Case Studies of High-Performing, High-Technology Schools:
Final Case Report on School F

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Methods and Data Sources

The North Central Regional Educational Laboratory (NCREL) study of high-performing, high-technology schools was based on a mixed methodology case study research design (Creswell, 2003; Yin, 2003; Greene, Caracelli, & Graham, 1989; Tashakkori & Teddlie, 1998). The research team elected to use quantitative methods to build on findings from previous studies of what educational technology schools use (Anderson & Ronkvist, 1999), how schools use educational technology (Becker, Ravitz, & Wong, 1999), and conditions under which educational technology have helped raise student achievement (Mann, Shakeshaft, Becker, & Kottkamp, 1999; Chang, Henriquez, Honey, Light, Moeller, & Ross, 1998; Wenglinsky, 1998). On the other hand, qualitative methods enabled exploration of characteristic uses of educational technology in high-performing schools that may contribute to the academic achievement of low-income, African-American, and Latino students.

Previous studies in both the qualitative and quantitative literature have generally proceeded from a specific use of educational technology to a consideration of its effects on some measure of student achievement, ranging from instruments designed by teachers or researchers to standardized tests. The NCREL study proceeds from success on state achievement tests at the school level to an exploration of educational technology in successful schools. The initial research questions for the case studies were:

• What effects on student achievement do administrators and teachers in high-performing, high-technology schools attribute to educational technology?
• What types of educational technology do administrators, teachers, and students use in high-performing, high-technology schools?
• What educational technology practices do administrators and teachers in high-performing, high-technology schools employ?
• What educational technology policies do administrators and teachers in high-performing, high-technology schools implement?
• How does the technology capacity of high-performing, high-technology schools affect administrator, teacher, and student use of educational technology?
• What resources, strategies, and structures do schools use to become high-performing and high-technology; to what extent are these integrated with other school improvement efforts?

The NCREL research team defined “high-performing” to mean that students’ reading and mathematics performance on statewide achievement tests was in the top third among all schools.
in the state at the same grade level during the 1999–2000 school year. This definition was chosen to be consistent with No Child Left Behind requirements for adequate yearly progress in both subjects. The NCREL definition represents a subset of schools identified by The Education Trust in which students’ reading or mathematics performance was in the top third among all schools in the state at any grade level in 2000 (Jerald, 2001). The research team used Education Trust definitions of “high-poverty” and “high-minority” without modification to identify high-performing schools with predominantly low-income, African-American, or Latino student populations. The research team identified all schools that met the NCREL criteria for high-performing and The Education Trust criteria for high-poverty or high-minority in 10 states were selected on the basis of geographic distribution and size of low-income, African-American, or Latino student populations.

The research team then surveyed principals of qualifying schools to identify those that used educational technology most intensively, regardless of how they used technology (Sweet, Rasher, Abromitis, & Johnson, 2004). Based on the results of the principal survey, the research team defined “high-technology” to mean schools that reported 50 percent or more of all teachers use technology for professional purposes and assign their students to use technology every school day, and 75 percent or more of all teachers use technology for professional purposes and assign their students to use technology at least once per week. Due to the large number of qualifying schools in one of the 10 states, the criteria was set at 90 percent or more of all teachers using and assigning technology every school day in that state. The research team then conducted telephone interviews with the technology coordinators of all schools that met these criteria and eliminated schools in which the technology coordinator did not corroborate the levels of technology use and assignment reported by the principal.

The research team identified 41 schools that met all criteria for high-performing, high-technology schools with predominantly low-income, African-American, or Latino student populations. In order to encourage administrators and principals to be as forthcoming as possible, the research team pledged that the schools would remain anonymous in all research reports. Twenty of the eligible schools accepted an invitation to participate in case studies. After site visits were conducted, the research team decided to combine one middle school and high school for analysis because they were both located in the same building in a small rural district and respondents in these schools indicated extensive interdependence. In addition, some elementary teachers, also located in the same building, were interviewed and observed during the first site visit because respondents indicated extensive interdependence with the middle school. As a result, the NCREL study included 19 cases of high-performing, high-technology schools with predominantly low-income, African-American, or Latino student populations.

A member of the research team visited each school during the winter of 2002. Open-ended interview protocols provided qualitative data, while classroom observation protocols and survey instruments contained a mix of open- and close-ended items that provided both qualitative and quantitative data. Principals were asked to schedule at least six teachers for 30-minute interviews and 20- to 25-minute classroom observations. Technology plans and school improvement plans were collected during the winter site visit whenever they were available and other documents were collected when offered. Surveys were distributed to all administrators and teachers in each school after site visits were completed. Principals were briefed by telephone on data collection...
procedures and asked how many printed administrator and teacher surveys should be mailed to the school. Response rates were calculated based on the number of surveys principals requested, and at least two subsequent telephone calls were made to each teacher to improve response rates.

A case report was drafted based on the triangulation of interview, observation, survey, and documentary (Yin, 2003; Greene et al., 1989). The draft case report addressed each of the original research questions and identified primary and secondary characteristics of each school based on each question. In general, attributes that were reported by a majority (at least one half) of respondents in the school were classified as primary and attributes reported by a substantial minority (at least one fourth) were classified as secondary. Attributes reported in multiple data sources were assumed to be more reliable than those reported in one data source. The draft case report was returned to the principal of each school for review and revised based on comments received from the school.

A member of the research team made a follow-up visit to each school during the spring of 2003. The primary purpose of the second site visit was to observe classroom uses of technology in more depth than was possible during the initial site visit. The research team asked principals to schedule three teachers for a 40- to 45-minute lesson observation, with 30-minute interviews before and after the lesson. The interview before the observation provided a context for the lesson and identified curriculum objectives, instructional and assessment strategies, and planned uses of educational technology. In the interview after the observation, teachers interpreted the lesson and the extent to which curriculum objectives were met, instructional and assessment strategies were effective, and uses of educational technology contributed to lesson outcomes. All lessons that included teacher or student use of educational technology were written up as classroom vignettes and appended to the case report. Finally, the research team prepared a summary for each school based on the revised case report, classroom vignettes, and all data that had been collected from the school.

