enough computers to reduce the ratio of students to computers from 236:1 to 5:1.

In order to encourage implementation of these recommendations and to create a countywide educational technology system, the Wake Technology Task Force was formed in 1997. This task force involved leaders from the school system and from technology-related businesses and industries, who conducted a system-wide assessment of technology in the public schools. Out of this assessment grew a system-wide plan in 1999 to support efforts to integrate technology within the instructional program (Technology Connections) and to improve the existing technology infrastructure.

In 1999, the plan also established Project Lighthouse at Southeast Raleigh High School (SRHS) as the leading strategy to demonstrate best practices in the incorporation of technology in the teaching and learning process. SRHS is a magnet school with an emphasis on math, science and technology, and thus served as an ideal launching site for Project Lighthouse. Goals of Project Lighthouse at SRHS include:

- Increase teacher competence with integrating technology into the classroom to improve student achievement;
- Demonstrate the value of connecting classrooms and homes through the Internet to help families understand the learning needs of their children; and
- Define the value realized in the investment of public and private funds in technology in all WCPSS classrooms.

To accomplish these goals, business partners such as SAS, BellSouth, EDS, IBM and Cisco Systems have made significant gifts of technology to SRHS as well as provided for extensive teacher training to develop leadership in the effective use of technology. In the last three years SRHS has:

- Upgraded their network infrastructure to support advanced uses of instructional and administrative technology;
- Added twenty computers to existing computer labs;

- Launched a train-the-trainer staff development model (the "Lighthouse Beacon" program) to train all faculty in uses of instructional technology; and

- Coordinated and hosted two week-long teacher technology institutes that benefited more than 330 teachers and administrators in Wake County.

In order to provide information regarding the value of investment in technology, a program evaluation of the technology model at SRHS was undertaken for the 2003-04 year (the fourth year of the Project Lighthouse program). The Technology Task Force and Wake Education Partnership deemed it important to examine student achievement and technology use at SRHS to provide a broad perspective on program impact.

EVALUATION PLAN

An independent program evaluation firm was contracted to conduct the evaluation. The evaluation includes an analysis of the impact of technology on student achievement and attitudes towards technology, as well as the impact on teachers and parents.

It is important to note, however, that although the Project Lighthouse program has certainly provided key technology resources and teacher training to SRHS, they of course have also benefited from many other technology resources and services provided through the school system and other corporate grants. Therefore, it is difficult, if not impossible, to isolate the impact of Project Lighthouse from other programming efforts. This evaluation therefore is designed to examine broadly how student achievement and perceptions of technology at a high school are impacted by infusion of a variety of technology resources and training.

Evaluation questions addressed by the Project Lighthouse program evaluation include[1]:

1. What technology-related resources and training have been added at Southeast Raleigh High School (SRHS) since the inception of the Project Lighthouse program?(page 10)

2. What is the impact of a technology-rich environment on student achievement? (page 12)

3. How has a technology-rich environment impacted students' skills, usage and attitudes towards technology? (page 16)

4. How has a technology-rich environment impacted teachers' skills, usage and attitudes towards technology? (page 24)

5. How has a technology-rich environment impacted parents' ability to communicate with the school, and their perceptions regarding how technology has impacted their students' opportunities and academic performance? (page 36)

6. How do administrators in a technology-rich environment and at comparison sites describe their schools' use of instructional technology? (page 43)

To help address these questions, a cohort of SRHS students who began as 9th graders in 2000-01 and a comparison group of similar students from other high schools in the WCPSS were selected and their academic progress tracked through the end of the first semester of their senior year (2003-04). Data were then collected using the following instruments/procedures:

- **Program Implementation data** were collected from SRHS and Wake Education Partnership staff to provide a description of how the model has been implemented thus far.

- **Student Academic Performance data** were collected from WCPSS Evaluation and Research department to include End-of-Course, Advanced Placement, and Scholastic Assessment Test data.

1 The complete Evaluation Plan document is available at www.wakeeducationpartnership.org.

- **Teacher Technology Survey,** administered via the World Wide Web to SRHS teachers and teachers at comparison sites measured skills, attitudes and usage of technology.

- **Student Technology Survey** administered via the World Wide Web to SRHS and Comparison Group students addressed students' usage, skills and attitudes towards technology.

- **Parent Technology Survey** administered through the US Mail and World Wide Web provided data on SRHS and Comparison Group parents' perceptions of school communication, student academic performance and opportunities related to technology.

- **Principal Interviews** administered via email addressed administrators' perceptions of technology's impact on teaching and learning at both SRHS and comparison sites.

The remainder of this report details evaluation results for each of the identified evaluation questions.

EVALUATION RESULTS

1. *What technology-related resources and training have been added at Southeast Raleigh High School (SRHS) since the inception of the Project Lighthouse program?*

SRHS: A Technology Magnet School

Even before SRHS was selected as a technology demonstration site through Project Lighthouse, it served as the county's only technology magnet high school. The school opened in 1997, and draws students from across the county for its math, science and technology programs. The use of technology is an integral part of students' day-to-day experiences. All seniors complete a senior project for graduation, and technology must be used to complete this project. Students also have the option to join a "career-focused learning community," in which they conduct career exploration and on-the-job experience in preparation for life after high school. These learning communities are technology-focused and include medicine/biotechnology, engineering, information technology and digital arts. Students at SRHS have developed and maintain the school's web site, and courses and certification are offered to students on networking (Cisco Networking Academy), Oracle training, and basic and advanced web site development.

A variety of technology features are in place at SRHS[2], including:

- Total school network with 5-6 computers in all classrooms;
- Multimedia centers with morning and evening access;
- Latest computer software and sophisticated technology equipment;
- Laptop computers for all teachers and available for students' home use;
- Parent access to student information such as grades, discipline and attendance via the school's web site;
- Telecommunication opportunities for all students; and
- On-line collaboration with peers, teachers and experts.

As evidence later in this report will show, SRHS clearly has a greater quantity and variety of technology resources relative to other similar WCPSS high schools. SRHS has significantly more computers available for student use than the four comparison high schools selected for this evaluation. Computers at SRHS are more

2 See http://www.srhs.net/aboutus/features/itech.html for examples of technology equipment and software in use at SRHS

likely to be equipped with sophisticated software (e.g., web page design and multimedia tools) than at comparison schools, and students at SRHS have better access to tools such as scanners and digital cameras. In addition, parents at comparison high schools cannot access student information, while parents at SRHS regularly access web-based information on their students.

The use of technology at SRHS has been greatly enabled through the support of business partners in the surrounding community. Many of these partnerships were established through Project Lighthouse. Business donations have supported teacher training, upgrades to the school's network infrastructure, and purchases of hardware and software. Business partnerships and the resulting benefits include:

- **SAS:** provided software and access to SAS InSchools.
- **Cisco Systems:** Provided an upgrade of the school's network infrastructure to allow for advanced uses of instructional and administrative technology, provided funding to support an upcoming Teacher Technology Institute at SRHS and support for the completion of this program evaluation.
- **IBM:** donated 20 computers housed in classrooms and labs.
- **EDS:** Provided support for Teacher Technology Institutes hosted by SRHS, with technology courses taught by Lighthouse Beacons and other WCPSS teachers and support for the completion of this program evaluation.
- **BellSouth:** Provided funding to support an upcoming Teacher Technology Institute at SRHS and support for the completion of this program evaluation.

While all of the technology resources create an infrastructure to support technology use at SRHS, staff development is fundamental to develop teacher expertise and ability to integrate the technology into the curriculum. In order to enable technology integration school-wide, the Lighthouse Beacon Program was established through Project Lighthouse beginning with the 2001-02 academic year.

Lighthouse Beacon Staff Development Model

A "train-the-trainer" model was selected as the best approach to support widespread use of technology by teachers at SRHS. This approach allows staff initially trained in a technology application to subsequently train other staff to use the technology. During summer 2001, ten SRHS teachers from math, science, English, social studies and digital arts were selected to serve as Lighthouse Beacons, or technology lead teachers. These Beacons received a stipend to perform their role during 2001-02. They received intensive training to develop technology lessons across the curriculum, using tools to assess student learning with technology and to employ technology to help students understand complex topics. Beacons then developed a plan for training their colleagues, which included the use of the following methods:

- Researching best practices in using technology;
- Team teaching with colleagues;
- Being available informally to provide assistance to teachers as the need arises;
- Inviting colleagues into their classroom to observe; and
- Offering formal staff development sessions.

During 2001-02, Beacons began offering staff development and assistance with technology use. They were asked to keep journals recording their activities, and successes and failures in helping teachers learn and use technological tools. They recorded many successful experiences, but also a number of problems. They identified barriers to technology use by teachers such as poor timing of staff development (e.g., when teachers are "burned out" over fall break rather than on an early-release day), the need to avoid technology tools that may have all the "bells and whistles" but do not constitute best practices within a discipline, and the need to integrate technology into an already overloaded schedule to cover curriculum for End-of-Course tests.

Beacons provided training in technology integration using tools such as Inspiration software to create graphic organizers, rubric development software, Vernier scientifc probes, SAS in Schools, Integrade software, and sessions on Internet research and web site creation. As they provided technology training and assistance, they experimented with various staff development approaches and learned a number of valuable lessons about the best way to introduce new technology and encourage teachers to actually adopt it for classroom instruction. One Beacon recommended the following staff development model:

> *"Technology leaders should carefully examine each potential tool for its particular uses within each discipline and then integrate the introduction and modeling of those specific uses within monthly department meetings, carefully planning both the introduction, applications, and follow-up support….After learning to use the tool, teachers are then expected to use the tool within the next month and record assessments of the use of that tool for the next department meeting. Teachers then share their observations at the next meeting…Without the follow-up session and the expectations of implementation between the two sessions, we can only expect a very small percentage of the faculty to apply the introduced technology."*

Another mentioned the need to conduct staff development within subject-specific meetings:

> *"I feel that one of the most effective ways to promote the utilization of technology might be through small subject specific meetings. In division or department meetings, the audience is often big enough that teachers can hide in anonymity. It is also often difficult to make the content of the presentation specific enough to address the needs of all participants…I visited several different subject specific meetings (Physics, Chemistry, Biology, Earth Science) to distribute information on SAS in Schools. It was very nice to address 2-5 teachers all interested in the same subject area. It think this is a great way to promote technology in the future because the approach can be very targeted and it can allow teachers with similar teaching interests to discuss the value and utilization of the software."*

Beacons also expressed the need for further clarification of their roles and expectations as technology lead teachers:

> *"In the first year of a program it is often difficult to define what was previously undefined. I think that we collectively need more guidance, encouragement, and frankly in some cases, accountability."*

Unfortunately, following the first year of the Lighthouse Beacon program, funding was not available to continue offering a stipend to Beacons. Most Beacons undoubtedly continue to offer technology support to colleagues, but only on an informal basis.

2. *What is the impact of a technology-rich environment on student achievement?*

In order to examine student achievement, a stratified random sampling procedure[3] was used. A sample of 120 SRHS who began as 9th graders in 2000-01 (at the beginning of Project Lighthouse implementation) was randomly chosen who had remained at SRHS into their senior year. The sample was selected to represent the school's demographic profile, with 30 African American males, 30 African American females, 30 White males and 30 White females constituting the sample. Then for each SRHS student, a similar student who matched the SRHS student on as many demographic and academic variables as possible was selected from the rest of the county's students who had remained at their high school all four years.[4] This comparison group sample yielded students from Millbrook, Sanderson, Athens Drive and Broughton High Schools.

Student performance was also examined by race and gender to determine any subgroup differences within the SRHS and Comparison Group cohorts. Of interest was the question of whether, for example, African American students at SRHS performed differently than African American students from the Comparison Group. Only statistically significant results for these comparisons are provided below.

Academic Achievement During High School

High school students in WCPSS take a series of End-of-Course tests to determine their mastery of the NC Standard Course of Study. Items on each test are designed to address students' knowledge and skills of the concepts that must be taught in North Carolina classrooms. Some students also take Advanced Placement Tests in order to attain college credit for certain courses; preliminary data on students taking these tests at the end of their sophomore or junior year was examined as another indicator of academic achievement.

3 See Appendix A for a complete description of the sampling procedure used.
4 See Appendix B for a profile of SRHS and Comparison Group students selected for the sample.

End-of-Course Test Performance

End-of-Course tests are taken at the end of the semester or academic year that the student is completing the course. Scale scores (which range from 20 to 80 with a mean of 50 and standard deviation of 10) provide for consistent test-to-test interpretations, while achievement levels provide interpretation of student performance relative to a pre-determined standard. End-of-Course scale score data were collected for all SRHS and Comparison Group students; students' most recent test score was used in cases where students took the tests on multiple occasions.

Figures 1-3 illustrate results for End-of-Course tests. ***No significant difference was observed*** between ***SRHS and Comparison Group students on End-of-Course tests required for graduation*** (Chemistry, Biology, Physical Science, Algebra I/II, Economic, Legal and Political Systems, and English I tests). However, a significant difference was observed favoring Comparison Group students for Geometry and Physics tests.

FIGURE 1. End-of-Course Science Test Performance

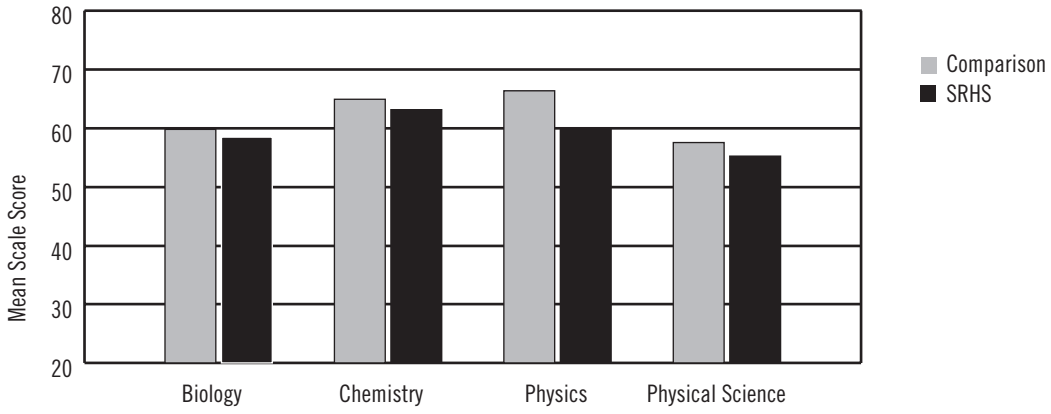


FIGURE 2. End-of-Course Math Test Performance

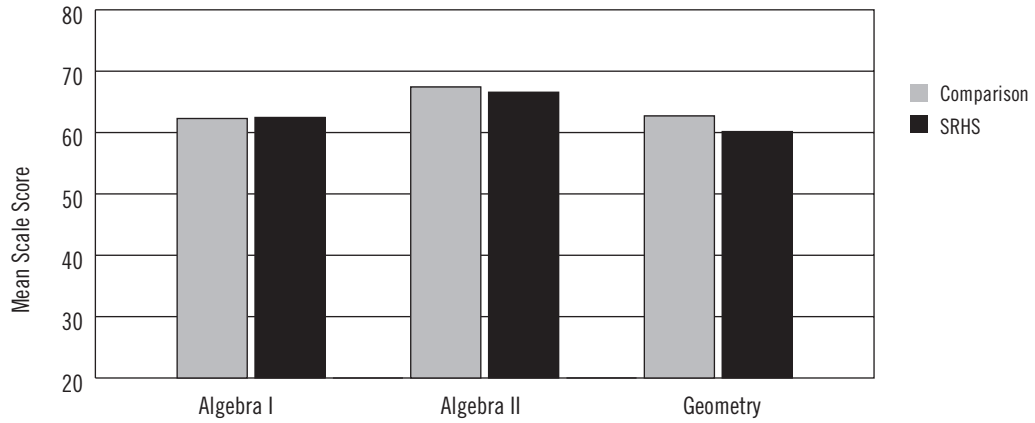
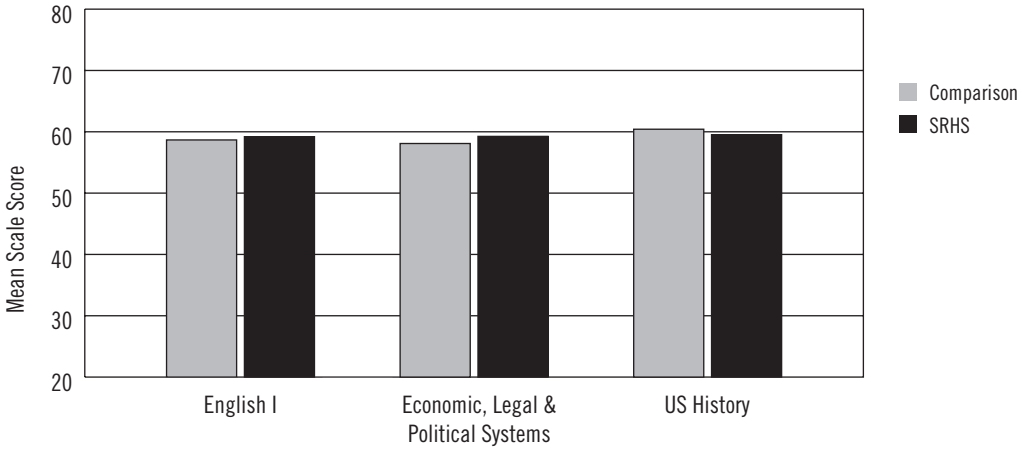


FIGURE 3. End-of-Course English/Social Studies Test Performance



Advanced Placement Test Performance

The Advanced Placement (AP) program allows students to take courses in high school to qualify for college credit if they earn an adequate score on AP exams. Advanced Placement data were examined for 2002 and 2003 in order to provide preliminary[5] data on percentages of SRHS and Comparison students taking and passing exams.

Very few students (14%) had taken AP exams as of the end of their junior year, and no statistically significant differences emerged between SRHS and Comparison Group students on number of exams taken or AP grades. Students in both groups performed well enough to earn college credit in the areas for which they took the tests.

