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

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Case Report on School B

Education Trust High-Poverty: No
Education Trust High-Minority: Yes
Location: Urban
Grades Served: K–8

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 & Ronnvist, 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 B in this report, which is based on the following data collected from the school:

• Six teachers and one administrator were interviewed during the first site visit.
• Six classrooms were observed during the first site visit.
• Seventeen teachers (50 percent) returned a survey.
• Two administrators (100 percent) returned a survey.
• A technology plan and school improvement plan were collected during the site visits.
• Three lessons were observed during the second site visit.
Case Background

School B is a part of the public school system of a major city and is located about 10 minutes from the downtown area. This city has experienced an economic downturn and, as a result, many middle-class families have moved from the city to the suburbs. The public school system serves a predominantly minority population of more than 150,000 students, most of which are African-American and less than 10 percent are Latino, white, Asian or Pacific Islander, and Native American. About 70 percent of the students in the district are eligible for free or reduced-price lunches.

School B is a unique magnet school in its public school system, serving approximately 750 academically gifted students in Grades K–8. The school is housed in an impressive stone building, which was once a high school and which today has the feel of being part of the nearby college campus. School B students are mostly middle class and more than 95 percent African-American. Only about 10 percent of students are eligible for free or reduced-priced lunch, and the school does not receive any federal or state poverty funding. More than half of the students are girls. The school’s attendance rate is almost 100 percent.

School B is adjacent to a local college in a formerly upper-middle class neighborhood of single-family homes. Since the 1970s, the community has become more working class and is comprised of about 50 percent retirees and 50 percent working families. School B students come from all over the city and must get to school on their own, without the support of school district busing. Most students are driven to school by parents who also are very involved in their children’s education.

Case Summary

In 1981, School B was established as a school for gifted and talented students, with an “accelerated program, horizontally enriched.” Accelerated meant that students would not necessarily be in age-based grades, but would move at their own academic pace. Horizontally enriched meant that the curriculum would be project-based, as well as focused on skill development. The principal reported that the “gifted and talented” designation has been broadly defined. According to respondents, School B students are of average to high-average capability; however, their work ethic and strong family support has led to achievement at the highest levels.

Teachers’ and administrators’ high expectations for students have created a positive atmosphere at the school. There is an orderly learning environment that is maintained through strong classroom management, the use of physical space in classrooms, and structured activities that are designed to keep students on task, self-directed, and learning at their own pace. Although technology is not evenly distributed throughout the school, students and teachers have access to computers in their classrooms and there are two computer laboratories, which are available to students during lunch, and before and after school.

Technology plays a significant role in instruction at School B because it is used for active learning. One teacher noted that “When the students are actually able to go on this Internet … I think it’s meaningful to them to actually be able to do the research themselves because it makes
more sense … it makes it a little bit more meaningful than me just verbalizing it and telling them.” Teachers also reported that technology use is a motivating factor for students.

School B teachers are committed to building a strong foundation in basic skills and they employ an open-ended, interdisciplinary curriculum that is aligned with state standards. Teachers are aware of the impact that faculty collaboration and professional development have on the success of their students, and actively engage in both activities. Teachers reported preparing students by teaching them test-taking skills, and not necessarily teaching to the test. Teachers believe that assignments that require reading and research help prepare students for assessments and encourage the use of an inter-based program, which is linked to the state achievement test as a test preparation tool. Technology also has had a significant impact on teachers’ professional practices. The majority of teachers reported that they use technology daily or weekly to create instructional materials, and many use it to gather information for planning lessons or maintain administrative records.

The administrators at School B are viewed as strongly supporting technology use and instrumental in implementing the school improvement plan. Among the administrators’ highest priorities for school improvement and technology are improving the integration of technology; individualizing learning experiences; making instruction more data driven; and increasing professional development opportunities. The administrator at School B reported using technology most frequently to communicate with other staff and access information on best practices.

The administrators and teachers have actively worked to raise funds in support of technology at School B because unlike other public schools, they are not eligible for federal funds. However, the teachers and administrators believe that access to technology in the school is important because more than 75 percent of their students have access to computers at home, so they expect to use them at school as well. Teachers reported that student achievement is most influenced by the use of technology for research. While teachers and administrators have generally positive views regarding the technology use in the classroom, they struggle with issues such as adequate funding for the purchase and maintenance of technology. The district’s policies on funding technology are seen as a significant obstacle to the effective use of technology at School B.