This report includes the summary, revised case report, and classroom vignettes for one of the 19 high-performing, high-technology schools with predominantly low-income, African-American, or Latino student populations. This school will be designated as School F in this report, which is based on the following data collected from the school:

- Seven teachers and three administrators were interviewed during the first site visit.
- Seven classrooms were observed during the first site visit.
- A school improvement plan was collected during the site visits.
- The school returned a technology infrastructure survey.
- Sixteen teachers (89 percent) returned a survey.
- One administrator (25 percent) returned a survey.
- Three lessons were observed during the second site visit.
Case Background

School F is a part of the second largest school district in its state, with more than 150,000 students attending approximately 150 elementary schools and 60 secondary schools. The district serves the city and several surrounding municipalities. The district employs approximately 13,000 professional staff, including about 11,000 teachers, as well approximately 7,000 support staff. The total budget of the district in 2002–03 was approximately one billion dollars. Almost 90 percent of the student population is Latino or African American. About 70 different languages are spoken in the homes of students in this district.

School F is one of several magnet high schools in the district, each of which provides a specific emphasis on a dedicated career path. This particular school combines the strength of education with practical business experience and leadership opportunities. The school serves approximately 500 students from diverse ethnic and cultural backgrounds; approximately 95 percent of the student population at School F is Latino or African American.

Case Summary

School F is a high-technology school, where each classroom has a mini-computer lab in addition to a larger computer laboratory that is available for use before and after school. Class sizes are small so computers often outnumber students, but this allows for frequent use of computers as well as interaction between student and instructors. Because of the technology-rich learning environment, students are very comfortable using computers.

School F offers training in current business practices through innovative programs that combine state-of-the-art integrated business training with a strong college preparatory curriculum. The school has a friendly, but business-like atmosphere, and teachers have high expectations for students. Student achievement is a campus priority, and the Business Advisory Committee has developed partnerships that contribute to student participation in shadowships, mentorships, and paid and nonpaid internships in the business environment. School F students also participate in business-related leadership organizations such as Business Professionals of America, DECA Clubs, and LULAC. The National Honor Society, Pan American Student Forum, and Spanish National Honor Society also are active on campus. Students are prevented from participating in extracurricular activities if their grades do not meet school standards.

The curriculum at School F is standards-based and is designed to help students explore various business careers, choose an appropriate cluster of courses, and possibly earn dual credit at a local community college for the advanced classes in the Academy of Finance, the Academy of Travel and Tourism, Business Management, and Marketing Education. Cisco Networking Academy is available to train students for a variety of jobs in the information technology industry including network support specialists, network control technicians, hardware/telecom field support technicians, LAN/WAN technicians, network specialists, and network systems technicians. Many classrooms are structured to simulate an office environment and teachers use a variety of activity structures (adult-led large and small groups, collaborative groups, and individual work) to engage students. One teacher commented on a class at School F, “At the beginning of each week, I give then a calendar of events, lesson plans … I am structured to the point where there is
order in my class … But they’re also free to move in the classroom. They are able to talk with each other … And that’s a part of corporate America. If you don’t know how to have teamwork, you don’t know how to get along with each other, then you are not going to survive.”

Many of the teachers at School F came to teaching from the business world, and many are proficient with the standard business applications of technology. The teachers are dedicated to the students’ success and many collaborate with one another, sharing their expertise with others. The teachers also are required to take 21 hours of content training and other professional development. All the teachers at School F reported using technology most frequently to create instructional materials and present information to students. Teacher reported that using technology to create instructional materials and gather information for lesson plans have had the greatest effect on their practice.

The administrators at School F are viewed as supportive of teachers and students and encourage the use of technology before, during, and after school. When asked about their highest priorities for school improvement and technology use, the administrator mentioned several including; improving technology integration; individualizing learning experiences; making instruction more data driven; and increasing professional development. The administrator also reported using technology frequently to access information and research on best practices and to purchase materials or services. Analyzing student data for school improvement, creating administrative materials, and presenting information to teachers and students were identified as uses of technology that have had the greatest effect on administrative practices.

School F has a dedicated funding source because of the careers program that has allowed it to purchase more technology than other schools, including other magnet programs in the district. Teachers and administrators use technology to analyze test scores and identify achievement gaps between student populations. This data is then used to improve curriculum and instruction, and set achievement goals. Teachers and administrators also continually monitor student achievement. This system has had some success as achievement gaps between the minority and white populations was very small in 2001, and not observed in 2002.

Technology plays an important role in test preparation in School F. Ninth-grade students who score below the desired percentile in mathematics on the standardized test are scheduled to use a math instruction software package in addition to their regular course work. Software designed to prepare students for the state achievement test also is available to students. Teachers reported assigning students to use computers daily or weekly to master skills and remediate skills, improve computer skills, work independently, and write. Teachers also reported that student use technology to master skills, conduct research, write, remediate skills, analyze information, and improve computer skills have had the greatest effect on student achievement. The technology resources at the school are viewed as adequate, and supportive of technology use at the school.

The school also has developed a number of relationships with area businesses to support the business emphasis of the school. These businesses provide experiential learning experiences, some paid and some nonpaid, for students. The combination of a learning environment rich with technology and other resources, motivated students, and committed teachers and parents has
produced results that are evident in high achievement on state assessments, high levels of technology literacy, and continued success beyond the walls of the school.

**Academic Achievement**

**Research Question:** What effects on academic achievement do administrators and teachers in School F attribute to educational technology?