FIGURE 4. Percentages and Numbers of Students Taking AP Exams and Average AP Grades[6]

	No./PercentTaking 1 Exam	No./Percent Taking 2 Exams	No./Percent Taking 3 Exams	Average AP Grade
SRHS (n=120)	10 (8.3%)	4 (3.3%)	1 (.83%)	3.09
Comparison (n=120)	11 (9.2%)	4 (3.3%)	4 (3.3%)	3.08

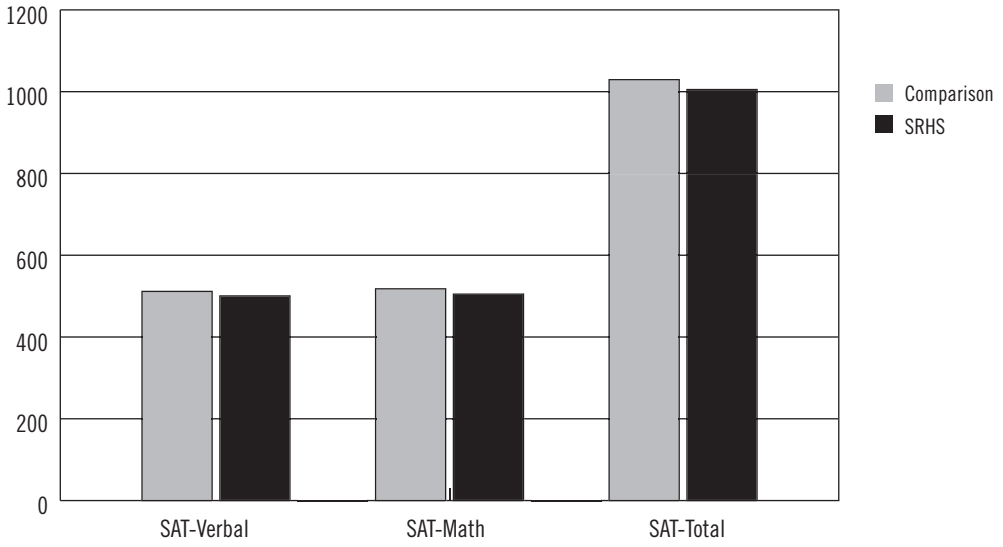
5 Students take these tests in May; therefore data for students' senior year were not yet available at the time this report was written.
6 Advanced Placement Grades range from 1 to 5, with scores of 3 or higher typically indicating sufficient mastery of course content to receive college credit.

Scholastic Assessment Test (SAT) Performance

The SAT provides a gauge of students' verbal and mathematical reasoning skills and serves as one indicator of their readiness for college level work. Students typically take the exam in their junior and/or senior year. For purposes of this evaluation, students' most recent SAT score[7] on file was used as a measure of their aptitude for college-level work. Although slightly more Comparison Group (62%) than SRHS (58%) had taken the SAT, this difference was not statistically significant.

SRHS and Comparison Group students performed similarly on both verbal and mathematics portions of the SAT, as the figure below illustrates. ***No statistically significant differences emerged between the two groups.***

FIGURE 5. SAT Performance of SRHS and Comparison Group Students



Summary of Academic Achievement Results

Data collected on the academic performance of SRHS and Comparison Group students yield virtually no significant differences in terms of students' academic performance. Students from both groups performed similarly on End-of-Course tests that measure student learning of state-mandated curriculum, and on SAT tests that measure verbal and mathematical ability and provide an indicator of college aptitude. Similar percentages took Advanced Placement tests, and performed similarly on those tests.

It is possible that the technology-rich environment at SRHS has not been in place long enough to begin to impact student achievement of the type measured in this evaluation. The Project Lighthouse program began in the 2000-01 academic year, and three years may not be enough time to expect technology to have an influence on student achievement. A second reason may be that the ways that technology impacts student learning may not be detected by the data collected for this evaluation. For example, students at SRHS may have better critical thinking, problem-solving or research skills, which may not be demonstrated on End-of-Course, Advanced Placement or SAT tests.

7 As of February, 2004.

3. *How has a technology-rich environment impacted students' skills, usage and attitudes towards technology?*

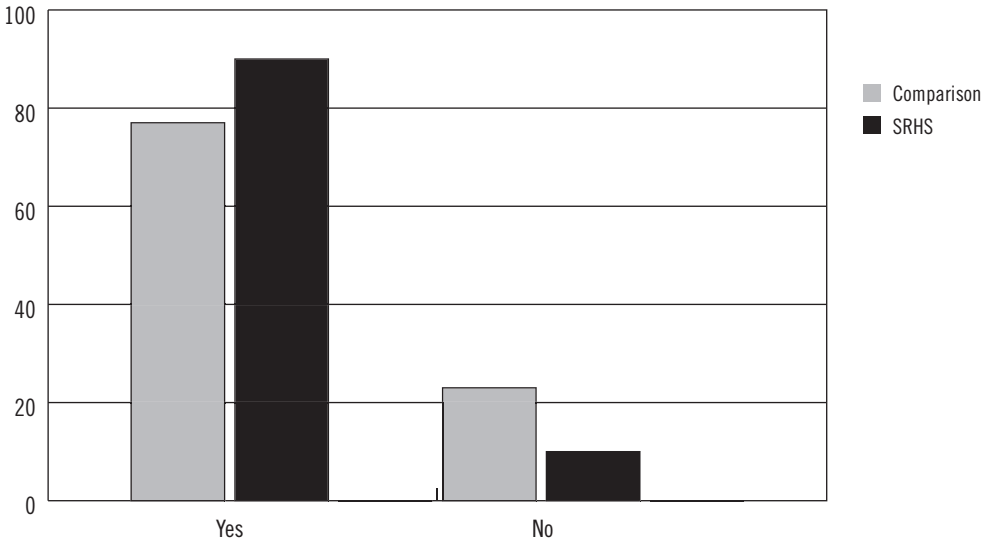
To gauge students' perceptions of their use of, and attitudes towards, technology, an online Student Technology Survey was administered to the SRHS and Comparison Group samples of students identified for analyses of student achievement. An assistant principal or technology/media specialist coordinated the surveying at their school. Surveys were completed by 78% of the SRHS sample, and by 86% of the Comparison Group sample.

Survey data were analyzed using Chi Square or Analysis of Variance (ANOVA) procedures[8]. All reported significance levels are at least $p < .05$ unless otherwise noted. Students were also asked to describe what would improve the technology at their school; these data were summarized qualitatively and sample student comments are included below.

Technology Functioning, Monitoring and Access

Significantly more SRHS than Comparison Group students reported having sufficient time and opportunity to use the technology at their school.

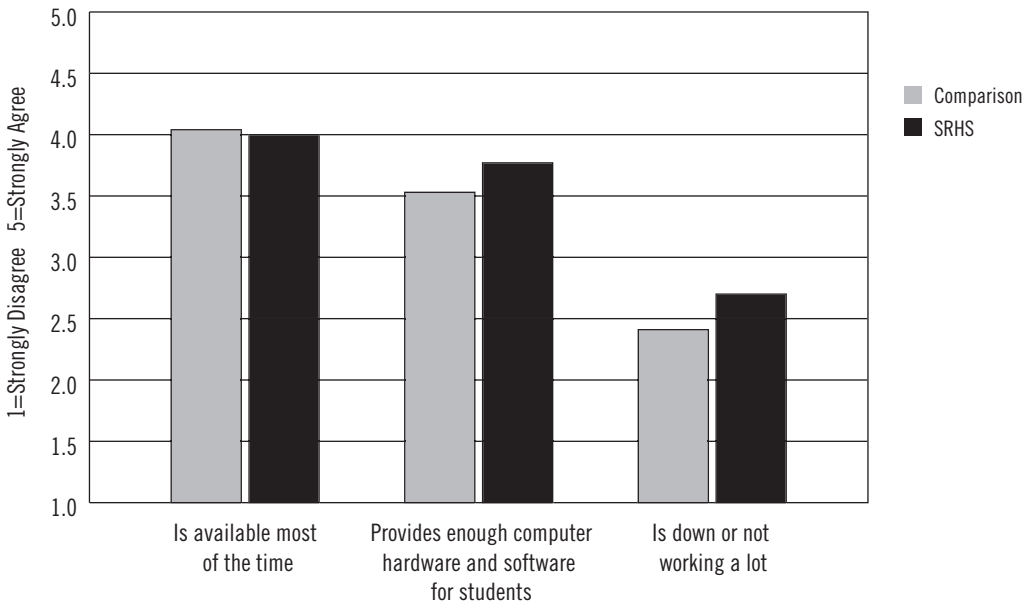
FIGURE 6. Do You Have the Time and Opportunity to Use the Technology at Your School?



Similar numbers of SRHS and Comparison Group students agree that technology at their school is available to students most of the time. SRHS students were more likely than Comparison Group students to report that the technology at their school allows for sufficient student access to hardware and software, although the difference was not statistically significant. ***Interestingly, SRHS students were significantly[9] more likely to report that the technology at their school was down or not working a lot of the time.*** The reason for this finding is unclear; it may be that since SRHS students are using the technology more frequently (see results in subsequent section), they may be more likely to encounter problems with it.

8 Both Chi Square and Analysis of Variance (ANOVA) procedures were used, depending on number and type of response categories.
9 Marginally significant at $p = .07$

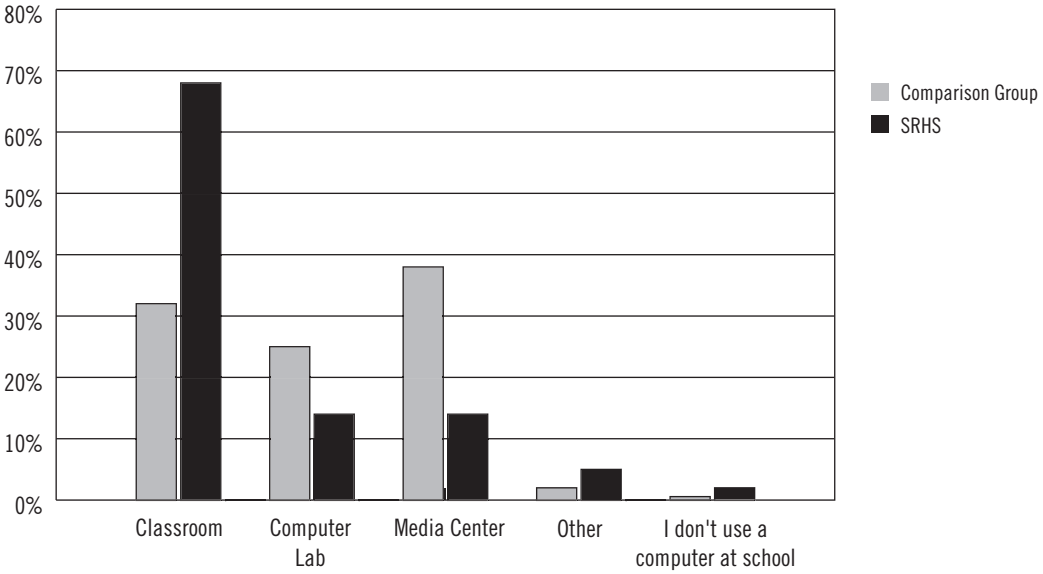
Figure 7. The Technology at My School...



When asked about availability of computers, almost all (90%) students from both groups indicated that they had access outside of class time at lunch or before and after school. When computers are available at these times, approximately 60% of SRHS and Comparison Group students report using them.

Results from the survey showed that SRHS students more frequently have opportunity to use computers in the classroom setting. A significant group difference was observed regarding location of computer use. ***More than two-thirds of SRHS students reported frequent use of computers in their classroom while slightly less than one-third of comparison students reported classroom use.***

FIGURE 8. Where Do You Most Often Use Computers at School?



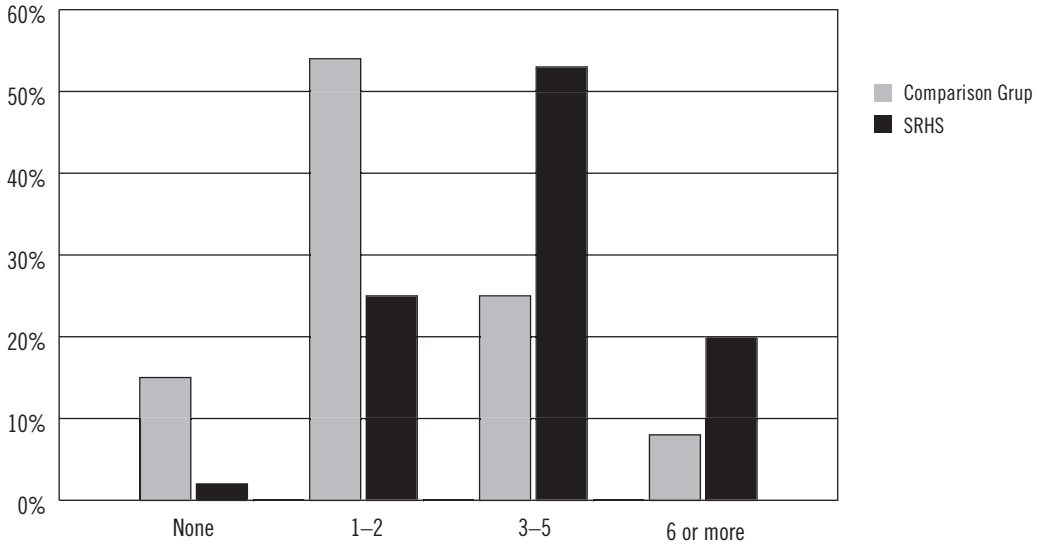
Nearly two-thirds of Comparison Group students reported most often using computers in the computer lab or media center compared with only 28% of SRHS students. When asked how technology could be improved at their school, many Comparison Group students mentioned that having computers in the classroom was important:

> *"[We need] easier computer access in the classroom, and teachers who use more forms of media in the classrooms; that helps me learn by seeing different forms of media, i.e., internet, videos, etc."*

> *"[We need] more computers in the classroom instead of the media center."*

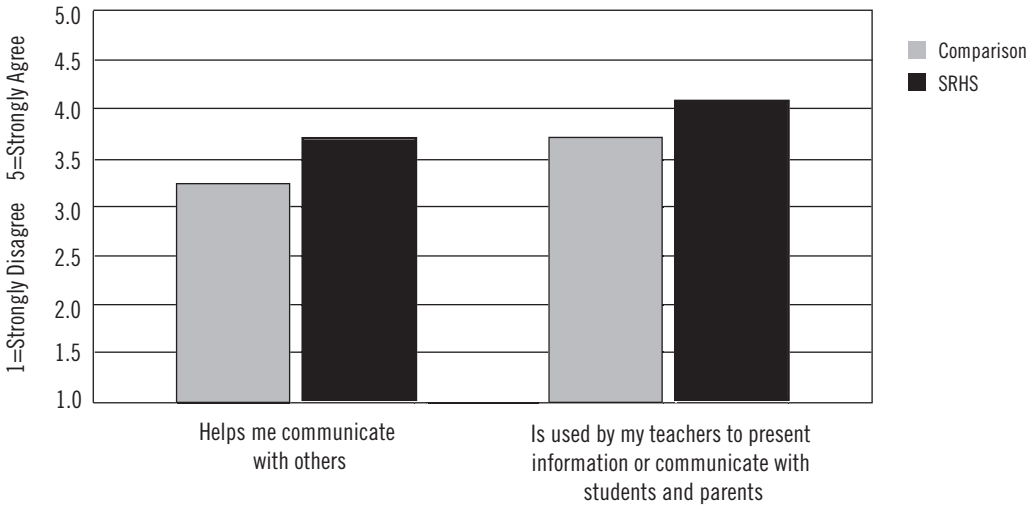
SRHS students also were significantly more likely to report using the email account that their school provides. ***Nearly two-thirds (63%) of SRHS reported using the school-provided email account, while just 3% of Comparison Group students reported using this account.*** SRHS students also indicated that more of their teachers have web sites that contain information for students and parents than do teachers of Comparison Group students.

FIGURE 9. Numbers of Teachers with Web Sites Containing Information for Students and Parents



These features may result in better communication between students and teachers. ***SRHS students were significantly more likely to report that technology at their school helps them communicate with other students, teachers or on-line experts than students in the Comparison Group, and that their teachers use technology to communicate with students and parents.***

FIGURE 10. The Technology at My School...

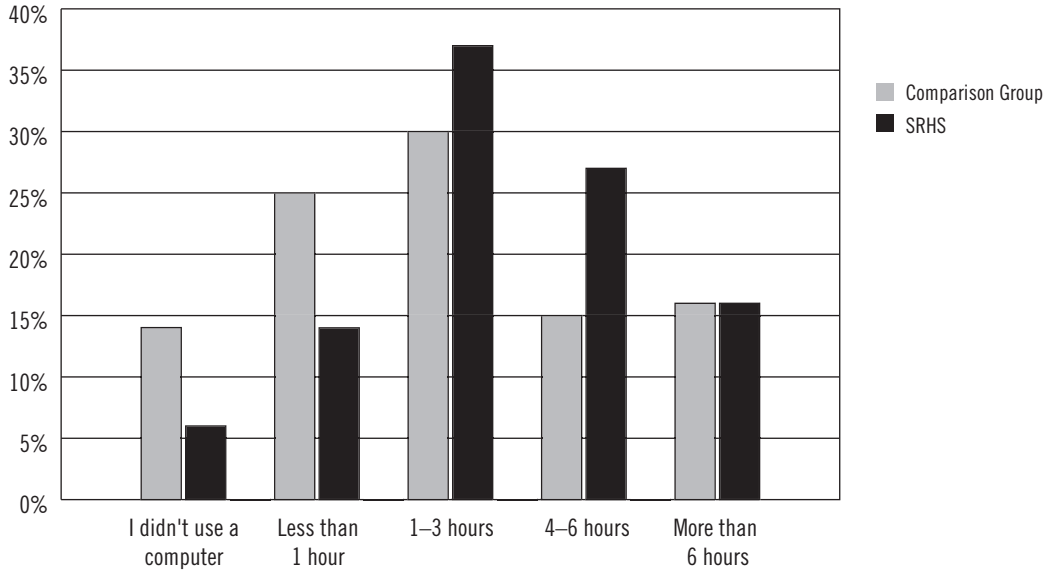


The survey also asked students whether they signed an Acceptable Use of Technology policy at their school, and what happens to students who use technology in inappropriate ways (e.g., accessing inappropriate web sites). ***A significant difference was observed, with all SRHS students reporting signing such a document, while fewer than three-quarters (71%) of Comparison Group students reported signing one.*** Almost all SRHS students described the consequences of misuse of technology, such as suspension of computer privileges, while most Comparison Group students were unsure or responded generally that students "got in trouble."

