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

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### Case Report on School A

**Education Trust High-Poverty:** No  
**Education Trust High-Minority:** Yes  
**Location:** Urban  
**Grades Served:** K–5

#### 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 & Ronkivist, 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 A in this report, which is based on the following data collected from the school:

- Six teachers and seven administrators (including district administrators) were interviewed during the first site visit.
- Eight classrooms were observed during the first site visit.
- A school improvement plan was collected during a site visit.
- Seventeen teachers (89 percent) returned a survey.
- One administrator (100 percent) returned a survey.
- Three lessons were observed during the second site visit.
Case Background

School A is part of the fourth largest school district in its state, serving more than 18,000 students and their families. The city in which School A is located is within 30 miles of a large metropolitan area. The local industrial base has been drastically downsized since the 1970s, causing financial and economic challenges for the city. The school district is now the largest employer in the city. The population served by this school district is over 95 percent African American. The district encourages strong parent involvement at each of its schools. Each school provides parenting information, school communication, volunteer opportunities, learning activities for the home, and opportunities for family members to be involved in school governance and community collaboration efforts.

School A serves the academically accelerated population of the local community. Students are selected for this magnet school by an identification program that relies on a variety of assessments, including interviews, standardized achievement tests, parent input, and teacher recommendations. The teachers at school A instill high expectations for learning achievement in their students, which is motivating for students. The school serves more than 400 children in kindergarten through Grade 5. More than 95 percent of the students are African American; the remaining 5 percent are Latino and white. Over one quarter of the students qualify for free or reduced-price lunches.

The School A community is comprised of individual homes, apartment complexes, and subsidized housing. A new housing development featuring middle-class homes is being developed, and new families are moving into this neighborhood with white-collar professional and highly skilled industrial workers. The neighborhood is well maintained and draws strength from the support of local churches and businesses, which help anchor the community.

Case Summary

School A is characterized by its family atmosphere where students, parents, and teachers work together to reach common goals, creating a positive and cohesive learning environment for students. School A has established enrichment programs through the computer laboratory, Invent America science laboratory, reading assessment software, Project 4 R’s technology, The Stock Market Game, foreign languages, Economics American, Travel Club, and literature-based special projects. Tutorial programs in mathematics and language arts are provided after school and during the lunch hour, as funds are available. Students and teachers at School A are encouraged to take advantage of their school’s computer laboratories and other technology that is available to them. For example, the local school district has invested in installing two-way interactive video equipment in all secondary schools in the district and each elementary school is paired with an equipped secondary school. This interactive video technology allows students and teachers to take advantage of many educational offerings over the distance-learning network.

Teachers at School A employ a number of instructional strategies and activity structures to meet the individual needs of their students. This approach to curriculum and instruction is rooted in School A’s focus on the development of higher-order thinking across content areas (reading, language arts, mathematics, science, and foreign language) and their curriculum has been aligned.
to state standards. For example, kindergarten and first-grade classrooms are self-contained to maximize teacher-student interactions, to encourage interdisciplinary teaming, and to create a sense of belonging for all students. Grades 2–5 are departmentalized by subject areas.

The teachers at School A consider themselves a community of competent and caring professionals who are dedicated to student learning. The staff is multiethnic and nearly one half of them have graduate degrees. Teachers collaborate for planning purposes and actively participate in professional development opportunities to enhance their teaching and technology skills. For example, teachers most often use technology for planning and creating instructional materials.

Administrators are viewed as supportive and instrumental to the successful implementation of the school improvement plan. The school administrator sets expectations for students and teachers and works hard to ensure that needs are met so teachers are effective. The school administrator uses technology frequently to communicate with colleagues, conduct research, and keep administrative records. According to the administrator, the use of technology that has had the most impact on practice is the ability to create administrative materials, access information on best practices, and analyze student data for school improvement. Thus, among the administrator’s highest priorities for school improvement and technology are: improving student achievement on state and standardized assessments; making instruction and school reform decisions more data driven; improving administrator efficiency; and improving students’, administrators’, and parents’ computer skills.

The technology plan at School A is aligned with the state and district expectations for achievement as technology purchases must be made within direct support of these goals. More than half of the students at School A do not have computers at home, thus for many, school is their only access to technology. Teacher and students use technology for many purposes, but most frequently for instruction, remediation, word processing, video media, Internet research, hypermedia-based learning, and workplace simulations. School A teachers feel that student use of technology to remediate skills not learned, written expression, and skills mastery are among the most significant uses of technology that influence student achievement. Thus, the software programs that teachers feel had the largest effect on student achievement are word processors, Web browsers, and a mathematics skills program.