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<tr>
<th>Primary Characteristics</th>
<th>Secondary Characteristics</th>
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<tr>
<td>One half of interview respondents referred to meeting the individual needs of students as a school characteristic that contributes to student achievement.</td>
<td>More than one fourth of interview respondents referred to high academic expectations and concern for students as school characteristics that contribute to student achievement.</td>
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<td>One half of respondents cited the use of technology by students for conducting research as a student use of technology that contributes to student achievement.</td>
<td>More than one fourth of interview respondents referred to hands-on or project-based learning, and content-specific strategies as student uses of technology that contribute to achievement.</td>
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<td>Teacher survey respondents most frequently listed a word processor, Web browser, and presentation software among the three software titles with the greatest effect on student achievement. The most commonly reported purpose for use of this software was writing, followed by instruction, and research.</td>
<td>Teacher survey respondents listed a spreadsheet among the three software titles with the greatest effect on student achievement.</td>
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<td>More than four fifths of teacher survey respondents reported frequently assigning students to use technology to master skills just taught, remediate skills not learned, improve computer skills, and learn to work independently. Three fourths reported weekly assignments to express themselves in writing. About two thirds reported weekly assignments for the following purposes: exploring concepts, models, or simulations; conducting research or gathering information; learning to work collaboratively; graphically organize information or ideas; and analyze information or solve problems.</td>
<td>At least one fourth of respondents also specified the following top uses of student technology: expressing themselves in writing, conducting research/gathering information, and remediating skills not learned.</td>
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<td>More than two thirds of teacher survey respondents ranked mastering skills just taught among the three purposes of student technology use with the greatest effect on achievement, and most respondents placed it first.</td>
<td>More than two fifths of teacher survey respondents reported frequently assigning students to use technology to present information to an audience.</td>
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<td></td>
<td>More than two fifths of teacher survey respondents ranked expressing themselves in writing and conducting research or gathering information among the top three purposes for student technology use with the greatest effect on achievement. Almost one third ranked remediate skills not learned among the top three purposes, and one fourth put analyzing information or solving problems and improving computer skills in the top three.</td>
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When asked what characteristics of School F as a whole have the greatest effect on student achievement, five (50 percent) of the 10 teachers and administrators interviewed cited the school’s focus on meeting the individual needs of students. Four (40 percent) respondents cited high academic expectations, three (30 percent) reported concern for students, and two (20 percent) respondents cited each of the following: administration leadership, other student characteristics, content-specific strategies, and practicing standardized tests. School F places a strong emphasis on both student success and college preparation, and it is generally assumed that students who attend this school are ambitious, motivated, and oriented toward these goals. Students at School F are in the business of being students; they regard it as their job.

Students at School F are enrolled based on a formula that includes test scores, grades, attendance, a persuasive essay, and recommendations. Although respondents attribute a great deal of the school’s success to the motivation level of the students who are attracted to a careers program, administrators and teachers leave nothing to chance when it comes to student achievement on state assessments. One teacher stated, “It’s the dedicated and hard work of teachers, and to put emphasis on the students of how important it is to accomplish and to pass the written exam.” Data from diagnostic and practice tests are used by School F to set goals for student achievement in reading, mathematics, and writing. Data also are analyzed to determine achievement gaps between the school’s minority (African-American and Latino) and white populations. Achievement gaps between the minority and white populations were negligible in 2001 and nonexistent in 2002.

Teachers use data to determine which students need tutoring in advance of the test and develop a tutoring schedule for those students to help them prepare. Throughout this process, student progress and preparation levels are monitored. For example, ninth-grade students who score below the 40th percentile in mathematics on the Stanford 9 standardized test are double-blocked in algebra and use math instruction software in addition to the regular coursework. Students who continue to struggle are tutored by mathematics teachers before and after school. The school makes software designed to prepare students for the state achievement test, as well as the PSAT and SAT available to students before and after school. Finally, the school’s “Student Success Initiative” pulls selected students out of careers classes to use test preparation software during the school day.

When asked what student uses of technology have the greatest effect on student achievement, respondents who were interviewed again offered multifaceted responses. Five (50 percent) of the 10 teachers and administrators who were interviewed indicated that the use of technology by students for conducting research has the most significant impact on their academic performance. Three (30 percent) respondents also each indicated that hands-on or project-based learning, and content-specific strategies significantly impact student achievement. An additional two (20 percent) respondents each indicated practicing standardized tests, technology use for typing, writing, or editing, and other ways in which technology aids in learning.

Sixteen teachers completed a technology inventory survey, which asked teachers to report the specific software applications used by students thought to have the greatest impact on their achievement. Respondents most frequently listed a word processor (n=12), Web browser (n=9), and presentation software (n=8) among the top three software titles with the greatest effect on
student achievement. Teachers also included a spreadsheet (n=7), software suite (n=2), and mathematics tool (n=2) among the top three software titles. Teachers also were asked to indicate what they assign their students to use this software for. The reported used were coded by researchers into categories. Respondents most frequently listed purposes that were coded as writing (n=15), instruction (n=9), and research (n=9). Teachers also reported purposes related to creating artifacts such as written documents and presentations (n=5), data analysis (n=4), communication (n=3), and mathematics (n=3).

The technology inventory survey also asked teachers to indicate how often they assign the use of educational technology for each of 16 specified purposes. Fourteen respondents (87.5 percent) reported students used technology daily or weekly to master skills just taught, remediate skills not learned, and improve computer skills. Thirteen respondents (81.3 percent) reported assigning students to use technology at least weekly to learn to work independently. Twelve respondents (75 percent) reported assigning students to use technology at least weekly to express themselves in writing. Eleven respondents (68.8 percent) reported weekly assignments for each of the following purposes: exploring concepts, models, or simulations; conducting research or gathering information; and learning to work collaboratively. Ten respondents (62.5 percent) reported weekly assignment of technology to graphically organize information or ideas, and analyze information or solve problems. Seven respondents (43.8 percent) reported assigning students to use technology at least weekly to present information to an audience. Teachers reported assigning students to use technology least frequently for the purpose of publishing their work on the Web.

The survey then asked teachers to select the three purposes from the list of 16 that have the most significant effect on student achievement, ranking them in order from one to three. Eleven respondents (68.8 percent) ranked mastering skills just taught among the three purposes for student technology use with the greatest impact on student achievement, and 10 (62.5 percent) placed it first. Seven respondents (43.8 percent) reported expressing themselves in writing, and conducting research, or gathering information among the top three purposes. Five respondents (31.3 percent) included remediating skills not learned among the top three purposes for student technology use with the greatest impact on student achievement. Four respondents (25 percent) put analyzing information or solving problems and improving computer skills in the top three.

The environment at School F is very businesslike, with a great deal of technology dedicated for the purposes of student achievement. Teachers are solidly focused on student success and collaborate with one another to share expertise across content areas. As one teacher observed, “The academic teachers and the technology teachers, they all act together, trying to make sure that the students have been pre-tested so that we can identify what areas they need extra help in.” Another teacher offered a detailed description of the collaborative climate of School F:

“We have software that helps the students learn the test-taking skills, practice on those things, which he or she may not have done very well on pencil and paper. They are able to see it in different formats, so they get used to it. The teachers are able to network with each other through the group share. If we find articles, or test-taking materials, or whatever, we’re able to put those in a staff share so other teachers may be able to utilize it. We have an excellent sharing program here. No
one wants to just hold whatever he or she has. Whatever I may have, someone else is free to borrow it, use it, keep it if necessary, make copies where it’s legitimate to do so. So we all work hand in hand, and we make everything available to the students. And I would like to say that we make things available to the students before school, during school, and after school. So if there’s something that the student didn’t understand while he or she was in class, that student would be able to catch the teacher after class and spend time and understand.”