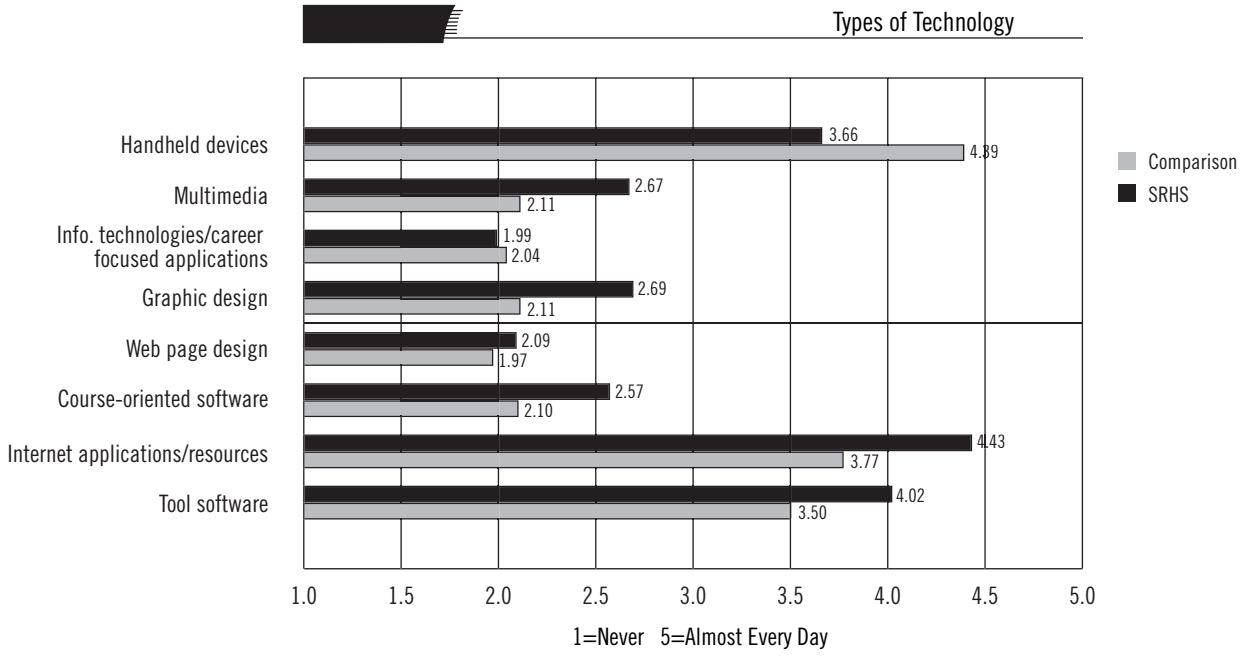
Frequency of Technology Use

The survey also addressed questions on how frequently students used various types of technological tools, and about how students' use of technology is monitored within their school. ***SRHS students reported spending significantly more time using computers within the last week than students in the Comparison Group; 80% of SRHS versus 61% of Comparison Group students reported spending at least an hour using computers within the last week.***

FIGURE 11. Within the Last Week, Approximately How Many Hours Did You Spend Using a Computer at Your School?



SRHS students were significantly more likely than Comparison Group students to report frequent use of tool software (e.g., MS Word, Excel. Powerpoint), Internet applications (e.g., email and Internet Explorer), course-oriented, or subject-specific software, graphic design software (e.g., Adobe Photoshop), and multimedia equipment (e.g., digital camera, scanner). Comparison Group students were significantly more likely to report frequent use of handheld devices (e.g., graphing calculator) than SRHS students, and both groups reported spending similar amounts of time using information technologies (e.g., Oracle, Cisco training, AutoCAD) and web page design software (e.g., Dreamweaver, FrontPage).



Many students in the Comparison Group expressed a desire for their teachers to more frequently integrate technology into their instruction and release some of the responsibility of learning to students:

"Maybe if more teachers would use technology in their lessons instead of lecturing to us like they do sometimes."

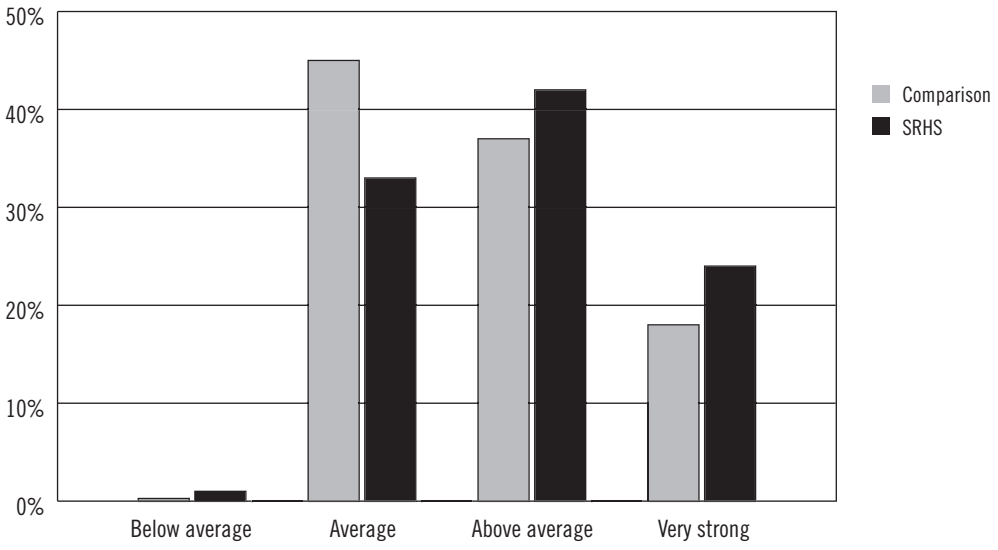
"[We need] the use of laptops in the classroom so it is easier to take notes and look at websites on-line that would help in the learning of different subjects."

"[We need] more practical use [of technology], instead of just doing set assignments that are clearly laid out, let the students figure out for themselves how to do some things."

Skill with Using Technology

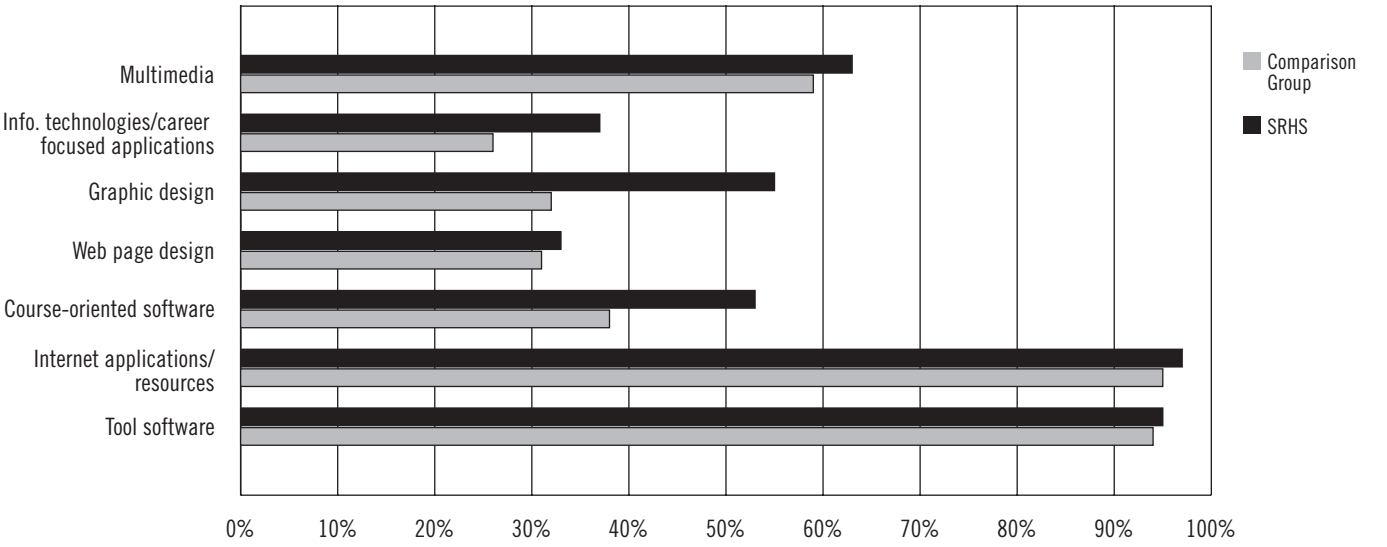
Students were asked to rate both their overall skill with using technology, as well as their skill at using particular technology applications. Two-thirds of SRHS students reported above average or very strong skill levels in using technology, while 55% of Comparison Group students reported these strong skill levels; this difference was not statistically significant.

FIGURE 13. Students' Perceptions of Skill in Using Technology Compared with Other High School Students



When asked about skill at using various types of technology, almost all students in both groups reported high levels of skill in using tool software and internet applications. SRHS students were significantly more likely to report high skill levels in using graphic design and course-oriented software than Comparison Group students. Fewer than a third of student in both groups reported high skill levels in web page design or information technologies/career focused applications.

FIGURE 14. Percentages of Students Reporting Intermediate[10] or Advanced[11] Skill Levels in Using Types of Technology

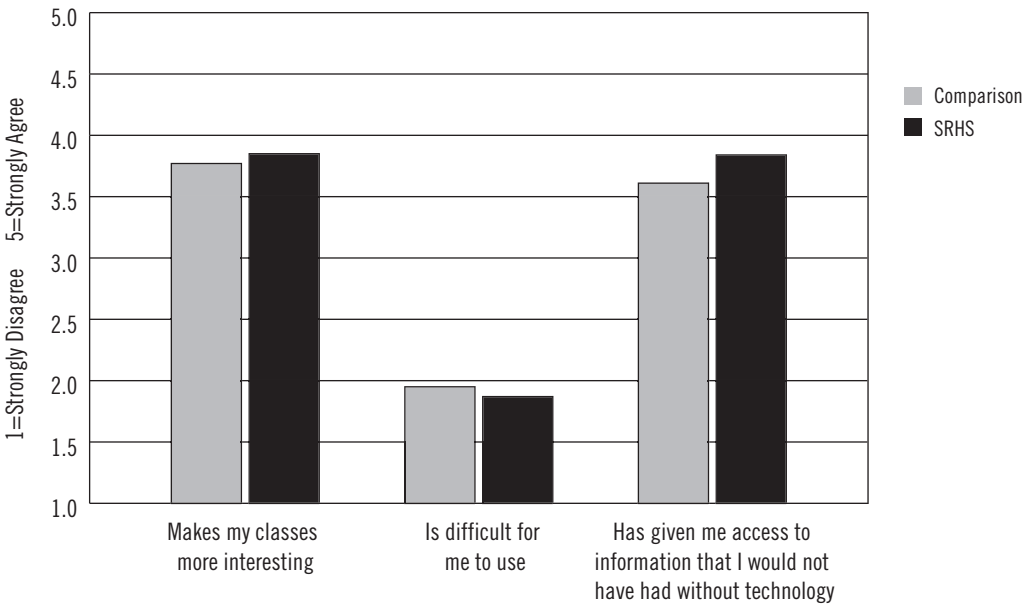


Attitudes About Technology

The survey asked students about their general attitudes towards technology, and specifically how they believed technology impacted them in the areas of career/job preparation and academic performance. SRHS students were only slightly more positive than Comparison Group students that technology made their classes more interesting and had given them access to information they wouldn't have gotten without technology.

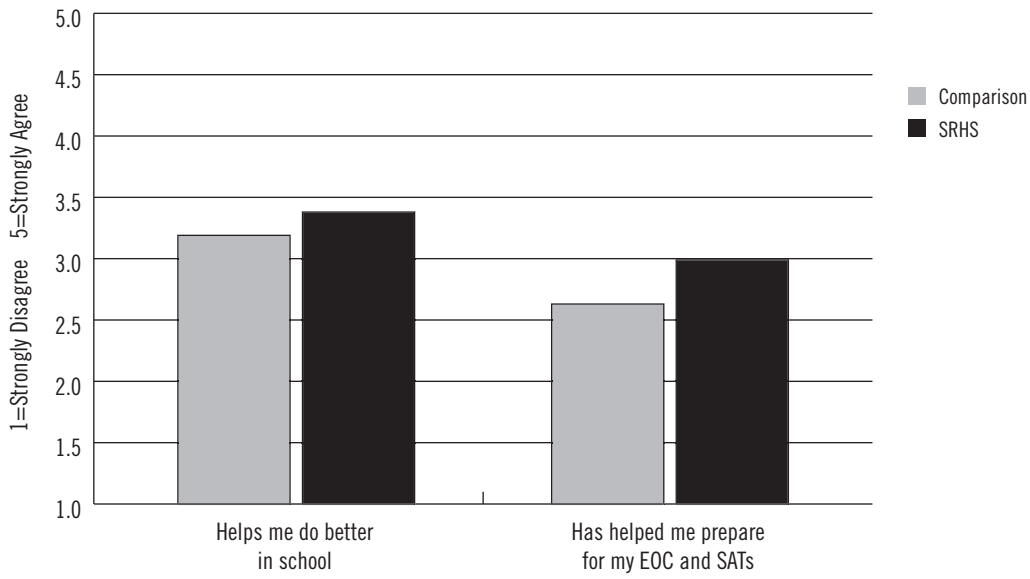
10 Further clarified on survey as "I can use it independently to do the basics."
11 Further clarified on survey as "I can figure out how to do new things and help others."

FIGURE 15. The Technology in My School....



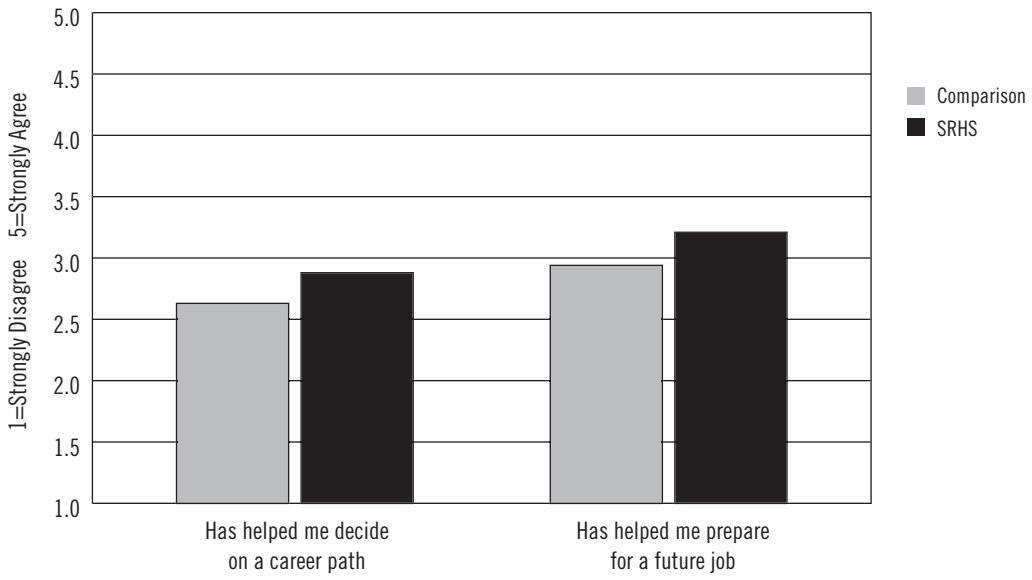
Students in both groups were less likely to agree that technology had helped them perform well in school or prepare for standardized tests; no significant group differences emerged on these items.

FIGURE 16. The Technology in My School....



SRHS students also were slightly, but not significantly, more likely than Comparison Group students to report that technology had helped them prepare for a future job and helped them decide on a career.

FIGURE 17. The Technology in My School....



Summary of Student Survey Results

It appears that students at SRHS report better access to, and more frequent use of, many of the technological tools designed to benefit student learning. SRHS students indicate they have more time and opportunity to use technology, and consequently spend more time using computers and other technological tools to promote learning, such as tool and internet software. They are more often using computers within the classroom setting rather than in a computer lab or media center, thus suggesting their teachers may be integrating these tools into their instruction on a more regular basis. More teachers of SRHS students are hosting their own web pages, which may lead to students reporting better levels of communication as a result of the technology. More SRHS students have signed acceptable use documents regarding appropriate uses of technology, thus leading to explicit awareness of the consequences of its misuse.

SRHS students were also somewhat more likely to report strong technology skills than Comparison Group students, although differences were not as large in this area. The reason for this finding is unclear; however, it may be that with increasing uses of technological tools comes increasing awareness of how much there is to learn about these tools and their potential. SRHS students may be more cognizant of these tools' capabilities, and thus rate their skills more realistically than Comparison Group students. SRHS students exhibited slightly better attitudes regarding technology's impact on their academic performance or future job preparation/career decision-making, but the difference was not significant.

4. *How has a technology-rich environment impacted teachers' skills, usage and attitudes towards technology?*

Teachers at SRHS and the four schools from which students in the Comparison Group were drawn completed an online survey to determine their perceived competence with using technology, how often they use it, and how they believe it impacts student learning. In addition to quantitative items addressing these issues, teachers were asked to describe how they had transformed a lesson to incorporate technology, and what should be done at their school to help them better use technology to improve student achievement. Responses to these items were summarized qualitatively and sample comments are included for illustration of survey findings. Teachers were emailed a link to the online survey, and principals were asked to encourage teachers to complete these surveys. A total of 80 teachers completed the survey at SRHS (62% of certified staff), while 224 teachers at Comparison Sites completed the survey (42% of certified staff).

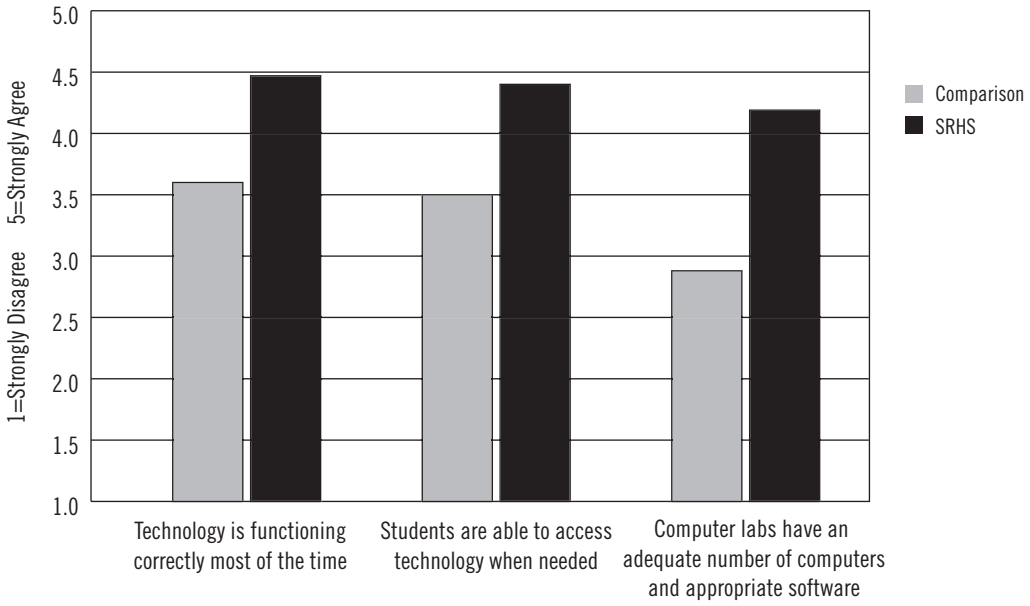
Most teachers who completed the survey taught mathematics, science, social studies, language arts, career/technical education or special programs; teachers in these subject areas accounted for nearly three-quarters (73%) of respondents. Almost all (94%) respondents had been teaching at least one year, and 30% had been teaching twenty years or more. Survey data were analyzed using Chi Square or Analysis of Variance (ANOVA) procedures[12]. All reported significance levels are at least $p < .05$ unless otherwise noted.