Parental involvement is viewed as another contributing factor to student achievement at School B. For example, parents volunteer at the school and work to secure resources, such as computers and access to a Web site that provides practice questions for the state achievement test. Teachers also identify the rigorous application process and the fact that their students must be driven to school for lack of bus service as indications of parental commitment to education and achievement. One respondent noted, “Because they have to test to get in here, we’ve gotten students who perform better; and the parents have taken the initiative to go through the testing, and the interview and application process, making them probably a more interested group of parents and probably parents where education is stressed at home.” School B graduates matriculate to the most selective public and private high schools in the city. Students also have been accepted into prestigious boarding schools both locally and in other parts of the country. Ninety-nine percent of School B graduates go to college. School B graduates who have attended Yale University represent the largest number of African-American graduates from any public elementary school in the United States.
Academic Achievement

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

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<tr>
<th>Primary Characteristics</th>
<th>Secondary Characteristics</th>
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<tr>
<td>Almost three fourths of teachers and administrators who were interviewed mentioned students with a high potential for success as a key characteristic of School B that contributes to student achievement. Teacher survey respondents frequently reported Web browser and word processing software titles as significantly affecting student achievement. Software is most frequently reported used for research and information gathering. More than one half of survey respondents reported that they assign students to use technology monthly or less for a variety of given purposes.</td>
<td>Almost one half of interview respondents believe that teacher competence has the greatest effect on student achievement. One fourth cited parent involvement and staff teamwork. Two fifths of interview respondents reported that student use of technology for practicing state tests and finding, creating, or updating instructional resources have the greatest effect on student achievement. One third referred to content-specific strategies and writing, editing, and typing. Two fifths of survey respondents reported assigning students daily or weekly use of technology to conduct research or gather information, improve computer skills, and learn to work independently. One third assign technology to learn to work collaboratively, express themselves in writing, during free time, or reward at least monthly. Almost one half ranked conducting research among the top three purposes of technology use with the greatest effect on student achievement. One third ranked expressing themselves in writing, and one fourth ranked master skills just taught among the top three purposes.</td>
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When asked what characteristics of School B as a whole have the greatest effect on student achievement, five of the seven administrators and teachers who were interviewed (71.4 percent) stated students with a high potential for success. In addition, three respondents (43 percent) reported teacher competence, while two (29 percent) cited parent involvement and staff teamwork. One respondent commented, “This is a team school. We work and have always worked very cohesively together to ensure high achievement. It’s not a one-person or two-person operation. We plan together. We create mutual staff development.” No other responses were coded for more than one participant.

Because School B is a magnet school, students undergo an application and testing process in order to be admitted. Participants indicated that this process has not only resulted in high-
achieving students, but also is considered indicative of a “supportive home environment” with parents who are actively involved in their students’ academic achievement and share the teachers’ high expectations for student learning.

Although teachers are aware of the standards, they do not overtly teach to the test or consider the standards a driving force in what they do. The Internet-based program that is linked to the state achievement test is used outside of the classroom as a support for test preparation and standards-based instruction. The program is available over the Web and students and parents may log in from home for additional practice on necessary skills.

When asked what student uses of technology have the greatest effect on student achievement, three (43 percent) of the seven participants who were interviewed each reported practicing standardized tests and finding, creating, or updating instructional resources. In addition, two (29 percent) participants each cited content-specific strategies and technology use for typing, writing, and editing. No other response was coded for more than one respondent.

Teachers who returned the technology survey most frequently reported a Web browser (n=9) as one of the three software titles that has the most significant impact on student achievement. Respondents also listed word processor (n=5), presentation software (n=3), and multimedia (n=2) among these titles. No other title was listed more than once. Teachers also were asked to indicate what they assign their students this software to do. The reported uses were coded by researchers into categories. The most frequently listed purposes by respondents were research (n=7), writing (n=6), and creating artifacts (n=4). Literacy and math skills development and research on the Internet were each listed two times.