Technology Use

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<th>Research Question: What kinds of educational technology do administrators, teachers, and students in School F use?</th>
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<td><strong>Primary Characteristics</strong></td>
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<td>Teacher survey respondents most frequently reported using computers, printers, digital cameras, and scanners, mostly on a daily basis in the classroom.</td>
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<tr>
<td>Teacher survey respondents most frequently reported using word processing, spreadsheet, presentation, and Web browsing applications. Teacher software is most frequently used on a daily basis in the classroom or at home.</td>
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<tr>
<td>Teacher survey respondents most frequently reported assigning students to use computers, printers, scanners, and digital cameras. Teachers reported assigning most hardware on a daily and weekly basis in the classroom.</td>
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<tr>
<td>Teacher survey respondents most frequently reported assigning students to use a word processor, presentation software, Web browser, and spreadsheet. Teachers reported assigning students to use most software on a daily basis in the classroom.</td>
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<td>Student used computers in more than half of the classes observed, along with a range of software consistent with what one would expect based on survey data.</td>
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The administrator at School F who completed a technology inventory survey reported daily use of a computer and printer, and monthly use of a projector. The administrator reported using computers and printers both at the office and their home offices. Also, word processing and Web browsing software applications were reported being used on a daily basis, with presentation
software used on a less than monthly basis. All three software applications indicated were used predominantly in the office. Administrators at School F are vigorous advocates of using educational technology to assess and develop the skills of students who need individual attention, and providing that attention before, during, and after the school day. When the state changed its state achievement test, the principal was very proactive in selecting a new software program that was aligned to the new test. This program is available for all students to use before and after school. Before the state achievement test is administered, selected students use the program during business classes.

Teachers who returned a technology inventory survey most frequently reported using a printer (n=18), computer (n=15), digital camera (n=10), and a scanner (n=9). Other hardware used included an overhead projector (n=2), LCD projector (n=2), and other projectors not specified (n=5). Most hardware was reportedly used daily (n=37), with some weekly (n=13), monthly (n=10), and less than monthly (n=7) use reported as well. Hardware is most commonly used by teachers in the classroom (n=60), with some use in the computer laboratory (n=14), and home office (n=18) reported as well. In terms of software, teachers most frequently reported using word processing (n=12), spreadsheet (n=12), presentation (n=11), and Web browsing (n=10) applications. Other software reported includes database (n=7), software suite (n=6), digital imaging (n=5), desktop publishing (n=3), grading (n=3), e-mail (n=3), mathematics tools (n=2), and keyboarding (n=2) applications. Most software use is on a daily (n=44) basis, with some weekly (n=15) and monthly (n=18) use reported as well. Software is commonly used in the classroom (n=70), home (n=32), and in the school computer laboratory (n=17).

Classroom observations found less teacher technology use at School F than one might expect based on survey data. Teachers used a computer in one class (14.3 percent) of the seven observed. In addition, one observation of a teacher using an overhead projector and one observation of the use of a camera/camcorder were made. All observed teacher technology use lasted less than 5 minutes. However, classroom observations were conducted on the first day of a new semester and students were finishing up various projects from the previous semester and working on college and scholarship applications in a number of classes. It is also probably that most teacher technology use at School F takes place during planning and preparation time, rather than during instruction.

Teachers who returned a technology inventory survey most frequently reported assigning students to use a computer (n=15) and a printer (n=15). Other student hardware use reported includes scanners (n=8) and digital cameras (n=8). Hardware is most commonly used daily (n=26) and weekly (n=11), typically in the classroom (n=42). In terms of software, teachers reported assigning students to use word processors (n=12), presentation software (n=10), Web browsers (n=9), and spreadsheet applications (n=9) with the greatest frequency. Other software commonly assigned includes software suites (n=3), desktop publishing applications (n=3), databases (n=3), and keyboarding software (n=2). Software is primarily assigned to students on a daily basis (n=31), with some moderate use on the weekly basis (n=13) as well. Students commonly use assigned software in the classroom (n=50), with some use in the computer laboratory (n=10) as well.
Classroom observations of student technology use were consistent with the survey data. Students used technology in four classes (57.1 percent) of the seven observed. In each class, one student per computer was observed and in one class, two students per computer were observed. Additionally, four observations of students using printers were made, with no other technology use observed among students. Most student computer use lasted either 5 minutes to 15 minutes or more than 15 minutes of a 20-minute to 25-minute observation. Students were observed using a word processor in three observations (42.9 percent), and a Web browser in two observations (28.6 percent), as well as Web publishing software, digital media software, a spreadsheet, and education software for keyboarding skills.

Administrators and teachers at School F use the Internet for research, productivity software to create administrative and instructional materials, and information systems to access and monitor student data. Many teachers at the school came from a business background before teaching and are very proficient with standard business applications of technology. All 9th- and 10th-grade students are required to take a computer information systems course which provides extensive instruction in productivity software, Internet research, and other application software. The result of a technology-rich learning environment and specific instruction in technology literacy is that students are completely comfortable using computers for any task, and require little direction from teachers to do so. For example, students in one classroom were observed using a search engine to find an application for designing bridges on the Internet, downloading and installing the application, and then taking notes on sample bridges, all without any assistance from the teacher.