Technology Functioning, Monitoring and Access

Teachers were asked about their home computer resources, student access to technology and how technology functioned within their school. Similar percentages of SRHS and Comparison Site teachers reported having and using computers at home, and approximately half of both groups have high speed internet access. Most SRHS teachers (59%) check out laptop computers for home use, while only slightly more than one-quarter (28%) of teachers at Comparison Sites do so. This is not surprising given that all SRHS teachers have a laptop computer for their individual use.

SRHS teachers were significantly more positive than Comparison Site teachers when evaluating student access and technology functioning within their school.

FIGURE 18. At My School...



12 Both Chi Square and Analysis of Variance (ANOVA) procedures were used, depending on number and type of response categories.

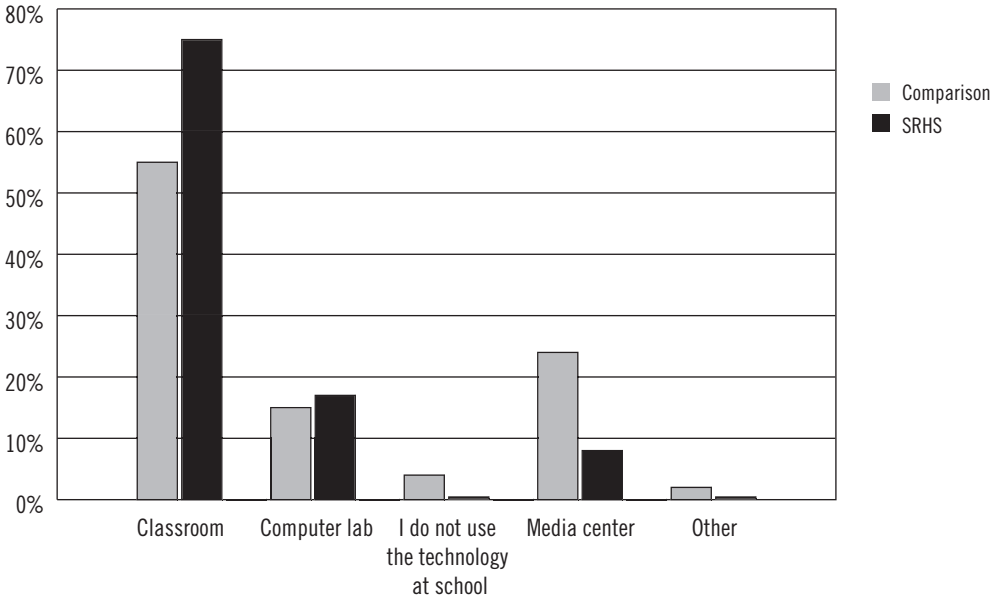
SRHS teachers were more likely to believe that technology functions well most of the time, computer labs contain enough computers and software and that students have sufficient access to technology. Many Comparison Site teachers indicated that more computers, both in the classroom and in computer labs, were necessary to improve student learning and achievement:

> *"Provide [computers] for every classroom and every teacher. There are so many more things I'd like to do, but can't, due to lack of a real school computer lab. The media center should not be the only accessible location of computers for students or teachers."*

> *"[We need] more computers in the classroom. 1 or 2 per room doesn't allow for enough time or equipment per student. Lab space is at a premium."*

> *"We need more computer access in the classrooms. Teachers monopolize the one computer lab we have and fight over time to get in to the lab. There is not enough access for everyone."*

FIGURE 19. Location of Technology Use

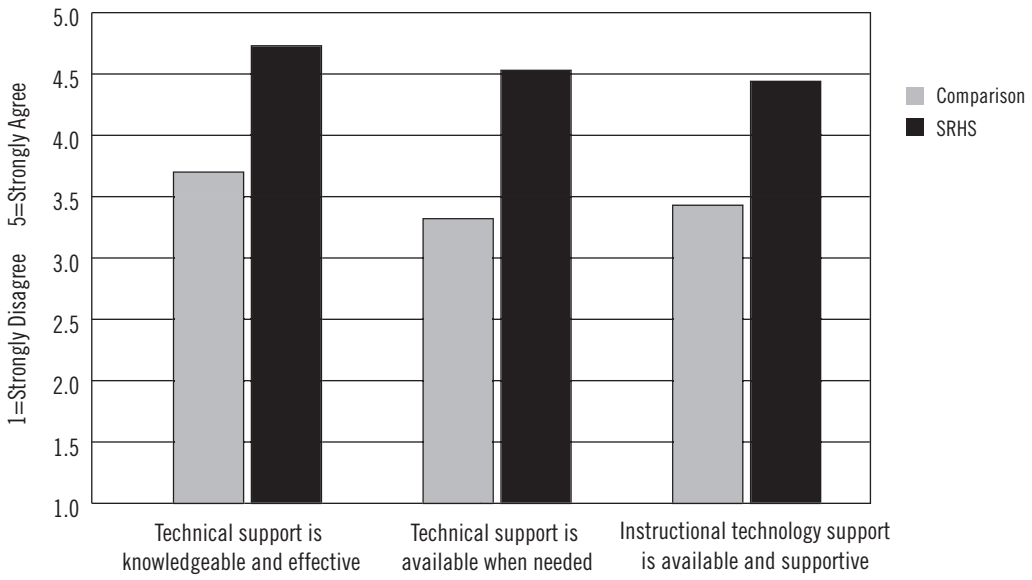


Not surprisingly, teachers at SRHS were also significantly more likely to report that they use technology most often ***within their classroom,*** while Comparison Site teachers were more likely to report media center use than SRHS teachers.

Significant group differences emerged regarding monitoring of student technology use. While all SRHS teachers indicated that their students had signed a document describing the acceptable and unacceptable uses of technology and consequences for misuse of technology, only approximately two-thirds (65%) of Comparison Site teachers were aware that their students had done so. In addition, nearly all (98%) SRHS teachers believe that their school is effective at monitoring students' technology use, compared with three-quarters of Comparison Site teachers.

SRHS teachers were also significantly more positive than Comparison Site teachers regarding the availability and quality of technical support they receive.

FIGURE 20. At My School...



Many Comparison Site teachers indicated that lack of technical support was a significant barrier to them using technology to improve student achievement:

> *"Our school is assigned a single person to handle the problems of our network and all of its software, several hundred workstations and printers…The county needs to realize that a school with thousands of technology-users (teachers and students) needs a STAFF of people to help. Although some teachers are able to troubleshoot some problems they encounter, others have no idea how to change the ink cartridge in their printer. When teachers get frustrated with glitches and our support person cannot respond within a reasonable amount of time (weeks in some cases) then they will stop using the technology. Any positive impact on student learning and achievement is lost."*

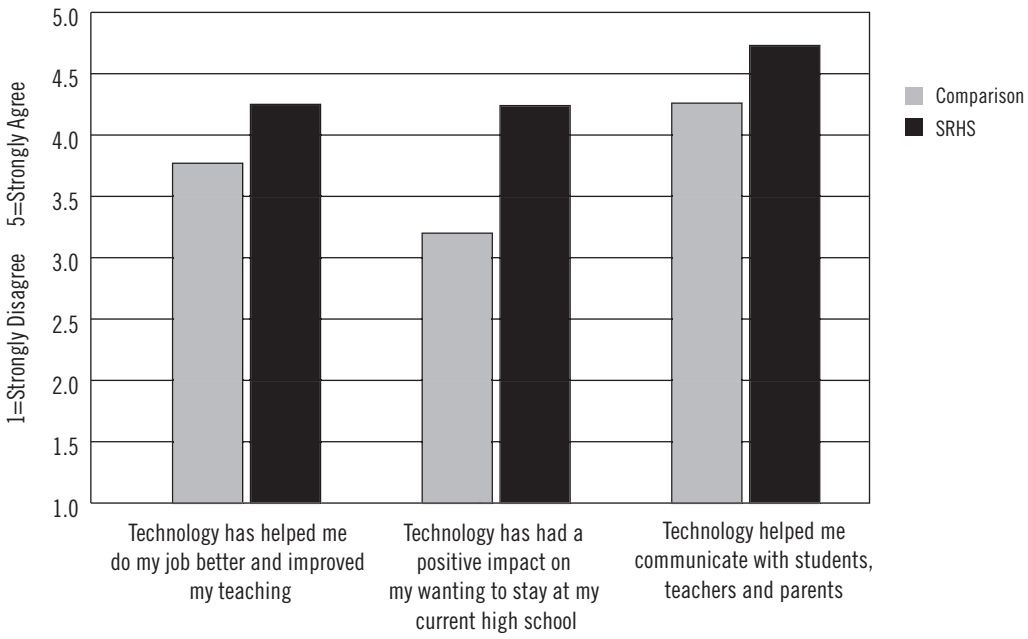
> *"More timely installation of software and attention to broken or malfunctioning computers. We have gone an entire term without software being installed that has been available in August at other high schools."*

Teachers at SRHS were also significantly more likely than Comparison Site teachers to indicate that technology helps them perform their job and communicate with other teachers, students and parents, and has resulted in them wanting to remain at their high school.

SRHS teachers' positive views of technology's benefits for communication likely result in them maximizing their use of technology for this purpose. ***Significantly more SRHS (77%) than Comparison Site teachers (37%) reported maintaining an up-to-date web site containing information for students and parents to access.*** One Lighthouse Beacon at SRHS described how she uses technology to communicate with parents, and the ways it benefits all concerned:

> *"Each week I email parents about what is 'going on' in class. It is a reminder of progress reports, Open House, report cards, registration, and other activities at school. I also include weekly student goals. When we start a unit, I attach a digital copy of the syllabus and documents I use to introduce the unit. I also update them on upcoming activities during the unit. I also email progress reports to parents. Sometimes a progress report 'won't make it home' and I want to ensure parents are well informed…Having the electronic gradebook lets me enter grades and immediately see their impact. When I have concerns, I can quickly address it with the student and involve the parents when necessary…The extensive technology makes it easier to keep parents, counselors, and teachers in the loop."*

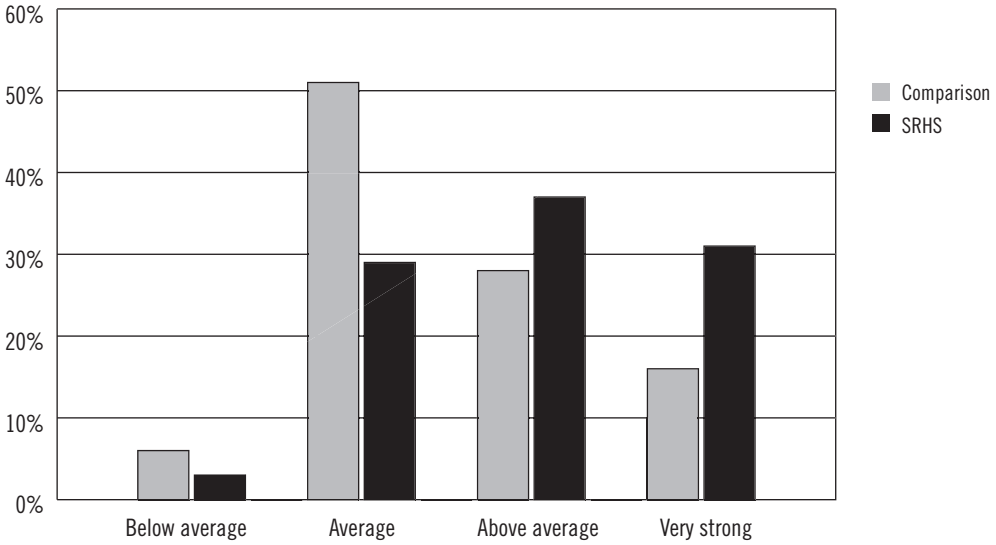
FIGURE 21. At My School...



Technology Professional Growth and Staff Development

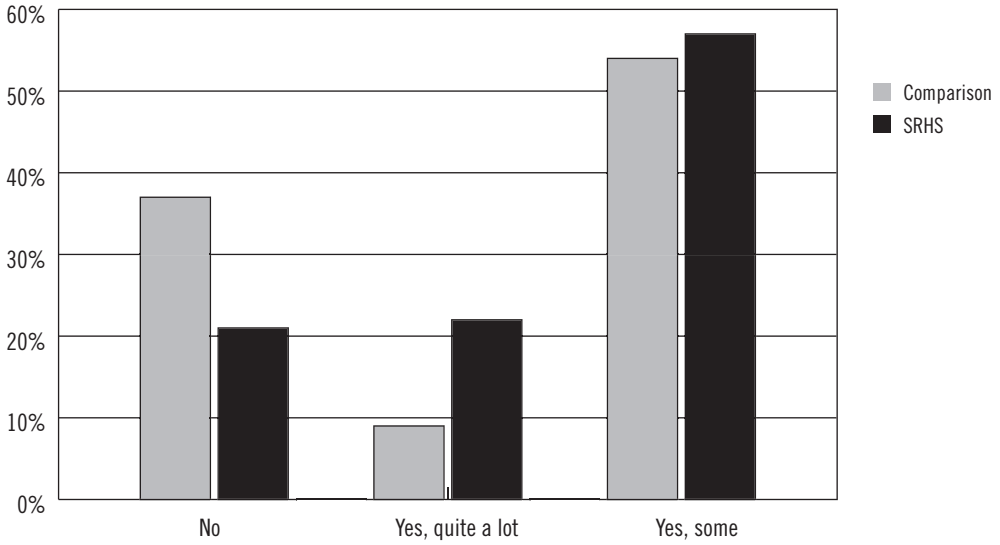
Teachers were asked about the quantity and types of technology-related staff development they have participated in the last few years, as well as their level of professional growth with respect to technology. ***Significantly more SRHS than Comparison Site teachers considered themselves to have attained very strong professional growth in the area of technology.***

FIGURE 22. How Would You Describe Your Professional Growth with Regards to Using and Integrating Technology as a Teacher?



Apparently greater professional growth in technology use by SRHS teachers has also contributed to an increased belief that they have a greater impact on decision-making within their school. ***SRHS teachers were significantly more likely to believe they were allowed to contribute to decision-making regarding the use and organization of technology at their school than Comparison Site teachers.***

FIGURE 23. Do You Feel You Have a Say in the Decisions that are Made Concerning the Use and Organization of Technology in Your School?

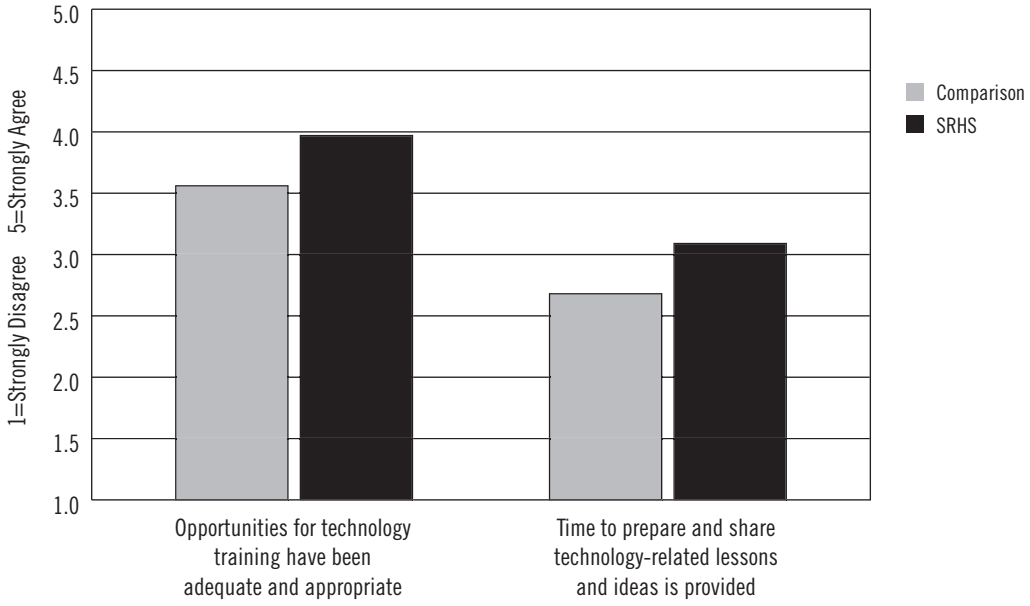


Several Comparison Site teachers mentioned the need for more input into the decision-making process for using technology. One teacher commented, for example:

> *"The school system puts so many restraints on computer usage that we frequently cannot set up computers for specific classes - an example would be not having more than six ports in an Interior Design course that uses Home Architect 3D with 23 students when we have twelve computers in the room ready to be used. It makes no sense why the system will not let the schools have some decision making in what is good for individual courses within the school itself."*

Fewer Comparison Site than SRHS teachers report that they have had adequate and appropriate opportunities for technology training, and that they are given adequate time to prepare and share technology-related lessons and ideas with other teachers.

FIGURE 24. At My School...