The technology inventory survey also asked teachers to indicate how often they assign their students to use educational technology for each of 16 given purposes. Several respondents reported assigning students to use technology on a daily or weekly basis for any of the given purposes. Seven respondents (41.1 percent) each reported that they assign students to use technology on a daily or weekly basis to conduct research or gather information, improve computer skills, and learn to work independently. Six respondents (35.3 percent) each reported assigning students to use technology on daily or weekly basis in their free time or as a reward for good behavior, to learn to work collaboratively, and to express themselves in writing. Survey respondents more frequently reported assigning technology use monthly or less than daily or weekly. Nine (53 percent) or more respondents reported that they assign their students to use technology monthly or less for 10 of the 16 given purposes including: master skills just taught; remediate skills not learned; publish their work on the Web; create publications such as newspapers; create multimedia presentations; present information to an audience; graphically organizing ideas; communication with people outside the classroom; explore concepts, models, or situations; and to analyze information for solving problems.

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. Eight respondents (47.1 percent) selected conduct research or gathering information in their top three, five ranking it first. Five (29.4 percent) selected express themselves in writing in the top three, but none ranked it first. Four (23.5 percent) identified mater skills just taught in the top three, and
three (17.6 percent) listed remediate skills not learned, graphically organize information or ideas, explore concepts, models or simulations, and learn to work independently in their top three. No more than two respondents (11.8 percent) listed any of the other 16 purposes among their top three.

**Technology Use**

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<tr>
<th>Research Question: What kinds of educational technology do administrators, teachers, and students at School B use?</th>
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<tr>
<td><strong>Primary Characteristics</strong></td>
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<tr>
<td>Survey respondents most frequently reported using computers, printers, word processors, Web browsers, and grading software on a daily or weekly basis. Hardware and software was most frequently reported used in the classroom or home office.</td>
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<tr>
<td>Survey respondents most frequently reported assigning students to use computers and printers, a Web browser, and word processor.</td>
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<tr>
<td>Survey respondents most frequently reported assigning students to use hardware and software on a daily or weekly basis, in the library/media center, home, classroom, and computer lab.</td>
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<td>Some survey respondents reported using projectors, digital cameras, TVs, VCRs, presentation, software suite, digital imaging, spreadsheets, and multimedia software.</td>
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<td>An administrator survey respondent reported daily or weekly use of word processors, Web browsers, and e-mail for communication with staff and colleagues outside of school. Technology is used monthly to analyze student data, present information, communicate with parents, and publicize information about the school. Hardware and software are used at school and home office.</td>
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The two administrators at School B who responded to the survey reported using a computer or laptop, digital camera, scanner, and word processor or software suite, and Web browser. One of the administrators reported using a printer, presentation software, grading software, and technology management tool. Most administrator technology use was reported on a daily basis in the school office and home office.

Teachers who returned a technology survey most frequently reported using a computer (n=15), printer (n=13). Other hardware reported used was a projector (type unspecified, n = 5), digital camera (n=3), with an overhead projector, scanner, TV, and VCR each reported twice. Most hardware was reported used daily (n=24) or weekly (n=14), in the classroom (n=35) or in the home office (n=23). Software titles that were most frequently reported were word processor (n=9), Web browser (n=8), and grading software (n=8). Other software reported included presentation (n=5) and software suite applications (n=3), with digital imaging, spreadsheet, and multimedia software each reported twice. Software is used predominantly in the classroom (n=26) or home office (n=24).

Classroom observations of teacher technology use were generally inconsistent with use reported by survey respondents. While survey data revealed that teachers at School B largely use word processors on a very frequent basis, teachers actually used computers in only two of the six
observations made during the winter site visit. Furthermore, three teachers made no use of hardware and one used an overhead projector. Duration of teacher use of a computer was between 5–15 minutes for both observations. Teachers were observed using a word processor, multimedia software, a word-processing/graphic program, and Web sites. Teacher use of an overhead projector was for less than five minutes and one teacher used a teacher-made transparency. Whereas survey respondents reported daily or weekly use of hardware and software in the classroom, only one third of teachers were observed using technology in the classroom.