Teachers often use the Internet to provide anchors for student work by having students find real-world examples of the business products they are creating in class. For example, a teacher who assigned students to write a position description suggested that they review positions that had been posted on employment Web sites. Students also make extensive use of the Internet to research careers, colleges, and scholarships. This is one use of technology in which teachers provide extremely vigorous encouragement, including directing students to use class time to complete applications at the beginning of the spring semester. One teacher observed, “I set high standards for myself and I use technology to increase my knowledge; I expect my students to do the same.”
Educational Technology Practices

**Research Question:** What educational technology practices do administrators and teachers in School F employ?

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<td>According to at least one half of interview respondents, finding, creating, or updating instructional resources and content-specific strategies are professional uses of technology with the most significant effect on their practices and student achievement. Teacher survey respondents most frequently listed word processing and presentation software among the titles that have most significantly affected their teaching practices. Teachers most commonly reported using this software in support of instruction, instructional materials, and document creation. All teacher survey respondents reported using technology at least weekly to create instructional materials and present information to students, and almost all reported weekly use to communicate with teaching colleagues. More than three fourths reported using technology at least weekly to gather information for planning lessons and access information on best practices. Two thirds reported weekly use to keep administrative records. About two thirds of teacher survey respondents ranked creating instructional materials and gathering information for planning lessons among the top three professional uses of technology with the greatest effect on their practices.</td>
<td>At least one fourth of interview respondents reported each of the following among the professional uses of technology with the most significant effect on their practices and student achievement: communication with staff, parents, and others; tracking student data; and typing, editing, and writing. Teacher survey respondents listed spreadsheet applications and Web browsers among the titles that have most significantly affected their teaching practices. Teachers reported using these titles in support of research, communication, and for administrative purposes. About one third of teacher survey respondents reported at least weekly use of technology to communicate with parents or guardians, communicate with students outside the classroom, and publish class information on the Web. Two fifths of teacher survey respondents reported that use of technology for assessing information and research on best practices and presenting information to students are among the top three professional uses of technology with the greatest effect on their practices. One fourth ranked keeping administrative records among the top three.</td>
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When asked about the professional uses of technology that have the greatest effect on their practice and student achievement, seven (70 percent) of the 10 administrators and teachers who were interviewed mentioned finding, creating, or updating instructional resources. Content specific strategies were cited by five (50 percent) of respondents, while four (40 percent) respondents reported communication with staff, parents, or others. Three (30 percent) of respondents cited both tracking student data, and technology used for typing, editing, or writing.
Two (20 percent) respondents reported hands-on or project-based learning, teacher presentation, and visual aid use, including boards and overhead projectors.

The administrator who returned a technology inventory survey reported that word processing, Web browser, and spreadsheet software have the greatest impact on professional practice. The administrator at School F reported using this technology for creating administrative materials, accessing information and research, purchasing materials/services, and analyzing student data. When asked to rank the top three technology uses from a specified list of administrative purposes, the administrator ranked analyzing student data for school improvement, creating administrative materials, and presenting information to teachers or students first, second, and third, respectively. Interview data confirmed the consistent use of technology by administrators for reasons relating to tracking student achievement. Results indicated that administrators primarily use computers for continually monitoring and assessing student achievement. In response to the student data collected through this process, administrators use technology to develop plans to assist students in preparing for state tests based on current achievement levels.

Teachers who returned a technology inventory survey most frequently listed a word processor (n=12) and presentation software (n=8) among the top three software titles that have had the greatest effect on their teaching practice. Teachers also reported spreadsheets (n=6) and Web browsers (n=6) among these titles. No other type of software was reported by more than one respondent. Teachers also were asked to report what they use this software to do, and the reported uses were coded into categories. Multiple uses for a given software title were each coded into the appropriate category. The most commonly reported purposes were related to instruction (n=11), instructional materials (n=11), and creating written documents and reports (n=9). Teachers also reported using these titles for purposes related to research (n=6), communication (n=5), and administrative purposes (n=4).

The technology inventory survey also asked teachers to indicate how often they use educational technology for each of 10 specified purposes. All 16 respondents (100 percent) reported using technology daily or weekly to create instructional materials and present information to students. Fifteen respondents (93.8 percent) reported daily or weekly use to communicate with teaching colleagues. Fourteen respondents (87.5 percent) reported at least weekly use to gather information for planning lessons, and 13 respondents (81.3 percent) to access information on best practices. Eleven respondents (68.8 percent) reported daily or weekly use of technology to keep administrative records. The following purposes were reported daily or weekly for more than one fourth of respondents: communicate with parents or guardians (37.5 percent), communicate with students outside of the classroom (37.5 percent), and publish class information on the Web (31.3 percent). The least frequently reported purpose was publishing student work on the Web.

The survey then asked teachers to select from this list the top three purposes for technology use that have the most significant effect on their practices, ranking them in order from one to three. Eleven respondents (68.8 percent) ranked creating instructional materials among the top three purposes with the most significant effect on their practices, and seven (43.8 percent) placed it first. Ten respondents (62.5 percent) ranked gathering information for planning lessons among the top three purposes, with four (25 percent) placing it first. Seven respondents (43.8 percent) reported assessing information and research on best practices for teaching and presenting
information to students among the top three purposes. Four respondents (25 percent) put keeping administrative records in the top three.

Seven classes were observed at School F during the winter site visit: one each in the 9th, 11th, and 12th grades, and four in the 10th grade. All seven observations were made in a classroom setting. Business was the dominant subject observed in three classrooms, while accounting and computers/technology were the dominant subjects within the remaining four classes observed. Five different activity structures were observed: adult-led large group was observed in five classes, an individual structure was observed in four classes, and adult-led small group, collaborative pairs, and collaborative small group structures were each observed in one class. The individual structure was recorded as the dominant structure in four classrooms, while the adult-led large group structure was dominant in the remaining three classes observed.

**Educational Technology Policies**

| Research Question: What educational technology policies do administrators and teachers in School F implement? |
|---|---|
| **Primary Characteristics** | **Secondary Characteristics** |
| Plans and standards were cited by more than one half of interview respondents as school or district and state policies that benefit educational technology use at School F. More than three fourths of interview respondents reported being unaware of any aspects of school or district policies that hinder educational technology. Two thirds of administrator interview respondents referred to plans or standards at a state policy level that benefits educational technology use, and the same number reported being unfamiliar with any federal policies that hinder the school. | At least one fourth of interview respondents referred to resources and support by the community, and practice for standardized tests as benefits of school or district policy. |

The administrator technology inventory survey asked respondents to indicate the priority of 20 given objectives for educational technology for their school on a scale of one to five, with one being the lowest priority and five being the highest priority. The administrator at School F who returned a survey indicated that 14 of the 20 objectives specified were among the highest priorities including the following:

- Improving teachers’ strategies for integrating technology.
- Individualizing student learning experiences.
- Making classroom instruction more data driven.
- Increasing professional development opportunities for teachers.
• Improving student achievement on state assessments.
• Improving student achievement on standardized tests.
• Better preparing students for careers.
• Improving students’ computer skills.
• Improving students’ basic skills.
• Improving administrative efficiency.
• Increasing parental involvement.
• Publicizing student and school accomplishments.