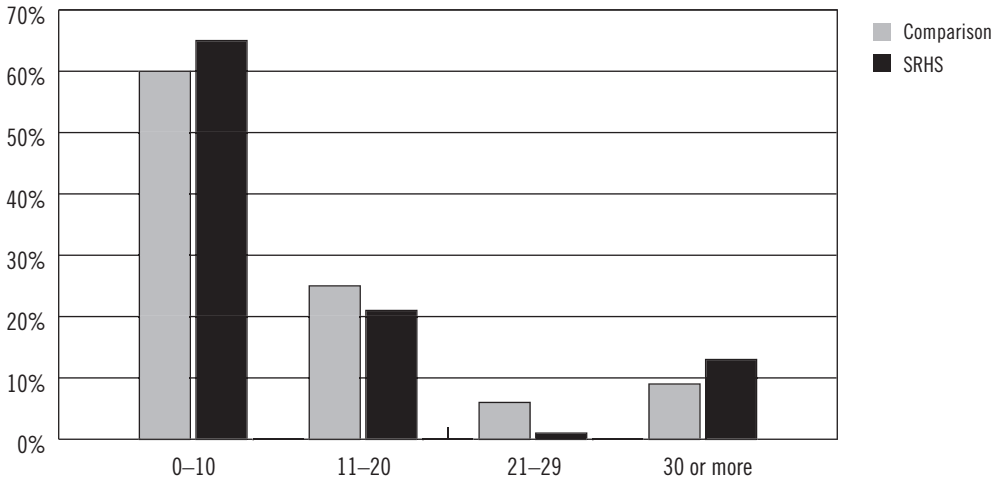


Many Comparison Site teachers mentioned the need for increased training in the "basics" of computer use. SRHS teachers, on the other hand, were more likely to request specific, higher-level technology training in areas such as graphic design software and multimedia, and updates on new Internet courses. They also frequently mentioned the need for more independent professional development time, as one SRHS teacher described:

> *"I need the time to learn the new technology, and then develop lessons or modify existing ones to maximize the benefits of the technology."*

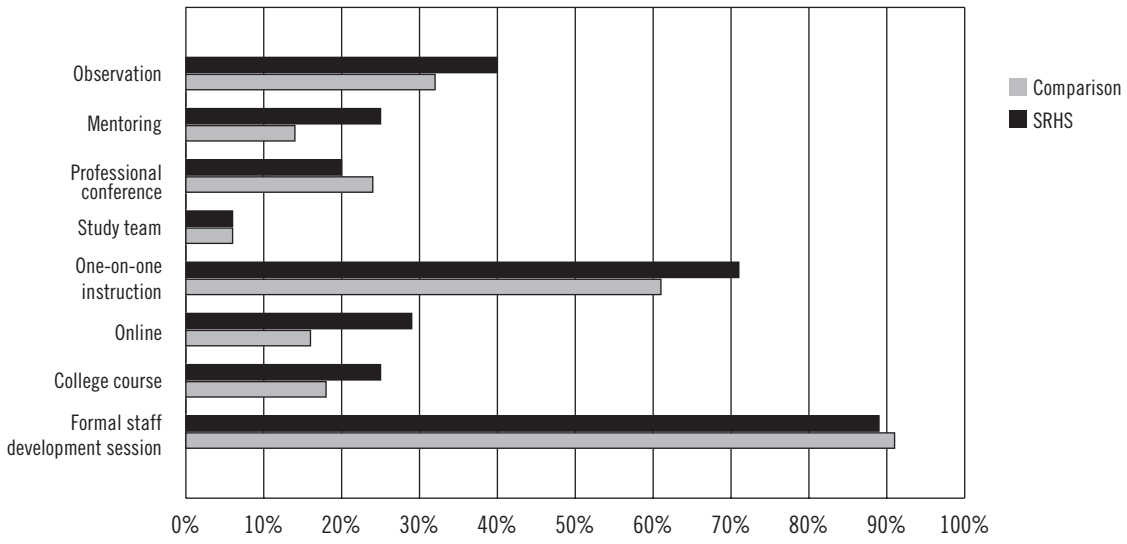
Although SRHS teachers were positive about their professional growth and opportunities for technology training, no significant group difference emerged in terms of number of hours of technology-related professional development.

FIGURE 25. Number of Hours of Technology-Related Staff Development in Past Year



However, SRHS teachers were somewhat more likely to participate in all types of technology-related professional development, particularly in the areas of mentoring, online assistance, and one-one-one instruction or help from a colleague or technology specialist.

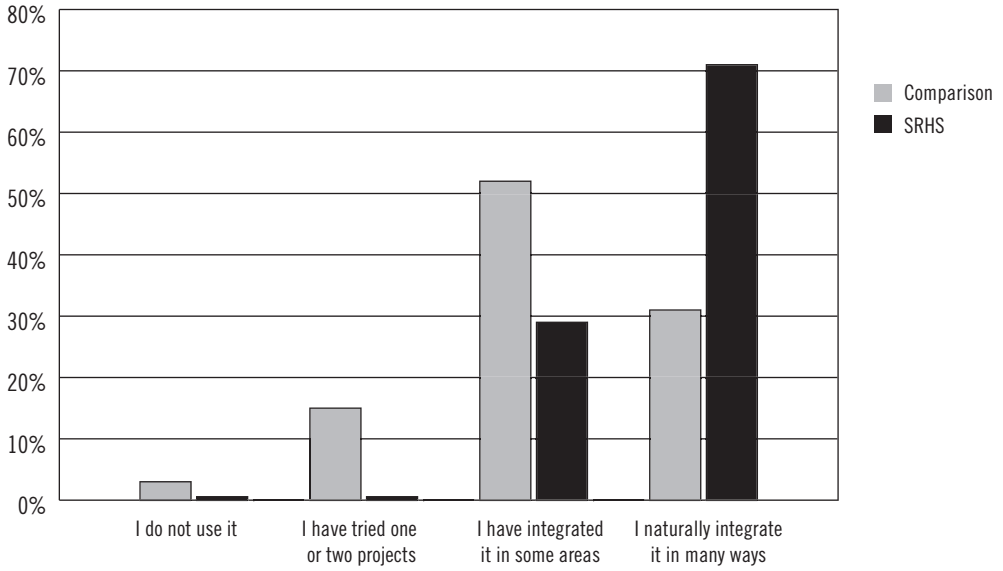
FIGURE 26. Types of Technology-Related Professional Development within Past Three Years



Frequency of Technology Use

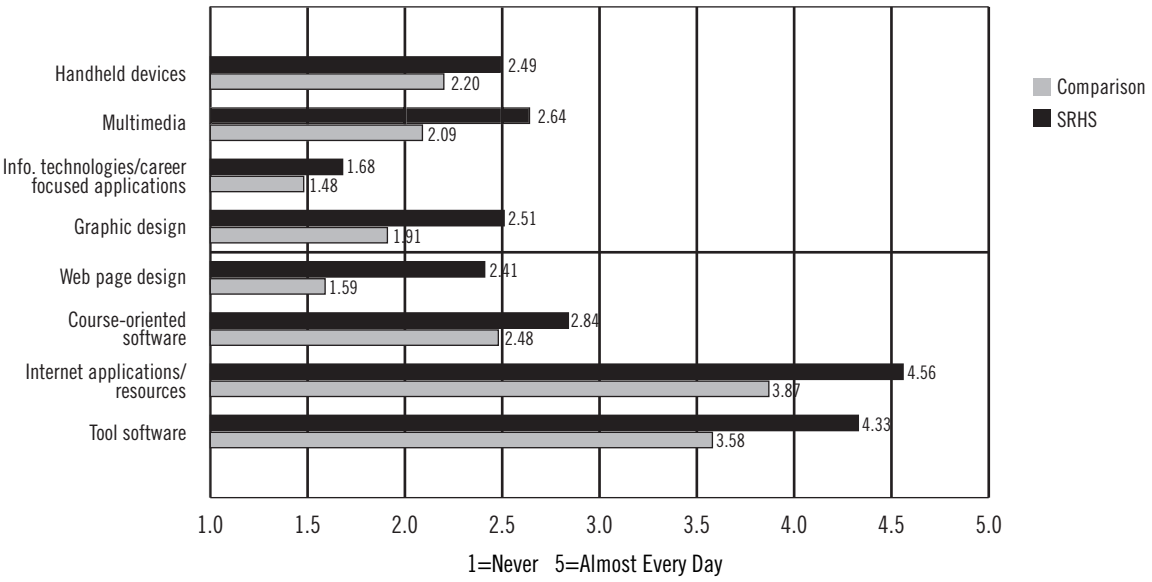
Teachers were asked to indicate how far along they were with integrating technology into their instruction and how often they used various technological tools which can enhance student learning. ***SRHS teachers were significantly more likely than Comparison Site teachers to report that they regularly integrate technology into their instruction to enhance teaching and learning.*** Nearly three-quarters of SRHS teachers, as opposed to fewer than one-third of Comparison Site teachers, believe they naturally integrate technology into their lessons in many ways.

FIGURE 27. How Much Do You Use Technology to Enhance Teaching and Learning?



SRHS teachers were more likely also to report regular use of all of the technological tools addressed on the survey. Teachers in both groups were most likely to report very frequent use of tool software (e.g., Microsoft Word, Excel, Powerpoint), Internet applications (e.g., email, Blackboard.com, NC Wise Owl) and course-based (e.g., subject specific) software. SRHS teachers were significantly more likely than Comparison Site teachers to report frequently using tool software, Internet applications, web page design (e.g., Dreamweaver), graphic design (e.g., Adobe Photoshop, MS Publisher) and multimedia technologies (e.g., digital camera, scanner).

FIGURE 28. How Frequently Teachers Use Different Types of Technology



These findings are supported by qualitative data from teachers' responses to a question asking teachers to describe how they have successfully transformed an existing lesson to incorporate technology. Comparison Site teachers most frequently described a basic use of technology tools:

> *"Teaching the preparation of business letters, memos and resumes using Microsoft Word."*
>
> *"Using a graphing calculator to enhance math lessons."*
>
> *"Instead of traditional research paper, students used PowerPoint to create a presentation on a famous African-American for Black History month."*

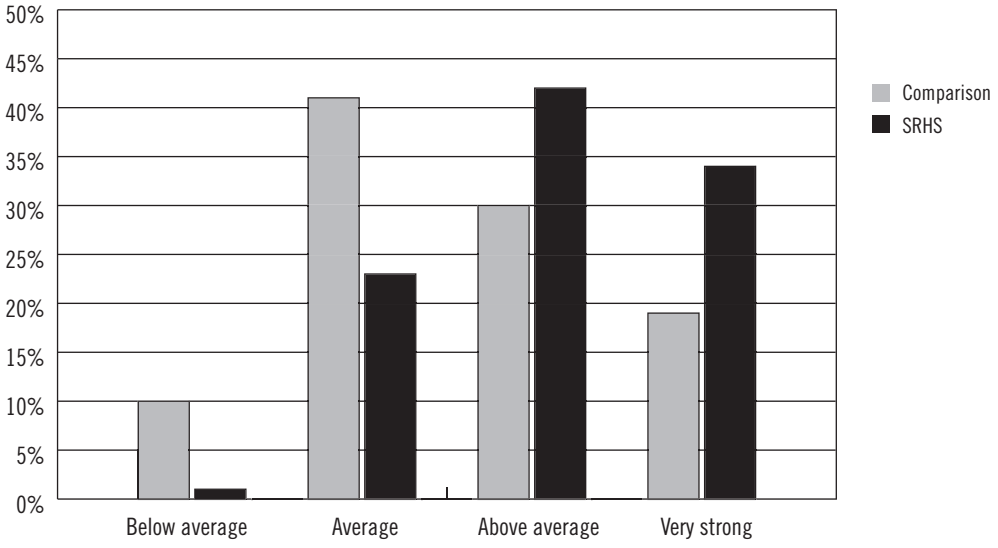
The majority of SRHS teachers, on the other hand, reported a higher level, more infused use of technology:

> *"The Internet has completely changed the way I teach because students are in control of their learning and I only serve as the guide. We research art history, methods and techniques with various media, e-mail professional artists, digital stock photography for inspiration, etc. It's much more exciting than being the 'know it all' with all the answers."*
>
> *"Cell Newspaper assignment completed in Publisher. Mitosis flipbook turned into animation using flex cam and digital capture software, all notes on PowerPoint and posted on my website."*

Skill in Using Technology

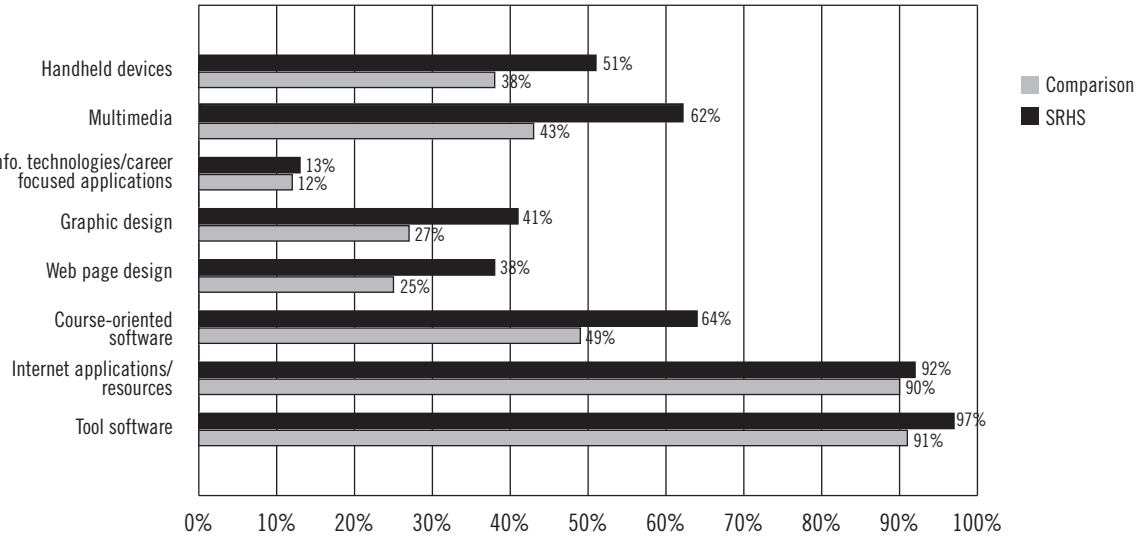
Teachers at SRHS and Comparison Sites differ with respect to their perceived level of skill at using technology to foster student learning. ***More than three-quarters of SRHS teachers rated their knowledge compared with other high school teachers as at least above average, while fewer than half (49%) of Comparison Site teachers rated themselves this way.***

FIGURE 29. How Would You Rate Your Knowledge of Computers and Different Forms of Technology Compared to Other High School Teachers?



When asked to rate their skill level with using various types of technology, SRHS teachers were significantly more likely than Comparison Site teachers to report intermediate or advanced skill with using tool software, course-specific software, web page design, graphic design, multimedia and handheld devices (e.g., graphing calculator, probes, PDA).

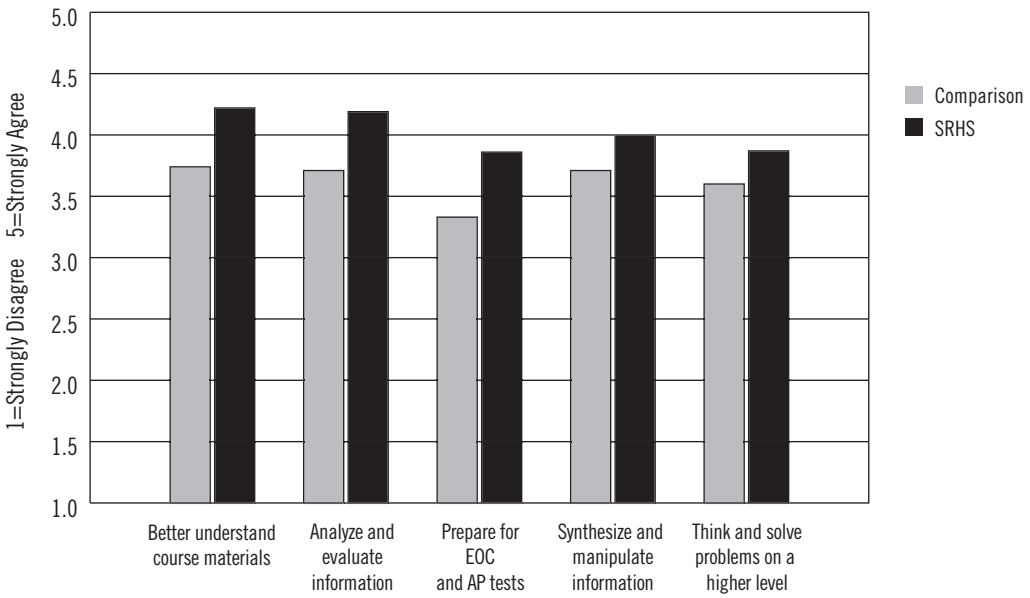
FIGURE 30. Percentages of Teachers Reporting Intermediate[13] or Advanced[14] Skill Levels in Using Types of Technology



Impact of Technology on Students

Teachers from SRHS and Comparison Sites differed with respect to the extent to which they believe technology has positively impacted their students. ***SRHS teachers were significantly more likely than Comparison Site teachers to indicate that technology in their classroom had fostered students' understanding of course materials and test performance, and had sharpened students' higher-level thinking skills.***

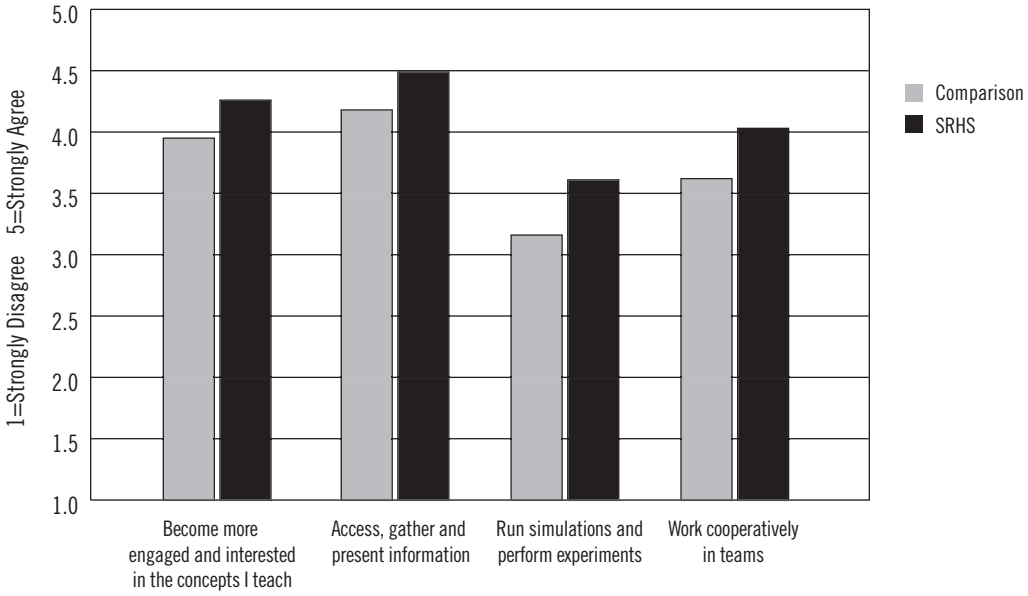
FIGURE 31. The Integration of Technology in My Classroom Has Helped My Students...



13 Further clarified on survey as "I can use it independently to do the basics."
14 Further clarified on survey as "I can figure out how to do new things and help others."