Teachers who returned a technology inventory survey most frequently reported assigning students to use a computer (n=12) and printer (n=8). Reported less frequently were a projector (n=2), games, and digital camera each reported once. Teachers reported assigning most hardware on a daily (n=10) or weekly (n=7) basis, with some use monthly (n=5) or less (n=2). Hardware is assigned for use in the library/media center (n=15) and home (n=15), with some use in the classroom (n=12) or the computer lab (n=11). Software titles that students are frequently assigned include a Web browser (n=9) and word processor (n=8), with some assigned to use presentation (n=3), multimedia (n=3), and spreadsheet (n=2). No other software title was reported more than once. Most titles we assigned daily (n=10) or weekly (n=15) for use in the library/media center (n=19), home (n=18), classroom (n=14), and computer lab (n=14).

Six classes were observed in seven rooms: four in a classroom, two in the computer lab, and one in the library/media center. As was the case for teachers, classroom observations of student use of computers and printers also were generally inconsistent with survey data. While the survey data suggest that teachers primarily assign students to use computers and printers on a daily basis, few students were actually observed using this technology in the classroom. In four of the classes, no student use of computers was observed. In the other two classes, students were observed using a computer either individually or in pairs, for 5–15 minutes or more than 15 minutes. One student was observed using a printer for less than 5 minutes.

In terms of student software use at School B, survey respondents most frequently reported assigning students to use hardware and software such as a Web browser and word processor at least weekly in the library/media center, classroom, and computer lab, and this was consistent with observed use. There were two observations of students using of a word processor and one observation of students using multimedia software, a word-processing/graphic program, and accessing Web sites.

Both survey and observation data were consistent in terms of the types of hardware and software that are most commonly among teachers and students at School B. However, survey data portray that the extent of its use is greater than what was actually observed to be used by teachers and students in the classroom.

The data reveal that the most common student use of computers occurs in the computer lab and library/media center, which are made available to students before school, during lunch, and after school. The lab has three to four scheduled classes each day including creative video and computer lab for Grades 6–8. In Grades 5–8, students have regular computer lab instruction with their teacher. Students in Grades 6–8 can elect to take one of two computer courses: creative
video and publishing. Students are scheduled one to two times each week in the library/media center either for a special project or a lesson/unit with their teacher. In classrooms, one to four computers are used for drill and practice, project work, presentations, or for the teacher to access the Internet.

**Educational Technology Practices**

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<tr>
<th>Research Question: What educational technology practices do administrators and teachers at School B employ?</th>
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<td><strong>Primary Characteristics</strong></td>
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<tr>
<td>Three fourths of interview respondents reported that the use of technology for communication has had the greatest effect on their practice.</td>
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<td>Survey respondents most frequently reported word processor, grading software, and Web browser among the software titles with the greatest effect on professional practice. Software is most frequently reported used for creating instructional materials, and administrative and research purposes.</td>
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<td>Almost all survey respondents reported the use of technology to create instructional materials at least weekly. More than one half also reported gathering information for planning lessons or accessing model lesson plans, keeping administrative records, and communicating with colleagues on a daily or weekly basis; however, most professional use of technology is reported occurring monthly or less.</td>
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<td>Four fifths of survey respondents ranked creating instructional materials as one of the top three uses of technology that significantly affect teaching practice. Three fourths ranked keeping administrative records in their top three.</td>
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<td>All six observations included adult-led instruction at some point; computer use by both teachers and students was observed in one third of all lessons.</td>
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When asked about the professional uses of technology that have the greatest effect on their practice and student achievement, five of the seven teachers and administrators who were interviewed (71.4 percent) referred to communication with staff, parents, or others. Three respondents (43 percent) mentioned tracking of student data and finding professional development resources, and two (29 percent) mentioned other instructional practices. No other response was coded for more than one respondent.

The two administrators who returned a survey both reported using technology to keep administrative records on a daily basis. One respondent reported using technology to create administrative materials and communicate with administrative colleagues on a daily basis. Both administrators also reported using technology to present information to teachers or students and publicize school information on a weekly basis. Both respondents included a word processor among the software titles with the greatest effect on their administrative practice; with a software suite, Web browser, grading software, and technology management tool reported by one respondent each. Both respondents listed accessing information or researching best practices, purchases, creating administrative materials, and keeping administrative records among the uses of technology with the greatest effect on their practices.