The only objective given the lowest priority by the administrator at school F was improving parents’ computer skills.

The policies and procedures enacted by administrators at School F appear to generally support these priorities. In terms of focusing on teachers’ instructional skills and technology use, School F requires all teachers to complete 21 hours of content training and other professional development courses on a frequent basis. The high expectations for achievement placed upon students not only encourages a climate of professionalism and accountability, they help direct student practices in ways that contribute to overall student achievement. For instance, the school has instituted a “no pass, no play” policy which prevents students from participating in extracurricular activities if their performance does not match school standards. Formal test preparation reflects the school’s commitment to cultivating a high-performing environment. Technology use is certainly a key component in the preparation process, and both the school administration and school district strongly support and encourage teacher and student technology use. School F also recognizes that a strong focus on content-area standards in coursework is integral to student success on state tests. As a result, basic skills are emphasized across the curriculum, even in more technical and applied classes.

Most respondents at School F seem to have a generally positive view of school and district policies, and recognize that the school is committed to providing resources that promote learning. Generally speaking, respondents voiced the opinion that School F is a good place to be. One teacher succinctly expressed this notion: “I like my school. No, change that. I love this place. This place is a dream for anyone, for me, to work here, and to me, too, the students to be here. I mean, there are so many opportunities afforded to them here that they may not get anywhere else.”

When asked about school or district policies that help School F use technology in ways that contribute to student achievement, six (60 percent) of the 10 teachers and administrators who were interviewed indicated plans and standards, both general, and relating to technology and computers. Three (30 percent) respondents cited both the provision of resources, support by the community, and practice for standardized tests. Another two (20 percent) respondents mentioned the computer laboratory schedule as primary school policy that directly influences technology use at School F such that student achievement is fostered. No other response was coded for more than one respondent.
Eight (80 percent) of the 10 respondents indicated no familiarity with any school or district obstacles that hinder the use of technology at School F in ways that negatively impact student achievement. Interview data revealed that in some classrooms, technology was described as getting older and is in need of updating, but it generally is recognized that School F is more technologically advanced that most other schools. Funding for technology has not been a problem in the past; however, many respondents acknowledged a concern that it could become an issue for them in the future.

In terms of the benefits to School F based on state policy, two (66.7 percent) of the three administrators interviewed indicated plans or standards as the primary benefit to the school and its technology environment. At the federal level, no responses concerning federal policy benefits were coded for more than one administrator. Two (66.7 percent) administrators indicated a lack of familiarity with any obstacles based on state and federal policy that affect the school.

Technology Capacity

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<thead>
<tr>
<th>Research Question: How does the technology capacity of School F affect administrator, teacher, and student use of educational technology?</th>
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<tbody>
<tr>
<td><strong>Primary Characteristics</strong></td>
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<tr>
<td>Technology is very accessible to both teachers and students at School F, with an average of 15 computers per classroom, all of which are networked and connected to the Internet. However, all of these computers have older processors.</td>
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<tr>
<td>School F reported owning nine software applications that fall within the following categories: productivity tools, research tools, media tools, and education software for reading skills development and multicurricular assessment.</td>
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<td>One half of respondents indicated software use and practicing standardized tests as characteristics of School F’s technology environment that contribute to student achievement.</td>
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School F benefited from new technology deployed in the school center in which it is housed when the facility was constructed in 1996; since then, it has continued to expand and update its technology resources using funds dedicated to the careers program. As a result, almost every classroom resembles a computer laboratory and computers outnumber students in many classes. District technology staff members are on-site to maintain computers and software, and provide technical support and help desk services. A teacher technology specialist works with the district...
technology staff, and coordinates purchasing and deployment of new technology as well as supports teachers in technology integration.

The school and district administrators value technology integration into classroom instruction. Computers appear to be pervasive in the school, and teachers use them in their own work, teach with them, and teach about them to their students. Many classrooms are structured as labs that function as simulated office environments in which the students rely heavily on technology to practice problem solving. Class sizes are small so there is rarely a problem with not having enough computers to go around, even if a few are not functioning. Students can access labs both before and after school, which is imperative given that many do not have computers or Internet access at home. One laboratory also is dedicated solely for test preparation purposes.

On the technology infrastructure survey, School F reported having an average of one computer per staff office, with a total of 20 staff offices in the school, and an average of 15 computers in each of the 20 classrooms on campus. All of the computers on campus have older processors. School F reported that all of its computers are connected to a fiber optic local area network and have a T1 or faster Internet connection. The school did not indicate the number of printers in offices and classrooms on campus, although other data discussed earlier revealed significant printer use by administrators, teachers, and students alike. School F has e-mail, printer, and video servers.

School F reported owning a total of nine different software titles; four productivity tools, one research tool, three media tools, and one education software application. The productivity tools include word processing, presentation, spreadsheet, and database applications. The research tool owned is a Web browser application. In terms of multimedia tools, the school owns multimedia authoring, digital imaging, and desktop publishing applications. Finally, in terms of educational software, the school possesses applications intended for reading skills development and multicurricular assessment.

When asked what characteristics of School F’s technology environment facilitate use of technology in ways that contribute to student achievement, six (60 percent) of the 10 respondents who were interviewed mentioned software (general, word processing, and spreadsheet applications). Five (50 percent) respondents listed practice for standardized tests, four (40 percent) respondents cited the computer laboratory and overall frequent use of technology, and two (20 percent) respondents each cited the integration of technology into instruction, computers in the classroom, Internet access, and technology support for staff.
Resources, Strategies, and Structures

**Research Question:** What resources, strategies, and structures does School F use to become a high-technology school, and to what extent are these integrated with other school improvement efforts?