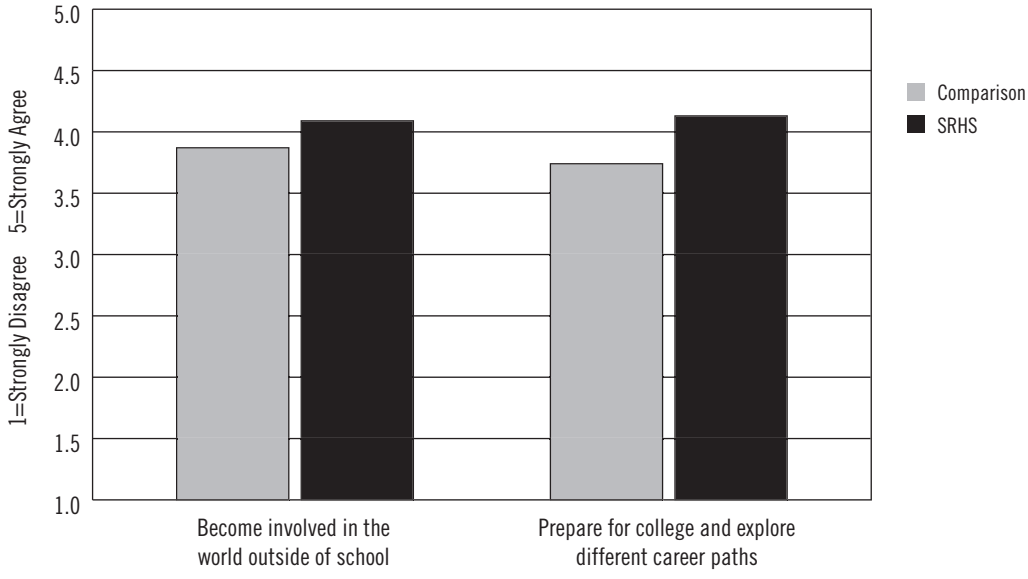
SRHS teachers were also significantly more likely to believe that classroom technology had helped their students become more engaged and interested, collect and present information, perform experiments or simulations, and engage in cooperative learning.

FIGURE 32. The Integration of Technology in My Classroom Has Helped My Students...



No significant difference was observed in terms of teacher perceptions of how technology has helped students get involved in the world outside of school. However, SRHS teachers were significantly more positive that technology had helped their students prepare for college and explore different career paths.

FIGURE 33. The Integration of Technology in My Classroom Has Helped My Students...

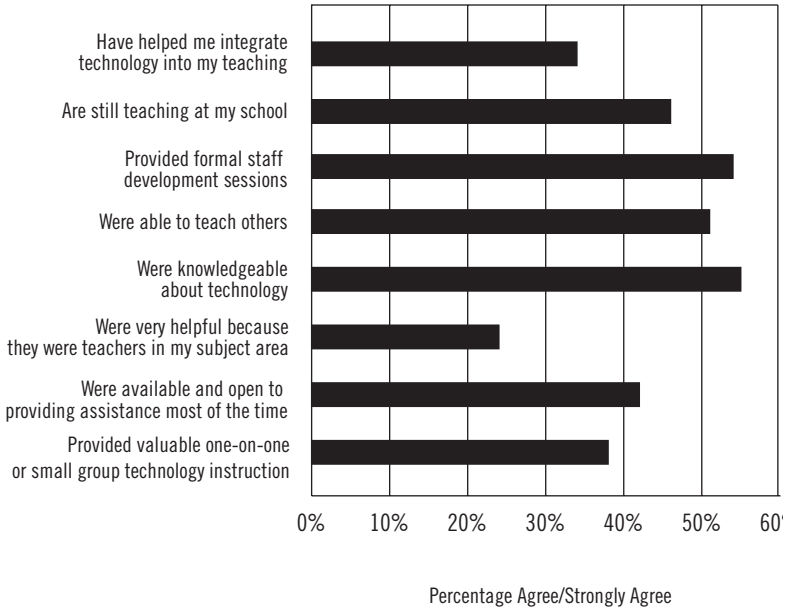


SRHS Teacher Survey Results: Project Lighthouse Beacon Program

Several questions were addressed only to SRHS teachers in an attempt to gather data of interest to specific features of the Project Lighthouse program. Apparently technology is an important reason that teachers/ certified staff elect to come to SRHS; more than three-quarters (78%) reported that technology played a role in their decision to apply. Nine of the survey respondents indicated that they had served or were serving as "Beacons," or lead technology teachers. These teachers received extra staff development during summer 2001 in integrating technology into instruction, and were charged with the task of assisting other teachers in their area with technology integration.

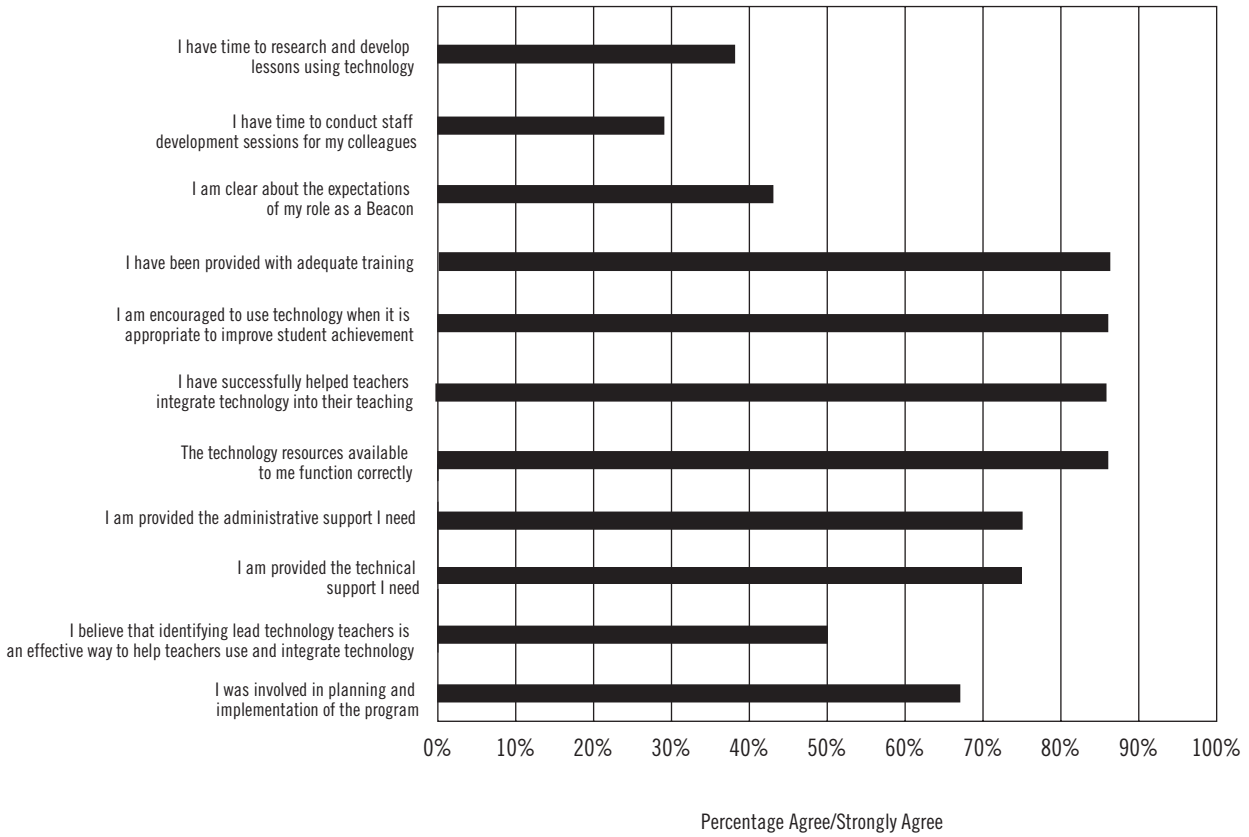
Fewer than half of survey respondents (47%) reported they had received technology assistance from one of the Beacons. In fact, many respondents, particularly new teachers, indicated that they were not familiar with the program. Results for items that addressed the effectiveness of the Beacons were somewhat positive; however almost half of the responses to most items fell into the category of "neutral/unsure." Teachers who were aware of the program generally agreed that the Beacons were knowledgeable about technology, provided formal staff development and helped them integrate technology into their teaching.

FIGURE 34. The Beacons in My School...



Several questions addressed Project Lighthouse Beacons' perspective regarding their role in fostering teachers' technology use. The responses of the nine teachers who identified themselves as Beacons are summarized below. ***While Beacons were very positive regarding their training, technical/administrative support received, and their ability to help teachers integrate technology, they were less likely to report time to develop lessons and conduct staff development for their colleagues.*** This is not surprising given that Beacons no longer received a stipend for their work after the 2001-02 year, and as the next figure shows, they are not currently provided with time to conduct formal staff development. They were also less clear about what was expected of them as Beacons, with one Beacon commenting: "I would have liked to have had a clearer statement about the expectations of Beacons...and a set of measureable goals would have been beneficial." This is consistent with statements derived from Beacons' journals during the 2001-02 year.

FIGURE 35. As a Lighthouse Beacon...



Summary of Teacher Survey Results

Data from the Teacher Survey suggests that SRHS teachers have a clear advantage over Comparison Site teachers in their opportunity and ability to use technology in a variety of ways to maximize student learning. SRHS teachers were more likely to report that they have sufficient access to technology resources which allows them to use computers and technology within their classroom rather than exclusively in labs or media centers, that these resources function well, and that they receive better technical support to use these resources. SRHS teachers described better communication through technology, and were more likely to maintain an up-to-date web site to help with this communication. They reported having made stronger professional growth with respect to their integration of technology into instruction, and an increased role in decision-making in this area within their school.

SRHS teachers also report more frequent use of almost all types of technology tools assessed on the survey. They also report stronger skills with using technology, and more of an ability to integrate it naturally into their teaching. This ability has led to SRHS teachers using technology in more infused, higher level ways to foster student learning. SRHS teachers also were more likely to believe that technology has positively impacted students' learning, engagement and preparation for college and a career. While the Project Lighthouse Beacon program likely contributed in part to the findings observed, the lack of financial support has reduced the ability of the Beacons to provide formal staff development to their colleagues that is specific to their discipline area. In addition, fewer than half of the teachers at SRHS had used the Beacons for assistance, and many did not know that the program existed. The Lighthouse Beacons themselves requested clearer expectations of their role in the program, and more time to conduct staff development and create lessons using technology.

5. *How has a technology-rich environment impacted parents' ability to communicate with the school, and their perceptions regarding how technology has impacted their students' opportunities and academic performance?*

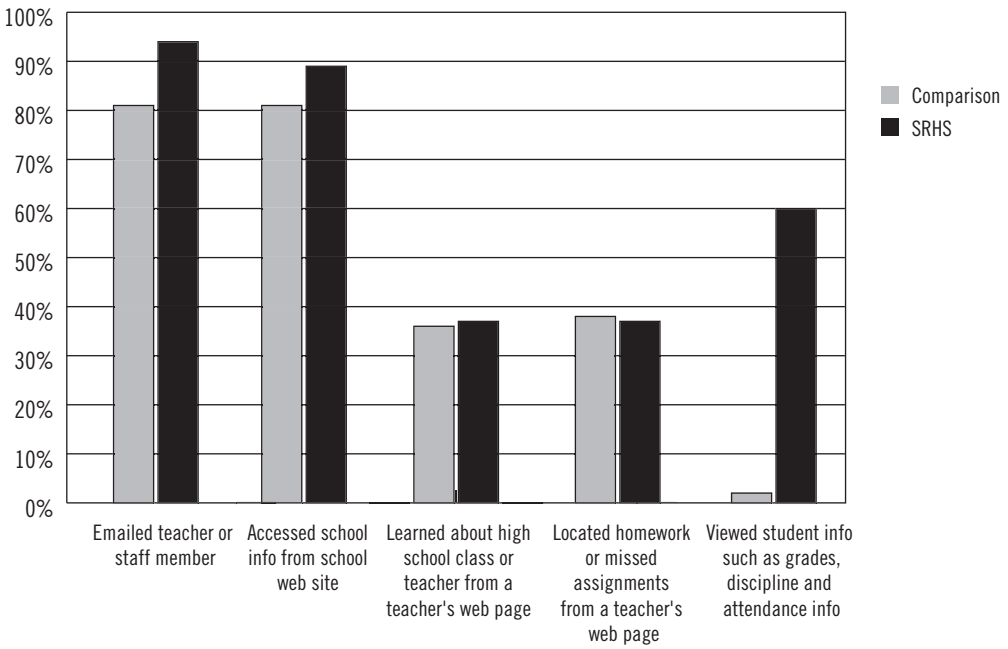
In order to gather information on parents' perceptions of technology's impact, surveys were mailed to the parents of identified SRHS and Comparison Group students. The mail survey was returned by 77 parents, for a response rate of 32%. To collect additional data on parent perceptions at SRHS, the same survey was then posted online and the principal invited all parents from SRHS to complete the survey if they had not already completed a mail survey. A total of 73 parents completed the web survey; data from the two survey administrations are provided below, followed by a qualitative analysis of parent comments to open-ended items addressed on the surveys. Survey data were analyzed using Chi Square or Analysis of Variance (ANOVA) procedures[15]. All reported significance levels are at least $p < .05$ unless otherwise noted.

SRHS and Comparison Group Parent Survey Results: Mail Survey

Parent-School Communication

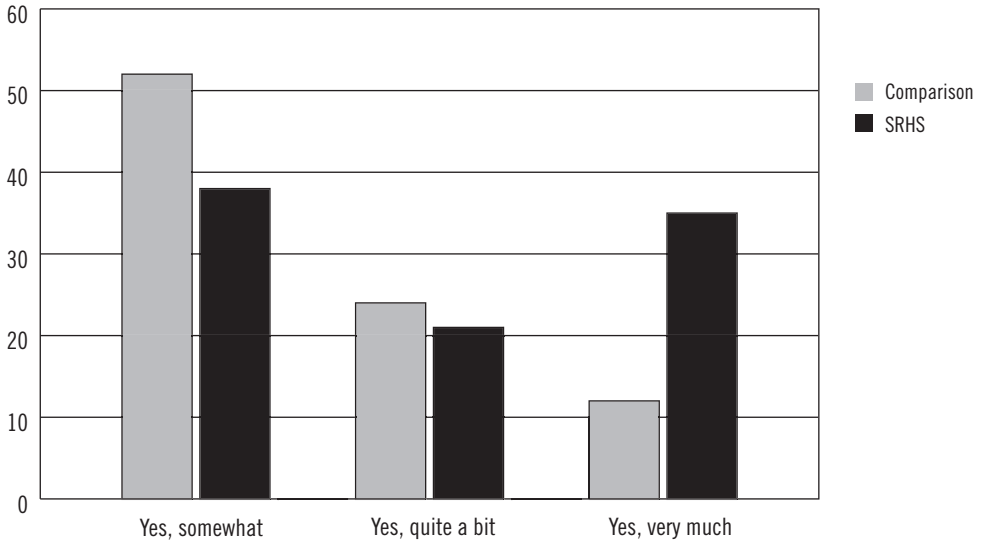
Parents were asked about ways they communicate with their high school, their knowledge of their child's use of various technological tools, and whether technology had impacted their child's academic performance, attitudes, and preparation for life after high school. Almost all parents (93%) in both groups reported using a computer to communicate with their child's high school. SRHS parents were more likely than Comparison Group parents to have emailed a teacher or staff member[16] and accessed information from the school's web site, although most parents from both groups had used this method of communication. Only slightly more than one-third of parents of both groups reported accessing teacher web sites to learn about a teacher or class, or locate homework and missed assignments. However, significantly more SRHS than Comparison Group parents had viewed student grades, discipline or attendance information.

FIGURE 36. Ways Parents Report Communicating with their Child's School



15 Both Chi Square and Analysis of Variance (ANOVA) procedures were used, depending on number and type of response categories.
16 Marginally significant, $p = .08$.

FIGURE 37. Has the Technology at Your Child's High School Improved Your Communication with the School Environment?

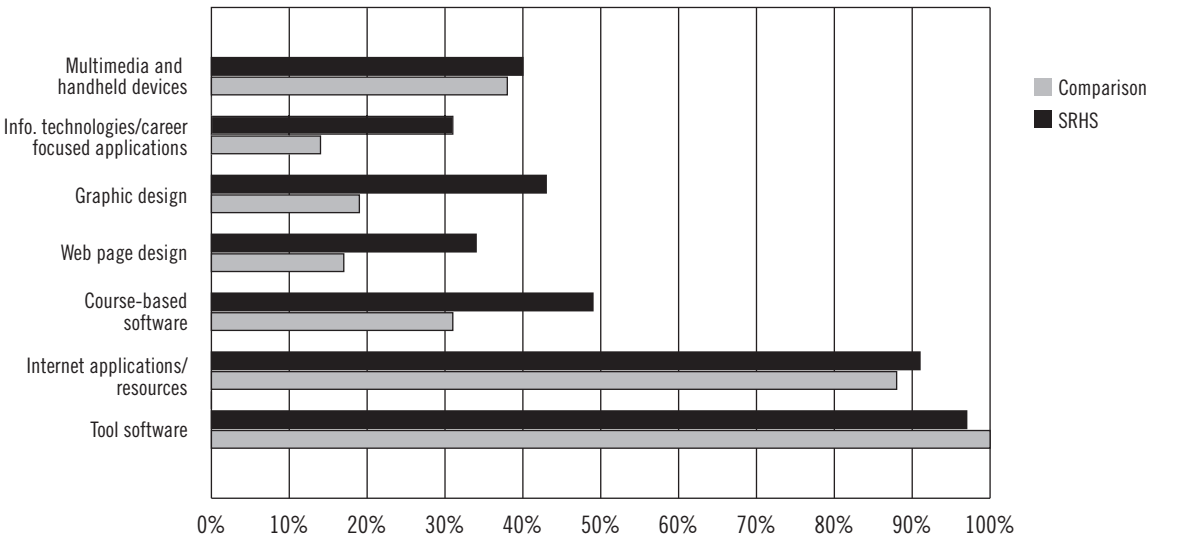


SRHS parents were also more positive (although not significantly) that technology at their child's high school had improved their ability to communicate within the school environment, with more than half of SRHS parents indicating a substantial improvement as compared with approximately one-third of Comparison Group parents.

Knowledge of Students' Use of Technology

Parents were asked to indicate on the survey whether their child used various technological tools at school. All or almost all parents in both groups reported that their child used tool software and Internet applications and resources. Fewer than half of both groups reported knowledge of their child's use of all other technology resources addressed on the survey. However, SRHS parents were more likely to report their child has used web page design and information technologies and applications[17], course-based software, and graphic design software[18].