The teachers who returned a technology survey most frequently listed a word processor (n=11), grading software (n=8), and Web browser (n=6) among the software titles with the greatest effect on teaching practice. Teachers also reported using presentation software (n=3); no other software title was reported by more than one respondent. Teachers were then asked to report what they use this software to do, and the reported uses were coded into categories. The most commonly reported purposes were creating instructional materials (n=17), keeping administrative records (n=10), and conducting research (n=4).

The technology inventory also asked teachers to indicate how often they use technology for each of 10 specified purposes. Sixteen respondents (94.1 percent) reported daily or weekly use of technology to create instructional materials. Twelve (71 percent) reported use of technology to gather information for planning lessons or to access model lesson plans, and keeping administrative records, and nine (53.0 percent) reported communicate with teaching colleagues on a daily or weekly basis. Five respondents (29.4 percent) each reported that they use technology at least weekly to access information and research on best practices, present information to students, and communicate with students’ parents or guardians. While teachers reported using technology daily or weekly for several of the given professional purposes, the most commonly reported frequency of use was monthly or less.

The survey then asked teachers to select three purposes of technology use from the given list that have had the most significant effect on their teaching practice. Fourteen (82.4 percent) respondents selected create instructional materials, and half ranked it first. Twelve (71 percent) put keeping administrative records in their top three, with six respondents ranking it first. Seven (41.2 percent) selected gather information for planning lessons or accessing model lesson plans among the top three. Four (24.0 percent) teachers each selected present information to students and communicate with students’ parents or guardians in their top three. No other professional purposes were listed in the top three by more than three respondents (17.6 percent).
Teachers are highly collaborative at School B. During their interviews, they describe sharing what they are doing with other teachers, both at their school and at other schools, and regularly looking to each other for ideas and support. School B teachers use technology to access materials for class, communicate with other teachers both locally and elsewhere, develop curriculum, and keep current professionally. They also have access to an electronic grading program, which has improved communication with parents, as one teacher said, “It … came in handy because when we had parent conferences, I actually printed off a progress report right on the spot. There weren’t that many questions, because everything’s there in black and white.”

Specific methods and technologies used in classes vary, but teachers seem to be interested in engaging students in inquiry as much as possible. “When the students are actually able to go on this Internet … I think it’s meaningful for them to actually be able to do the research themselves because it makes more sense … it makes it a little bit more meaningful than me just verbalizing it and telling them. They’re actually able to make the connection to real life.” Peer tutoring and collaboration also are encouraged. Teachers state that they do not overtly teach to the standardized tests, and they believe that engaging the students in reading and research activities prepares them for the assessments. Some teachers, however, do report teaching test-taking skills and presenting students with similar types of questions to help them become familiar with the test format.

Six lessons (second, fourth and sixth grades, one elementary-mixed class, and two middle school mixed classes) were observed in the winter of 2002 through 2003. Of these observed lessons, four took place in traditional classrooms, two were conducted in the computer labs, and one was conducted in the library/media center. Four of the observations were of language arts lessons, and one each was a science and mathematics lesson. The activities that were observed included a variety of structures. All six lessons included an adult leading the entire class at some point. Three of the lessons included students working in collaborative pairs, and three included individual work. One lesson included a student leading the large group, and one included adult tutoring. Two co-dominant structures were observed, individual work (n=3), and adult-led large group (n=3). One lesson also cited the student-led large group as an equally dominant structure.

No technology use was observed in three of the lessons. In two of the other lessons, teachers used computers for 15 minutes or less, and in one lesson, a teacher used an overhead projector for less than 5 minutes. In the teacher survey, respondents did not rank presentation as a highly significant effect of technology on their teaching practice.

Educational Technology Policies

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<th>Research Question: What educational technology policies do administrators and teachers at School B implement?</th>
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<tr>
<td><strong>Primary Characteristics</strong></td>
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<td>More than one half of respondents reported insufficient district funding is an obstacle to technology use.</td>
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</table>
The district’s technology plan, which is currently still under development, includes a comprehensive set of student technology standards based on national models, such as the National Educational Technology Standards (NETS) for Students from the International Society for Technology in Education. These standards have not yet been disseminated or implemented in the district, however, because teachers have requested that the district first develop a technology scope and sequence and provide the required resources. The district is working toward these goals. It is important to note that reference to the NETS for Teachers do not appear to be referenced in this plan, and there are no specific objectives for developing teachers’ skills around the use and integration of technology included in this technology plan.