<table>
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<tr>
<th>Primary Characteristics</th>
<th>Secondary Characteristics</th>
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<td>More than one half of teacher interview respondents cited the ambience of the classroom and student presentations as characteristics of their classrooms that contribute to student achievement.</td>
<td>Other classroom characteristics cited by at least one fourth of teachers interviewed included classroom management, hands-on or project-based learning, content-specific strategies, print resources, desk arrangement, student grouping strategies, computers in the classroom, computers in general, hardware other than computers, and other instructional practices.</td>
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<tr>
<td>Two thirds of administrators interviewed reported that the school’s supplementary enrichment program has been a key resource used to develop the school’s overall learning environment, and that the school’s improvement plan and overall unified vision has contributed to developing the school’s technology environment.</td>
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When asked about their classroom learning environment and the resources, strategies, and structures they have used to create that environment, four (57.1 percent) of the seven teachers cited both the overall ambience of the classroom and student presentations as being key components of this environment, while three (42.9 percent) teachers reported classroom management, hands-on or project-based learning, content-specific strategies, and print resources. Two (28.6 percent) teachers indicated the desk arrangement, student grouping strategies, computers in the classroom, computers in general, hardware other than computers, and other instructional practices.

Class sizes are small, and tend to be very business-like in nature. One School F teacher describes the aura of her classroom experience as follows:

> “At the beginning of each week, I give them a calendar of events, lesson plans. Of course I have more detailed ones for myself, but the students have lesson plans. So I always joke with them, if I were to drop dead on the spot you’d be able to carry on, because you know what’s going on. I do that; they’re always able to get in touch with me. I am structured to the point where there is order in my class, and we don’t have problems with getting off task to the point where we’re disrupting anyone else. But they’re also free to move in the classroom, where they don’t feel as if they’re little rats in a cage, if you will. They are able to talk with each other. They are able to interact with each other. And that’s a part of corporate America. If you don’t know how to have teamwork, you don’t know how to get along with each other, then you’re not going to survive, and I think that helps their people skills a whole lot more, also. All of that to me just makes for a successful classroom. I feel that’s what I have.”
Administrators were asked to articulate the specific resources that are used to develop the defining characteristics of the school as a whole. In interviews, two (66.7 percent) administrators cited the supplementary enrichment program. When asked about the specific resources used to develop the school’s technology environment, two (66.7 percent) administrators cited the school improvement plan and a unified vision of what the school’s technology environment should be.

**Classroom Vignettes**

Three lessons were observed during the spring site visit to School F. The first observation was of a technology class comprised of eight 11th and 12th graders. The second observation was of seven 12th graders in a business/finance class. Finally, nine 11th and 12th graders were observed in a technology class. In each of these observations, computers and other technologies were used by teachers and students alike in support of the day’s lesson for each class.

In each case, teachers were interviewed before the lesson to establish a context for the lesson observation that follows and an understanding of how instructional strategies and technology will be integrated to facilitate student learning. Teachers also were interviewed following each observation to provide a lesson interpretation and an understanding of the role of technology in achieving specific lesson outcomes.

**Eleventh- and Twelfth-Grade Technology Lesson**

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<th>Class 1</th>
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<tr>
<td>Grade:</td>
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<tr>
<td>Subject:</td>
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<tr>
<td>Setting:</td>
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<tr>
<td>Teacher Hardware Used:</td>
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<td>Teacher Software Used:</td>
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<tr>
<td>Student Hardware Used:</td>
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<tr>
<td>Student Software Used:</td>
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In a preobservation interview, the teacher indicated that the purpose of this lesson was to provide students with practice in the use of digital imaging software; a previous lesson demonstrated for students how to use this application and introduced the full scope of operations it can be used to perform. The Web mastery course was designed to prepare students to author and publish Web sites. In the lesson that was observed, students took photographs of each other with a digital camera and found photographs of famous landmarks on the Web. Students were assigned to use digital imaging software to combine the images, placing themselves at the site of the famous landmark. These images would be used on a Web page recounting a fictional vacation to the landmark location.

The teacher also indicated that this lesson is aligned with state learning standards relating to Web mastery. Given the complexity of this software application, the teacher has designed the lesson such that the process of using it is simplified, fun, and applicable to the most common, everyday uses of this software. To accomplish this, students will be asked to complete reading, comprehension, and problem-solving activities, and will use the Internet, a digital camera, digital
imaging software, Web publishing software, and a computer and printer as part of these activities.

During the observation, nine students and one teacher were observed working in a computer laboratory with 20 computers, six printers, and one scanner, television, overhead projector, and camera. The teacher was observed using a computer and digital camera for a brief time as well as a software suite. Every student worked at his or her own computer for a duration of more than 15 minutes, accessing software applications that included two types of digital imaging software and a Web browser. Almost every student also was observed using a digital camera briefly, for about five minutes or less.

Some students were assigned to do Internet research on the computers searching for images, with some conversation among students about ideal keywords to search for and what others’ searches revealed. Meanwhile, other students retreated to the hallway to take group pictures with the digital camera. During this time, the teacher walked around the room offering suggestions and answering questions.

Once all of the students have had a chance to have their picture taken, she asked them first to locate an image of a landmark online, and then blend the picture of themselves into those images using digital imaging software. While students used the computer to search for these images, the teacher walked around to each student allowing them to copy their pictures from the digital camera disk used to capture them. In the process of doing this, the teacher discovered that several students recorded movies instead of pictures, which really amused and fascinated the class. Several students commented, “Oh, man … we should have done movies.” The teacher instructed the class to leave the movies on the disk for use at a later time. For the duration of the activity, students asked a variety of questions that were related both to clarifying the assignment instruction and requesting technical assistance with the software applications employed. Students printed their documents as they completed them.

In the interview following the observation, the teacher said she felt that students generally were able to do everything the lesson asked them to do such that they would be able to replicate this process outside of the classroom. The teacher also felt confident that the skills learned in this lesson would be beneficial to students in their other classes, namely social studies and mathematics. The use of repetition of lesson concepts and ideas and involving students in the activity also were cited as key instructional strategies that helped students learn what the teacher wanted them to learn. In terms of repetition, the teacher explained the content several times and then asked students to explain what they have learned back to the class. The lesson handouts also served to reinforce these ideas.

Having students take and use their own picture as part of this project helped them become personally vested in their work; as a result, they worked diligently to complete the assignment and had fun doing so. The use of technology in this lesson also helped to greatly facilitate the work students were asked to do. Not only did it increase the efficiency of their work processes, the use of the Internet specifically provided a myriad of options in terms of the images they were searching for and forced students to utilize their problem-solving skills to make their final choices of which images were the best for them to use.
Finally, the teacher also noted postobservation that some students created attractive documents that were not exact reproductions and moved very quickly, while others laboriously reproduced even the less aesthetic details of the documents on the handouts. It was not clear to students whether the primary objective was to produce an attractive document or to reproduce the handout exactly. As a result, the teacher stated that next time she would give students more information about what she expects from them.