FIGURE 38. Percentage of Parents Reporting their Child Uses Technological Tools

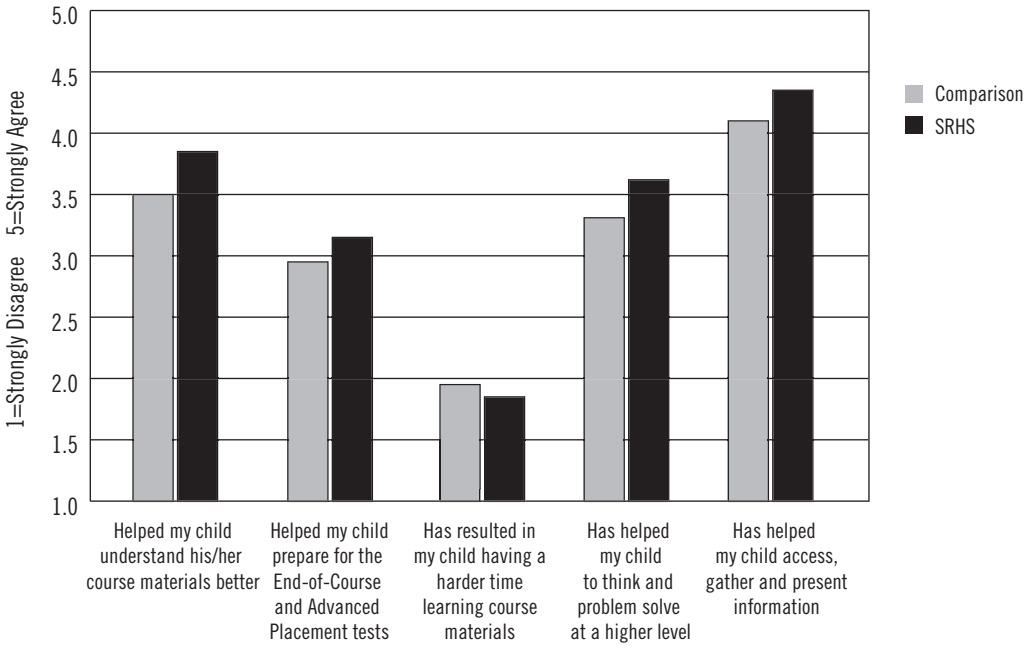


17 Marginally significant, p = .07
18 p < .05

Perceptions of Technology's Impact on Students

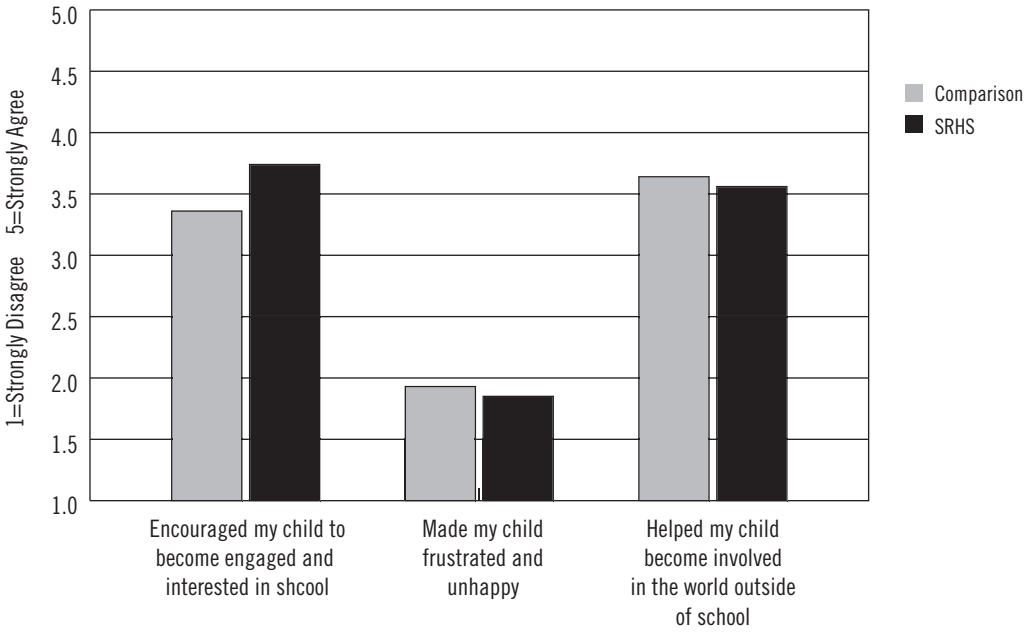
SRHS parents were more positive than Comparison Group parents that the school's technology had helped their child understand course materials better,[19] and locate and present information.

FIGURE 39. The School's Technology Has...



SRHS parents were significantly more likely than Comparison Group parents to report that the school's technology had resulted in their child becoming more interested and engaged with academics.

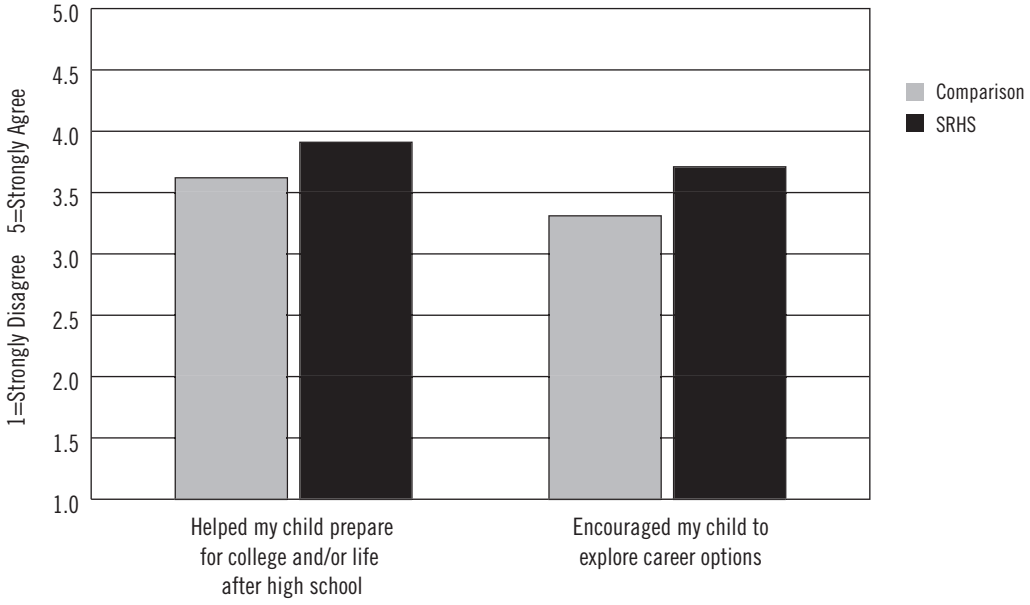
FIGURE 40. The School's Technology Has...



19 Marginally significant, p = .06

SRHS parents were more positive than Comparison Group parents that the school's technology had helped their child understand career options[20] and prepare for college or life beyond high school.

FIGURE 41. The School's Technology Has...



SRHS Parent Survey Results: Web Survey

The SRHS Parent Survey administered online was completed by 73 parents; most (81%) parents who responded had a child or children in the 9th or 10th grades. It should be noted that the sample of parents who completed this survey is not necessarily representative of the demographic diversity at the school. For example, it is not known how many ethnic groups are represented in survey respondents; therefore comparisons with survey results described above should be made with caution.

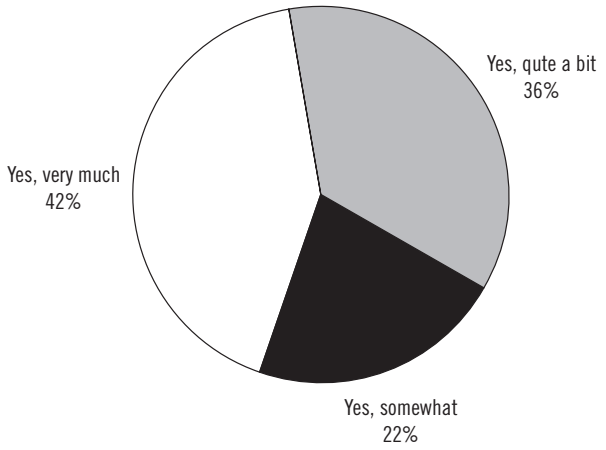
Parent-School Communication

All parents reported having used a computer to communicate with their child's school, and most had used a variety of communication tools. Almost all had emailed a teacher or staff member and accessed information from the school's web site. Approximately three-quarters had also used their computer to gather information about classes or teachers (79%) and locate homework or missed assignments (73%) from teachers' web pages. This result is an increase over what was observed for SRHS parents on the mail survey where fewer than half reported this use of technology. Most (81%) had also viewed student grades, discipline or attendance information, also an increase over what was observed for the mail survey (60%).

Parents were also quite positive that technology at SRHS had improved their ability to communicate with the school's environment, with 78% reporting notable improvement.

20 Marginally significant, p = .06

FIGURE 42. Has the Technology at Your Child's High School Improved Your Communication with the School Environment?



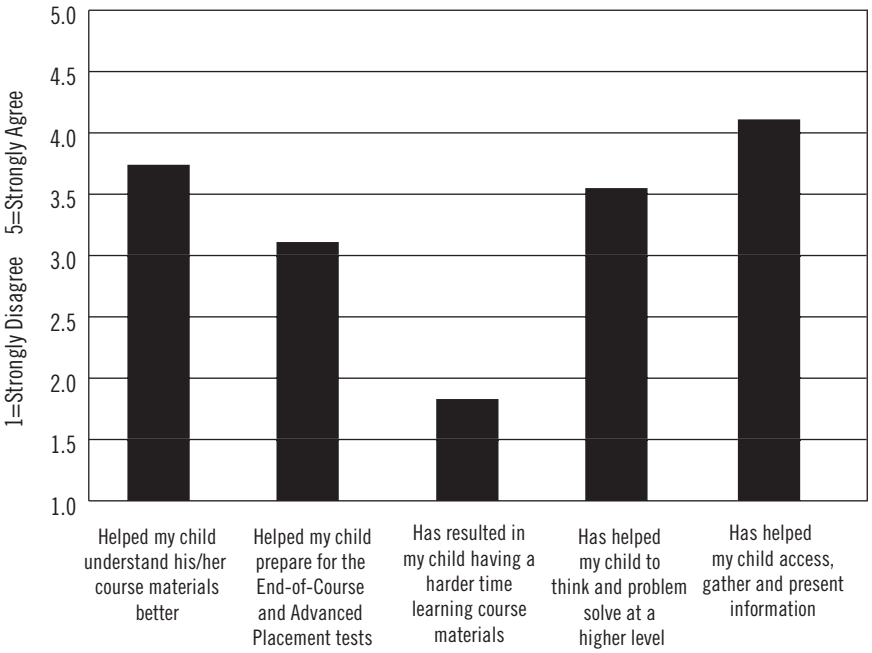
Knowledge of Students' Use of Technology

Similar to the mail-administered survey, SRHS parents were more likely to report knowledge of their child's use of tool software (98%) and Internet applications (96%), and less likely to know about their child's use of content-based software (48%), web page design software (47%), graphic design software (47%), multimedia and handheld devices (60%) and information technologies (27%).

Perceptions of Technology's Impact on Students

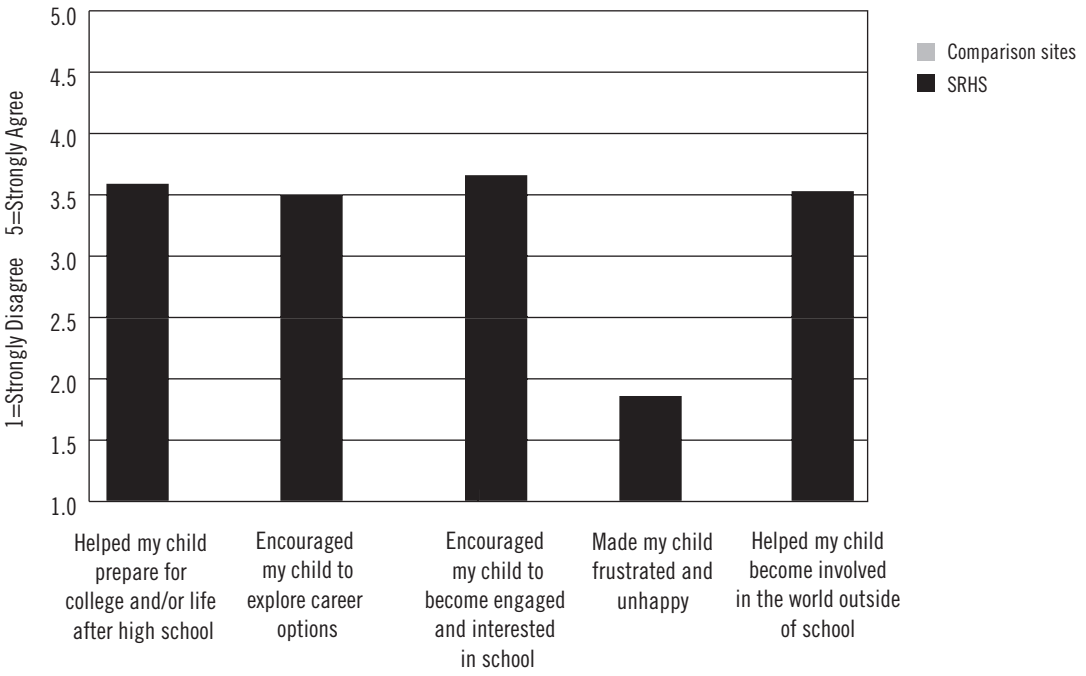
SRHS parents reported that technology had helped their child with the academic skills addressed on the survey, particularly in the areas of understanding course materials, accessing and presenting information, and thinking and problem solving. Parents responding to the web survey were more positive than those responding by mail to most items addressing academics.

FIGURE 43. The School's Technology Has...



SRHS parents also believed that technology benefited their child's attitude toward school, their connection with the world outside of school and their preparation for a future after high school.

FIGURE 44. The School's Technology Has...



Parent Reponses to Open-Ended Survey Items

Parents on both mail and web administered surveys were asked to describe anything that their child had been particularly interested or excited about regarding technology at their school, and to make recommendations for how the use of the school's technology could be improved. SRHS parents mentioned a variety of technology programs and applications that their child had been enthusiastic about, including:

- Computer-aided design: CADD and AutoCAD training;
- FIRST Team/Organization (a team of students using engineering, technology and science to design robots to compete against other teams);
- Digital Arts (e.g., digital music composition) classes;
- Principles of Electronics courses
- Broadcasting, film editing and news preparation.

Very few Comparison Group parents were able to name technology that had excited their child. Several mentioned online SAT preparation courses and use of technology such as scanners in computer applications classes.

When asked what would improve technology at their child's school, parents of Comparison Group students mentioned increases in technology resources, such as having computers in individual classrooms and more computers in labs, and better trained teachers. One parent described the issue of teacher training:

> *"Train teachers on the use of computers and standard software programs. My daughter says many teachers do not know how to use computers or some of the software. For example, they cannot use NCWISE to let the kids track their grades."*

They also mentioned a desire for better communication with the school via technology such as teacher web sites:

> *"I would love to be able to get grades and assignments off the Internet. But almost none of the teachers have even the most fundamental web page… I would suggest starting with a main page that almost never changes, then links to pages that change yearly (a course page), then progressing to weekly assignment pages.… Students, especially poor ones, need feedback and have trouble keeping track of assignments."*

While most SRHS parents were pleased with the quantity of technological resources available to their child, some mentioned the need for even more technology to optimize teaching and learning:

> *"I will be thrilled if we ever get to the point where each child and teacher has a computer to use individually in class.We will be totally integrating technology at that point."*

Some SRHS parents were also not convinced that the school was doing all that it could regarding communication with parents and help with using the technology:

> *"Have the teachers consistently use their web sites and web pages. Many times teachers have not made a web page or do not update it so that it is not as useful to the students and parents as it could be."*

> *"The parent access would be better if teachers kept the grades up to date."*

> *"Parents need to be trained on how to access and feel comfortable with the myriad of opportunities available at our school. Maybe PTA meetings can give min-sessions for parents who are computer challenged."*

Summary of Parent Survey Results

A key goal of the Project Lighthouse program is to improve parent-school communication through the use of technology. Parents of SRHS students reported more frequent and better communication with the school, particularly in the area of viewing student grades, attendance and discipline information than did parents of Comparison Group students. Apparently, however, many parents at SRHS (or Comparison Sites) are not frequently accessing teacher web sites for information about missed assignments and homework, and many SRHS parents mentioned a need to improve the information available via teacher web sites.

SRHS parents were more likely to report their child's use of more sophisticated technological tools, such as course-based software, information technologies and graphic design software. Apparently SRHS students have told their parents about their use of technology, as many parents were able to name several technological tools that had promoted their child's interest or enthusiasm. Parents of Comparison Group students, on the other hand, echoed the concerns expressed by students and teachers that sufficient technology resources were not available in their school. They mentioned the need for more computers, particularly in the classroom, and better trained teachers.

SRHS parents were also more likely to report that the school's technology had helped their child become more interested and engaged in school, helped them better understand course materials, and access and present information. They were also more likely to believe that the technology had helped their child understand career options and prepare for life after high school.

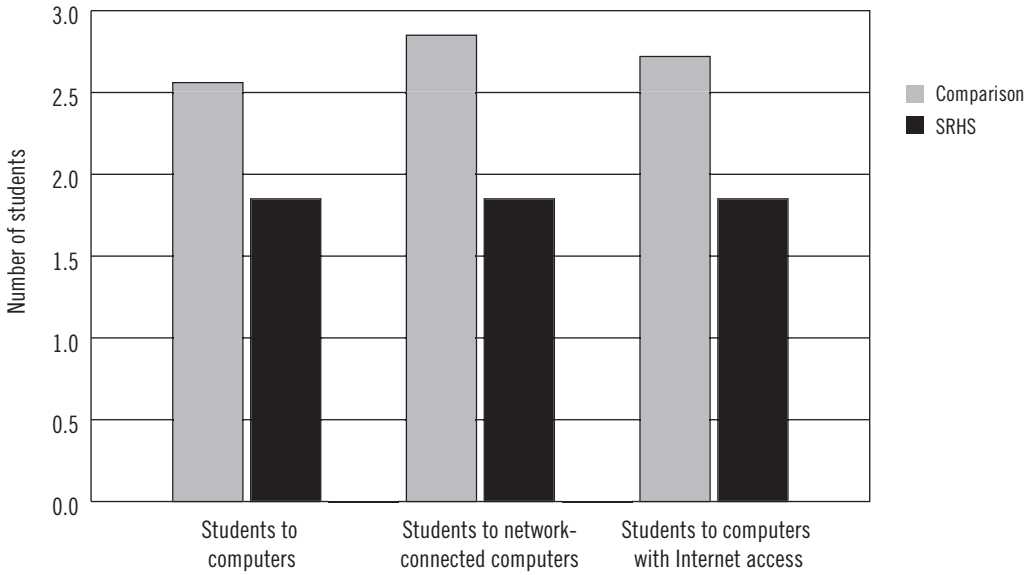
6. *How do administrators in a technology-rich environment and at comparison sites describe their schools' use of instructional technology?*

To gauge administrators' perceptions of the way technology functions within their school, the administrators (principals) at SRHS and Comparison Sites were sent an Administrator Interview via email. These interviews contained quantitative and qualitative items addressing the issues of technology resources, staff, professional development, funding and level of technology integration by teachers. All administrators returned the interview questions. Results are summarized below.