The technology inventory survey asked respondents to indicate the priority of 20 given objectives for educational technology for their school on a scale from one to five, with one being the lowest priority and five being the highest priority. The two administrators who returned a survey both ranked several objectives as having the highest priority: improving student achievement on state assessments and standardized tests; improving student computer skills, basic skills, and 21st century skills; and publicizing school and student accomplishments.

Teachers and administrators mentioned few benefits of school and district policies as contributing to technology use at School B during their interviews. Two respondents (29 percent) named financial support or grants, the supply of computers in general, and the support for curriculum as benefits supplied by the school or district. Other support resources mentioned by individual interview respondents were community and parents; plans, policies, and standards set forth by the school or district; and other technology resources in general. When asked what school and district policies hinder technology use, four respondents (57.1 percent) attributed insufficient district funding as an obstacle to technology use. Individual interview respondents also referred to inadequate technology support for staff, and inadequate technology as school or district obstacles hindering technology use at School B. One respondent identified the reason for limited funding and the effect of district policies on technology use, “We don’t have any town money so it’s hard to buy stuff. And then the other thing is the district; they want you to buy certain machines. Now, I mean you can’t deviate from what they want, and their price is a lot higher than if we went to the store and bought them ourselves.”

The administrator who was interviewed referred to the use of computers in general as a benefit of state policy and was unaware or unsure of any state policy obstacles. Federal policies, plans, and standards, and the availability of grant money, were both mentioned as beneficial to the school.

School B is not eligible for federal funds like most public schools in the system and the teachers and administrator believe they receive fewer perks because they are already a high-performing school. The district has not funded the technology at the level it exists at School B. Much of the technology was acquired through the combined efforts of the media/library director, who also functions as a technology coordinator, and the principal, who obtained funds from various sources. A parent group also is very active in providing financial support for technology.
Technology Capacity

**Research Question:** How does the technology capacity of School B affect administrator, teacher, and student use of educational technology?

<table>
<thead>
<tr>
<th>Primary Characteristics</th>
<th>Secondary Characteristics</th>
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<tr>
<td>More than one half of interview respondents consider computers in the classroom a significant aspect of the technology environment at School B. School B has two computer labs, where much of the student use of technology takes place. However, not all computers in the labs are connected to the Internet.</td>
<td>Almost one half of interview respondents mentioned software or practicing standardized tests as characteristics of the school’s technology contributing to student achievement. One fourth mentioned the use of technology for communication, tracking student data, interactive learning, and students’ positive attitudes about technology. Classrooms tend to have a few computers in each, with a minimum of the teacher laptop or PC. Technology availability and access is not equal throughout the school; those who have worked for it have more technology.</td>
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</table>

School B has more than 100 computers, most of which have been purchased by the parent and community group, and through grants pursued and secured by the principal. The parent and community group also purchased access to a Web site, which correlates test questions to the state test. All classrooms have at least one computer (minimum of a teacher PC or laptop) and most have three or four, some of which are old, but functional. The older models are used mostly for drill and practice by individual students and small groups. Computers and other forms of technology are not evenly distributed throughout the building; the teachers who worked for these acquisitions have more technology at their disposal. Teachers consistently use the hardware they received through a state program at school and home.

School B was wired for the Internet eight years ago through the initiatives of the media/library director, who also functions as a technology coordinator, and the principal, who found funding for this work from various sources. The district has not funded technology at the level it exists at School B. A comprehensive technology plan exists at the district level, but the school staff is not aware of its particulars. The media/library director tries to meet the needs of teachers as they arise. An administrator reported a desire to install about seven computers in each classroom, but the building is not designed to accommodate this. However, between 75 percent and 80 percent of students have computers at home and use them regularly for schoolwork, and to access a Web site that correlates test questions to the state test.

Most of the computers at School B are centralized in two labs: one with 30 computers (with two laser printers—one black and white, and one color), which is operated by a computer technology teacher; and the Media Center/Library with 35 computers, similarly equipped with laser printers (black and white, and color) which is managed and operated by a library/media specialist. Not all of the computers in the labs have Internet connections. The majority of the technology use occurs in these two spaces; however, School B does not have enough computers to have a computer for each student when they are working in a lab setting. Overhead projectors are available for
teachers to check out. Palm pilots with probes are used in science classes. Media production facilities are available. Some teachers use a computer as a presentation station.