Twelfth Grade Business and Finance Lesson

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<th>Class 2</th>
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<tbody>
<tr>
<td>Grade:</td>
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<tr>
<td>Subject:</td>
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<tr>
<td>Setting:</td>
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<tr>
<td>Teacher Hardware Used:</td>
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<td>Teacher Software Used:</td>
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<tr>
<td>Student Hardware Used:</td>
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<td>Student Software Used:</td>
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The purpose of this lesson was to teach students about the role of the Securities and Exchange Commission (SEC), as well as the role of a financial planner/broker. At this end of this lesson, students would have the opportunity to take a mock exam that models the national securities exam taken by brokers. This class is defined by School F as an exploratory course and, as a result, is not yet tied to any specific local, state, or national learning standards. In an interview with the teacher just prior to the observation, she specified two primary instructional strategies that would be integrated into this lesson. First, she would use presentation software to convey the content of the lesson to the class. Second, students would use the computer to assess the mock brokers’ exam online, proving them with hands-on interaction with the day’s content and a more concrete understanding of what one needs to know in order to be certified as a broker.

In the securities class, seven students and one teacher were observed working in a classroom with 12 computers, five printers, four adding machines, two televisions, and one video player and overhead projector. The teacher was observed using a computer and presentation station for a period of time exceeding 15 minutes, and also accessed presentation software and Web browser applications. Every student in the class was observed using a computer and Web browser; each student had their own computer available to them and did not share with other students. Several students also briefly used calculators during the lesson observation.

During the lesson, the teacher used presentation software and a computer connected to the television to give students a presentation on the process of becoming a certified financial planner, while students took notes on paper. The teacher also talked about the role of the SEC and the Investment Advisors Act of 1940. The teacher was very knowledgeable about the topic and very conversational in her delivery, modeling excellent presentation skills although it was not a focus of the lesson. Students occasionally asked questions; one student asked if the income of a financial planner made the certification process worthwhile. The teacher presented some basic information about a particular certification examination, and then sent students to a Web site where they could take a practice version.
Students quickly went to computers located around the walls of the room, logged onto the network, and found the Web site. The teacher used the presentation station to demonstrate how to navigate the Web site; students were able to follow along easily and quickly began to take the practice test. The teacher directed one student who was not able to log onto the network to use her computer, and switched off the television monitor. Students asked if they would be timed (no) and if they could use books (yes). As students took the test, the teacher walked around the room. The room was silent and students took their performance on this exam seriously, taking it as though it were a real test.

In a postobservation interview, the teacher stated that she was pleased that the students took the test so seriously and clearly put their best effort forward. The teacher noted that students in the class have a friendly competition to see who gets the high score among the class. In the process, students seemed to gain an understanding of how arduous of a process it is to choose this particular profession. She also reported that the presentation was effective in reaching predominantly visual learners. In addition to familiarizing students with the requirements associated with the profession, the mock test also provided students with practice in problem solving, reading and comprehension, critical thinking, and strategizing about test-taking.

Eleventh and Twelfth Grade Technology Lesson

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<th>Class 3</th>
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<tbody>
<tr>
<td>Grade:</td>
<td>11, 12</td>
</tr>
<tr>
<td>Subject:</td>
<td>Technology</td>
</tr>
<tr>
<td>Setting:</td>
<td>Computer lab</td>
</tr>
<tr>
<td>Teacher Hardware Used:</td>
<td>Computer</td>
</tr>
<tr>
<td>Teacher Software Used:</td>
<td>Desktop publishing</td>
</tr>
<tr>
<td>Student Hardware Used:</td>
<td>Computer, printer</td>
</tr>
<tr>
<td>Student Software Used:</td>
<td>Desktop publishing, e-mail, digital imaging</td>
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</tbody>
</table>

The goal of this lesson was to provide students with practice in creating a variety of business documents through the duplication of several handouts which modeled the appropriate content and layout of these documents. This lesson was designed to conform to state learning standards, as well as those dictated by both the school and district. Students would be graded on the visual elements, spelling, punctuation, grammar, and the use of various software-specific formatting tools as they are applied to the creation of these business documents. Students would use desktop publishing software and clip art obtained through other programs and on the Internet to complete the assignment. The teacher intended to demonstrate the activity to the class, and then allow students to work independently, providing guidance and feedback as needed.

In the Business Image Management and Multimedia class, nine students and one teacher were observed working in a computer laboratory with 20 computers, six printers, four scanners, one television, and a variety of photocopiers and other business imaging equipment. During this class, the teacher was briefly observed using a computer to access desktop publishing software. Students were observed using computers and printers throughout the class, accessing software applications such as desktop publishing software, e-mail, and digital imaging software.
At the beginning of the class, students were given handouts of business documents with various types of layouts and used desktop publishing software to create documents that looked like the handouts. The handouts were taken from the course curriculum developed by a local university. The teacher introduced the lesson, but provided very little instruction beyond a brief simulation of how to use the desktop publishing software for layout and design. In the interview prior to the observation, she explained that students had learned the skills needed to create these documents earlier in the year and were applying them to authentic business tasks now.

During the observation, students worked quietly at their computers, occasionally asking each other questions about a particular document. The teacher walked around the room offering suggestions and answering questions. When some students were having difficulty finding a clip art image that looked like the image on the document they were reproducing, the teacher reminded them that they could use the desktop publishing software to draw the image themselves. Students printed their documents as they completed them. The environment of the room was relaxed and informal; one student played a CD softly on her computer as she worked. Some students created attractive documents that were not exact reproductions and moved very quickly, while others laboriously reproduced even the less aesthetic details of the documents on the handouts.

In an interview following the observation, the teacher reported that while the activity provided students with an opportunity to practice and perfect the techniques stressed, they still need to work on the balance concept relating to document layout. Still, the teacher believes that the lesson instilled confidence in the students with respect to their ability to create their own layouts and used desktop publishing software. In fact, the teacher cited that the use of the computer and related software applications were integral to the completion of this activity. At the end of the lesson, the teacher noted that it might not have been clear to students whether the primary objective was to produce an attractive document or to reproduce the handout exactly. In the interview after the observation, the teacher indicated that next time she would probably give students more information about what she expects from them.
References