Technology Resources: Hardware and Software

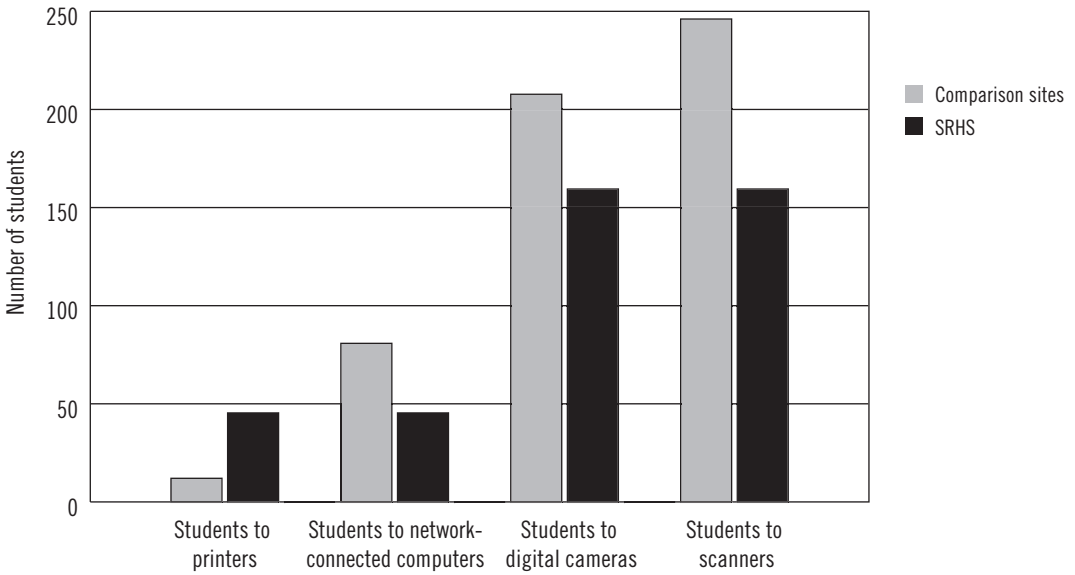
Administrators were asked to provide information regarding the quantity of technology hardware available currently at their school that was used exclusively for instructional purposes. A ratio of students to computer hardware was calculated for SRHS and Comparison Sites. Results showed there were fewer students per computer at SRHS than Comparison Sites.

FIGURE 45. Number of Students Per Computer at SRHS and Comparison Sites



There were also fewer students per other types of hardware at SRHS than at Comparison Sites. The only exception was for non-networked printers, where there were more SRHS students per printer. The reason for this finding is unclear; however, it may be that Comparison Sites had more "stand-alone" printers due to less networking capability.

FIGURE 46. Number of Students Per Types of Hardware at SRHS and Comparison Sites

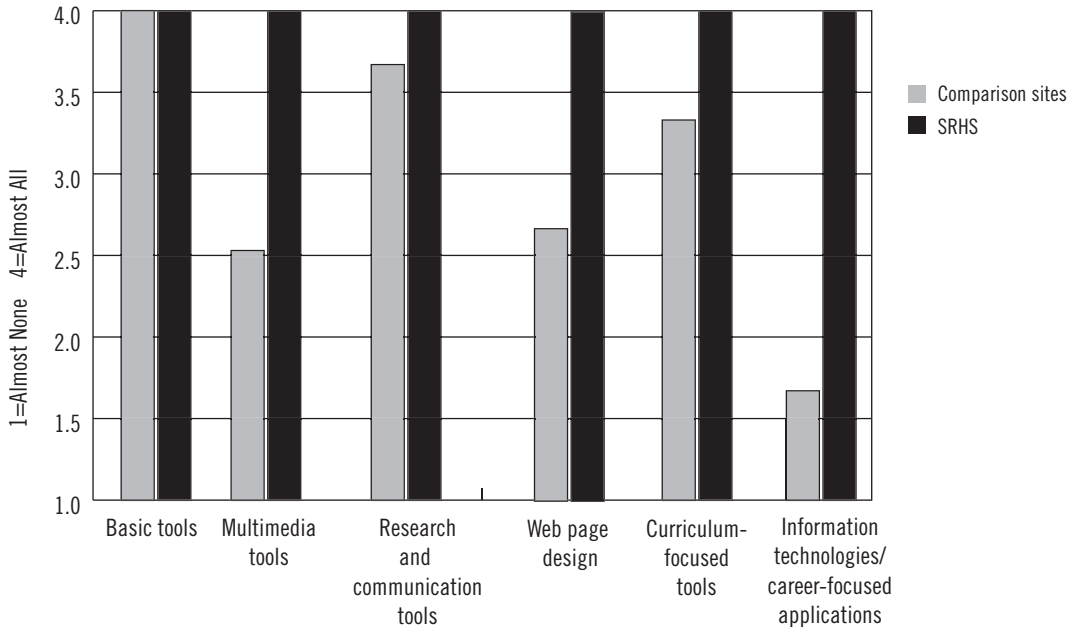


When asked whether they believed that students had sufficient access to these technological resources, three of four Comparison Site administrators believed they did, although one described their resources as "woefully inadequate." Other administrators stated they would benefit from additional resources such as:

- Funded replacement plan for outdated and/or aging hardware;
- More public computer labs or wireless mobile units; and
- Additional laptops, projectors and wireless laptop labs.

Administrators were also asked to describe how many of their computers were equipped with software and online resources. Results showed that more computers were equipped with sophisticated tools such as multimedia, web page design, and information technologies at SRHS than at Comparison Sites.

FIGURE 47. Approximate Numbers of Computers Equipped with Software and Online Resources



While the administrator at SRHS felt that students had sufficient access to these resources, administrators at Comparison Sites requested updates to software titles currently networked for school-wide use, and better classroom access to these resources.

Technology Funding

Not surprisingly, all administrators reported that more funds were necessary in order for instructional technology to positively impact student learning. Administrators' suggestions for additional funding included:

> *"Set up long-term plans to periodically update computers. Some of our older computers don't keep up with faster software applications. Also, the better our technology program is, the better prepared our graduates will be for their careers."*

> *"The school system should find a way to determine a standard level of 'hardware' and software per school and then fund the initiative separately from instructional supplies. There should be a replacement cycle cost figured into the initial program. The individual schools are faced with the costly perspective of replacing outdated equipment, as well as purchasing new types of equipment."*

Technology Resources: Staff

Administrators were asked to list all staff that provides at least 50% of their time to technology support. The administrator at SRHS described five staff members who provided technology support, including a Director of Technology and four Network Administrators. All administrators at Comparison Sites were only using one staff member for technology support, and were unanimous in their desire for increased staff in this area:

> *"We need at least one funded full-time school-based person to handle all aspects of technology."*

> *"[The technology support person] works late nights to keep our technology working."*

> *"The WCPSS does not provide an allotment for this type of personnel. At a traditional school, the only way to facilitate this is to use a classroom teaching position."*

Even the administrator at SRHS also stated that additional staff was necessary to optimize technology at his school:

> *"The industry standard for technology support is one person for every 22 computers. We fall way short of meeting this standard. We would benefit from additional support."*

Professional Development

Administrators were asked to describe major technology-related professional development taking place for their staff during 2003-04. Administrators at Comparison Sites generally only listed a few initiatives, including Blackboard and NCWISE training. However, one Comparison Site described training in web page design and use, and monthly meetings when staff receives information and training on various topics related to the use of technology. The administrator at SRHS described routine professional development taking place in a variety of areas, including:

- Working in a networked environment;
- Designing web sites for instructional use;
- SAS InSchools;
- SID (school developed student information database);
- Online media resources;
- NCWISE; and
- Software training in Inspiration, Advanced PowerPoint, and curriculum specific programs.

Administrators at Comparison Sites stated that their teachers would benefit from additional professional development opportunities such as further training in basic computer skills, continued instruction to improve use of NCWISE and Blackboard, basic technology troubleshooting, and integrating technology into the curriculum.

Technology and Learning/Instruction

When asked to describe the impact technology has made on classroom instruction and student learning/achievement over the past three years, most administrators at Comparison Sites indicated that technology had made "a fair amount of impact," while the administrator at SRHS described technology as making "a significant impact." The SRHS administrator described the impact in this way:

> *"I feel it has made a large impact because students have been taught that technology is a tool designed to optimize student learning. All of our students must learn how to use this tool for their learning needs. The best example I can offer is that for the Senior Graduation project 100% of the students use technology tools to present their project. The Senior Graduation Project is designed to be a culminating experience to demonstrate skills learned during the high school years. This would include communication skills and technology skills."*

All administrators reported that technology was one criterion used to assess teacher performance, and most incorporated this assessment into observation/evaluation tools. When asked what percentage of their teachers was sufficiently skilled at integrating technology into their classroom instruction on a regular basis, two of three administrators at Comparison Sites indicated that fewer than half were sufficiently skilled, while the SRHS administrator indicated between half and three-quarters were sufficiently skilled.

Summary of Administrator Interview Results

According to administrator-provided data, students at SRHS clearly have better access to technology hardware and software than students at Comparison Sites. There are fewer students per computer and almost all other types of technology hardware at SRHS, and more computers are equipped with sophisticated technology applications such as multimedia and web page design software. Administrators at Comparison Sites would like additional funding to support technology from the school system, and a plan to fund replacement of outdated technology.

While SRHS has a staff of five technology support personnel, all other administrators reporting only one staff person dedicated to this purpose. Administrators at Comparison Sites believed that this lack of support personnel created a barrier to technology use by teachers, and thus to the potential of technology to improve student learning and achievement. While teachers at Comparison Sites were provided with several training opportunities in technology use, teachers at SRHS have a broad menu to choose from to support or improve their technology use and skills. Technology is described by administrators at Comparison Sites as having a fair amount of impact on instruction and learning, but is described as significantly impacting these areas by the administrator at SRHS.

CONCLUSIONS

Results from this evaluation demonstrate that technology at SRHS is being used more frequently within the classroom, and in qualitatively different ways than at other high schools within WCPSS. Students and teachers report better access to, and more frequent use of, computers and other technological tools within their classroom, and more frequent use of communication tools such as email and teacher web sites. Parents of SRHS students are also taking advantage of these communication tools, and many are using them to access their child's academic information and communicate with teachers. SRHS parents were more likely to be aware of their child's technology use, and believe that the technology enhances their child's academics and access to career exploration. Teachers at SRHS report better access to technical support, more input into technology decision-making, and more professional growth relative to teachers at Comparison Sites. They also believe they are naturally integrating it into their teaching, and describe lessons with more infused, higher level uses of technology than do Comparison Site teachers.

Although teachers, students and parents report more enhanced uses of technology, the benefits to student achievement as measured by this evaluation have not yet been realized. Few differences were observed between SRHS and Comparison Group students on End-of-Course, Advanced Placement or SAT tests. It may be that enough time has not elapsed to detect differences in student performance; the Project Lighthouse program only began during the 2000-01 year, and it may take longer than four years for technology to become well-integrated enough with classroom instruction to begin to impact student achievement. When teachers adopt new technologies, learning how to use the technology may take precedence over learning through the technology:

> *"The technology learning curve tends to eclipse content learning temporarily; both teachers and kids seem to orient to technology until they become comfortable. Effective content integration takes time, and new technologies may have glitches. As a result, teachers' first technology projects generate excitement but often little content learning. Often it takes a few years until teachers can use technology effectively in core subject areas."*
>
> (Goldman, Cole & Syer, 1999)

It may also be that the student performance data collected for this evaluation does not reflect the types of benefits to student learning which technology may provide. The impact of technology may be easier to detect on critical thinking skills, research skills or presentation skills. This mismatch between the outcomes measured and the types of learning impacted by technology was recently described by several evaluators:

> *"Some technologies aim to promote mastery of the kinds of discrete skills tapped by most state achievement tests; others support problem-solving skills rarely addressed by achievement tests. A mismatch between the learning supported by an intervention and that measured as an outcome can lead to erroneous conclusions of 'no effect'."*
>
> (Haertal & Means, 2004)

This problem of mismatch was also noted by Schacter:

> *"I think there's a big gap in studies on how kids actually make and do and create things with technology and how that affects their cognitive development in not only the content knowledge, but in their thinking skills…There needs to be more work in terms of building tests to assess deeper understanding and problem-solving and how these technologies impact those cognitive skills as well.*
>
> (Schacter, 1999)

Additional evaluation data that may shed more light on technology's impact on high school students include tracking SRHS students into college and/or the workforce to determine whether they are better equipped to use technology on the job or with their course-work in college. Expanding the data collection process to include measurement of the skills described may allow for a more complete picture of technology's impact on high school students.

Although SRHS teachers were more positive than Comparison Site teachers about their access to technology and their ability to use it to promote student learning, the question remains as to whether the technology available at SRHS is being used in all the ways it could to enhance student learning. The Lighthouse Beacons were only compensated for their role for one year (2001-02), and although some undoubtedly continue to serve as technology leaders within their discipline, they are no longer provided with the time or money to conduct formal staff development or work with teachers to develop lessons integrating technology. SRHS and Comparison Site teachers report similar amounts of formal staff training in technology, although the administrator at SRHS reports a greater variety of training opportunities available. In addition, teachers and former Beacons report needing more time for collaboration and the development of lessons integrating technology. If the Beacon program is reestablished, perhaps the benefits of increased staff development with using technology within specific disciplines may eventually result in positive benefits for student achievement. Professional development of course is crucial to maximizing technology's impact:

> *"Effective professional development requires support from administrators in the form of building time into teachers' schedules for collaborative work in learning and applying technology to classroom practice. It also often requires a shift in how teachers view teaching, hinging on their willingness to move from the role of expert to that of facilitator or coach. Also important are adequate access to technology, technical support, and ongoing evaluation of student achievement to ensure that the technology application is appropriate to the educational goal."*
>
> (O'Neill, 2003)

While SRHS is clearly moving in the right direction with respect to many of these issues, the program may be made even stronger if Beacons provide teacher leadership and teachers are given more time for collaboration to integrate technology into their teaching.

A final point is that students, teachers, parents and administrators at Comparison Site high schools clearly want and need more technology resources to enhance student learning and home-school communication. More computers within classrooms rather than labs or media centers may enhance opportunities for teachers to integrate technology into their instruction, and increasing the numbers of teacher web sites may enhance parent-school communication. Finally, more technical support staff is needed at these schools to ensure that the technology that is available functions adequately.

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APPENDIX A: SAMPLING PROCEDURE

In order to document the impact of Project Lighthouse on student achievement, the Evaluator worked with key staff in the WCPSS E&R department to determine the most appropriate design for data collection. The conclusion was that the best design would involve random selection of a sample of SRHS students who began as 9th graders in 2000-01, and match them to other students in WCPSS generally that also began as 9th graders in 2000-01. It was agreed that a stratified random sampling procedure would be used, and the samples selected for analysis would consist of 30 Black Males, 30 Black Females, 30 White Males and 30 White Females from both SRHS (n=120) and WCPSS (n=120) as a whole.

The Evaluator first randomly selected 120 students from SHRS who began as 9th graders in 2000-01 and who had remained at SRHS into their senior year using the demographic distribution described above. Then for each SRHS student selected, a student from the rest of the WCPSS population (who had began at their high school in 2000-01 and remained there all four years) was selected who matched on as many demographic and entering academic variables as possible. The process for matching involved the following variables:

- Race;
- Gender;
- Limited English Proficiency (LEP) status;
- Special program status;
- Parent income level (*as determined by student node data linked to census data which showed the geographic distribution of income level for the county*);
- Free/Reduced lunch status;
- 8th grade EOG reading level;
- 8th grade EOG math level;
- 8th grade EOG reading scale score; and
- 8th grade EOG math scale score.

Students at Enloe High School were not included in the comparison group due to the unique types of students it attracts as a gifted/talented magnet school. There were no LEP students in the SRHS sample, so no LEP WCPSS students were used for sampling. In almost every case, students were able to be matched using the exact special programs code (e.g., academically gifted/language arts); in any case where a student with an exact match on special programs was unavailable, the next closest code was used (e.g., academically gifted language arts and mathematics). Parent income level (low, medium or high) was used as the next matching variable, followed by free/reduced lunch status. Then after selecting a match based on EOG level, an attempt was made to further match on EOG reading and math scale scores. If no exact match was available, then a student with the next closest scale score was selected. A profile containing a summary of demographic and academic characteristics for both the SRHS and comparison groups is provided in the appendix of the Evaluation Report.

APPENDIX B: PROFILE OF STUDENTS SELECTED FOR SAMPLE

CHARACTERISTICS OF SOUTHEAST RALEIGH HIGH AND COMPARISON GROUPS

	Special Programs					Parent Income Level		
	Number/Percent Free/Reduced Lunch	Learning Disabled	BEH	Academically Gifted	Other Health Impaired	Low	Medium	High
Southeast Raleigh High School (n=120)	7 (6%)	13 (11%)	2 (2%)	29 (24%)	2 (2%)	37 (31%)	61 (51%)	22 (18%)
Comparison Group (n=120)	8 (7%)	13 (11%)	2 (2%)	29 (24%)	2 (2%)	29 (24%)	69 (58%)	22 (18%)

	8th Grade End-of-Grade Reading Level				8th Grade End-of-Grade Math Level				8th Grade End-of-Grade Mean Scale Score	
	Level 1	Level 2	Level 3	Level 4	Level 1	Level 2	Level 3	Level 4	Reading	Math
Southeast Raleigh High School (n=120)	1 (1%)	8 (7%)	46 (38%)	61 (51%)	3 (3%)	10 (8%)	34 (28%)	69 (58%)	165.35	178.28
Comparison Group (n=120)	0 (0%)	9 (8%)	48 (40%	58 (48%	0 (0%)	15 (13%)	37 (31%)	63 (53%)	165.74	177.91

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