During their interviews, teachers and administrators were asked about the technology environment at School B. Four of the seven respondents (57.1 percent) mentioned the availability of computers in the classroom as a significant feature of the technology environment. However, one respondent reported that computers in the classroom are inadequate and one reported that computers in general are inadequate. Three respondents (43 percent) mentioned practicing standardized tests and software and two respondents (29 percent) mentioned Internet, tracking student data, communication with staff, parents, or others, and hands-on, project-based or interactive learning, and students familiar with or positive about technology as contributing factors of the school’s technology on student achievement. While some teachers mentioned that technology resources are inadequate, they make the most out of the resources available. For example, the teachers have been supplied with hardware from the state, and as one teacher commented, they “are putting those computers to very, very good use here at school and at home.”

School B did not return an infrastructure survey; therefore, other specific details of technology capacity are unavailable.

Resources, Strategies, and Structures

<table>
<thead>
<tr>
<th>Research Question: What resources, strategies, and structures does School B use to become a high-technology school, and to what extent are these integrated with other school improvement efforts?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Characteristics</strong></td>
</tr>
<tr>
<td>Two thirds of interview respondents reported that school ambience was a significant contributing factor to the school’s learning environment and student achievement. One half mentioned physical space, research by students, computers in the classroom, and other general technology resources. The administrator and teachers actively pursue other funding sources, and parents are involved in the funding of technology because School B does not qualify for federal funding due to its high-performing status. Parents and the local community also play integral roles in the acquisition of funds and resources to support the use of technology in this school.</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 of the six teachers interviewed (67 percent) cited the classroom ambience and physical space, and three (50 percent) reported that the allocated space was adequate. One teacher commented, “We every day, all day, we stress the importance of being on task. So I try to structure an environment in which the students are going to want to be on target because there’s so much that we learn, there’s so much that we teach.”
Three teachers (50 percent) cited research by students, largely using e-mail and the Internet, computers in the classroom, and general technology resources. Two teachers (33.3 percent) mentioned classroom management, class discussions, and communication with students, student grouping strategies, self-directed learning, print resources, and other instructional practices. When the administrator was asked to report the resources used to develop the school environment, the analysis of test scores was named as a resource used. When asked what resources are used to develop School B’s technology environment, the administrator cited the community’s provision of resources or support, money and grants, and the acquisition and maintenance of the school’s technology infrastructure.

While School B does not qualify for extra federal funds because of their status as a high-performing school, its staff and community find other ways to inject funding and technology into their school. The administrator secures funds whenever possible from various sources, including the active pursuit of grants. The school community is very supportive of the use of technology, and provides resources whenever possible. The parents’ group purchased access to a Web site that correlates test questions to the state test to assist in preparation for the state educational assessment program. Teachers reported seeking and taking advantage of various internal and external opportunities for professional development such as a collaborating with local universities on a technology-based learning program that includes professional development. In addition, the school participates in a national media competition sponsored by a national consumer electronics and technology manufacturer, which they won in 1999.

The media/library director also functions as a technology coordinator at the school, and interview respondents acknowledge the importance of the director’s efforts, and the necessity of having someone to acquire and maintain technology. One respondent said the level of technology support is inadequate, however.

Classroom Vignettes

Three lessons were observed at School B in spring 2003: an eighth-grade mathematics classroom of 28 students, an eighth-grade science class of 28 students in the science laboratory, and a mixed third and fourth grade social studies class of 27 students in the media center. In each case, teachers were interviewed before the lesson to establish a context for the lesson observation and an understanding of how instructional strategies and technology would be integrated to facilitate student learning. Teachers were also interviewed following each observation to interpret the lesson and the role of technology in achieving specific lesson outcomes. Technology use was observed in two of the three observations; these two observations are described below.

Eighth Graders in a Science Class

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<tr>
<th>Class 1</th>
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<tbody>
<tr>
<td>Grade: 8</td>
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<tr>
<td>Subject: Science</td>
</tr>
<tr>
<td>Setting: Science laboratory</td>
</tr>
<tr>
<td>Teacher Hardware Used: Presentation station, laptop</td>
</tr>
<tr>
<td>Teacher Software Used: Science</td>
</tr>
<tr>
<td>Student Hardware Used: Presentation station, laptop (one student used both)</td>
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<tr>
<td>Student Software Used: Science</td>
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</tbody>
</table>
The teacher for this lesson was unavailable for an interview before the observation; however, the teacher was interviewed afterward.

The observed lesson took place in the science laboratory, where 28 students sat at six tables. The laboratory was equipped with three desktop computers, a laptop computer, a digital projector, an overhead projector, a scanner, a camera, a calculator, and four printers. During the lesson, the teacher used a laptop computer/presentation station with science software for about 5 to 15 minutes to demonstrate prediction, observation, and explanation. Next, the teacher introduced the terms that students would use for a lesson on temperature. The lesson on temperature demonstrated endothermic and exothermic reactions in experiments with three different liquids.

The teacher used the presentation station and laptop to present a graph of the reaction to the class and directed the students to re-create the graph in their notebooks. The teacher then selected a student to work on a graph at the presentation station. The teacher asked questions such as, “Will the line on the graph go up or down?” Students predicted what they thought would happen, chatting quietly with each other and recording the prediction in their science notebook. The teacher, directing students’ attention to the large screen, showed a graph based on the data and asked students to write an explanation in their notebooks. Students were attentive and serious. The lesson concluded with a class discussion of an upcoming science fair. This lesson was in preparation for a follow-up class in which the teacher would demonstrate the experiment using the liquids.

After the observation, the teacher explained that technology was used to demonstrate the major ideas in the experiment and as a management technique to engage students in the lesson. The teacher reported that the graphing task served to assess students’ understanding of collecting, analyzing and interpreting data, noting that it appeared that students knew what they were doing. According to the teacher, the lesson provided necessary practice in the kinds of science questions and graphs the students will see on the state achievement test.

### Third and Fourth Graders in a Social Studies Class in the Media Center

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<tr>
<th>Class 3</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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</table>

Before the observation, the media specialist reported that the social studies lesson would include further instruction on presentation software, which was demonstrated earlier in the year, as well as instruction on searching the Internet and accessing a Web page that the media specialist constructed. The media specialist noted that once a lesson is presented in class, students are encouraged to work with other students if they have questions instead of asking the teacher directly.
The observation took place in the media center, which was equipped with 35 desktop computers, three networked printers (one black and white, and two color), a digital projector, a laptop, an overhead projector, a video player, television, camera, and calculator. In the media center, a class of 27 third- and fourth-grade students worked on the technology portion of a social studies unit on countries. The media specialist and students were observed using computers, conducting research on the Internet, and editing presentations with presentation software for the duration of the observation. Each student had selected a country to learn about and then developed a written and graphic report using presentation software. The media specialist designed the lesson to help students collect information from the Internet for each country. Students used a Web browser and search engines to find and access the Web sites of countries. Students were instructed to find the appropriate site and then find the country’s flag and download it into their presentations. Students had been using presentation software since the beginning of the school year and appeared to have little difficulty accessing the Web sites or using the software. Downloading the flag was a new experience, however, and the teacher encouraged them with comments such as, “You don’t need to copy everything, just read and think,” and “Think about your audience, what don’t they know about [a country]?” When the class ended, the teacher encouraged students to come in the next morning or after school to continue their work.

After the observation, the media specialist commented that modeling presentation software and search techniques were effective, as students appeared to understand what they were doing. The media specialist noted that this lesson would not have been possible without the available software. The media specialist stated that searching for flags for each student’s country was one aspect of the countries project, which also required writing, graphing, and reading maps, adding that these skills are measured by the state achievement test.

Each lesson observation reflected direct instruction as the dominant instructional method, along with individual student practice, and discussion. In each class, students were attentive, serious about their learning, and consistently on task. Students showed respect for their teachers and followed directions. Teachers were quick to discipline any deviation from orderly behavior. In both observations, teachers began the lesson by using presentation hardware and software to model the work that students would be expected to complete on their own. Teachers discussed the activity with their students before instructing students to engage in independent work. Students were assigned to use software for presenting information themselves or to remediate skills learned in that day’s or earlier lessons. Teachers often tied the skills covered in the lessons to those assessed in state achievement tests.
References