Most of the School A respondents feel that the generally adequate technology resources available contribute to effective use of technology. As far as the impact of federal and state policies, one administrator commented, “If we’re looking at the federal level, what has helped … the most is the E-rate that has provided us with the funding that has enabled us to put technology into schools and make it available to students.” However, while most respondents reported the technology resources at School A as adequate, a few cited some instances in which technology needs were not being met, such as a nonfunctioning e-mail system and a need for a computer teacher.

School A encourages strong community and parent involvement, providing parenting information, school communication, volunteer opportunities, learning activities from home, and involvement opportunities for family members. For example, there is an active PTA,
grandparents groups, community outreach program, and a Parent Resource Center that is coordinated by the parents. The school also benefits from multiple business partnerships, such as those with McDonald’s and Coca-Cola, agreements with local universities and churches, and grants to subsidize needs of the school.

Academic Achievement

| Research Question: What effects on academic achievement do administrators and teachers in School A attribute to educational technology? |
|---|---|
| **Primary Characteristics** | **Secondary Characteristics** |
| One half of interview respondents cited parent involvement as a characteristic of School A that contributes to student achievement. | Almost one half of interview respondents referred to administration leadership and teacher competence as school characteristics that contribute to student achievement. About one third mentioned that high academic expectations contribute to student achievement. |
| One half of interview respondents referred to content specific strategies when asked about student uses of technology that contribute to achievement. | One fourth of interview respondents referred to research by students when asked about student uses of technology that contribute to achievement. |
| Teacher survey respondents most frequently reported a word processor among the software titles with the greatest effect on student achievement. Purposes related to instruction were by far the most commonly reported for student use of software with the greatest effect on student achievement. | Teacher survey respondents reported a Web browser and mathematics skills program among the software titles with the greatest effect on student achievement. Respondents reported research as a purpose of student use of software with the greatest effect on student achievement. |
| One half of teacher survey respondents reported assigning students to use of technology at least weekly for mastering skills just taught, remediating skills not learned, improving computer skills, and collaborative work. | Almost one half of teacher survey respondents reported assigning students to use technology at least weekly for conducting research or gathering information, learning to work independently, and rewarding good behavior. |
| One half of survey respondents ranked remediating skills not learned among the purposes of student technology use with the greatest effect on student achievement. | Two fifths of teacher survey respondents ranked expressing themselves in writing among the top three purposes for student use of technology that have the greatest effect on student achievement. One third of survey respondents ranked mastering skills just taught among the top three purposes. |
When asked what characteristics of School A as a whole contribute most substantially to student achievement, seven (54 percent) of the 13 teachers and administrators interviewed reported parent involvement, six (46.1 percent) respondents indicated both administration leadership and teacher competence as defining characteristics, and four (31 percent) respondents reported high academic expectations. Other responses cited by two (15.4 percent) participants included community provision of support and resources, high achieving students, practice of standardized tests, curriculum support, alignment of curriculum and instruction with standards, and professional development.

Overall, the support of parents, administrators, and teachers of student learning seem to be integral to the achievement of students at School A. One School A administrator stated that test scores and academic success are largely attributed to people in the school: “… The secret to success is that the teachers, the parents, the staff, all of us work together; the principal leading where we ought to go. I believe that every child should have success here.” The school is described as a family, working together at school and home; the staff is dedicated; the administrators are supportive. One administrator at School A commented on this observation: “You have staff that’s interested and you have an administrator that sees that those requests and things that you want are in place.” In addition to this, students are selected for this magnet school, which serves gifted and talented students. As a result, students overall are of exceptional ability, and, as a result, teachers have high expectations of them, which serve only to motivate them to work even harder. The school principal is viewed as a strong administrator who sets the standard of expectations for students and faculty alike, and works hard to ensure that teachers have the supplies and resources necessary to help students meet and exceed these expectations.

The high academic expectations imposed by teachers and administrators on students at School A are largely standards based. School A is intensively focused on standards, and, accordingly, standards are addressed consistently in instructional practices across the curriculum. One school administrator recognized that “you have to teach every day. The state standards are every day. They should be a part of your curriculum. Those state standards should be correlated with what you do each and every day.” Within the school district, student achievement is measured with the following instruments: the statewide test for Grades 3, 6, 8, and 10 in mathematics and language arts; and the TerraNova assessment for Grades 1–9 in basic skills. State test scores are used to assess the extent to which students achieve established academic standards, and TerraNova scores are used to assess how the district’s students compare to national norms. Additional or alternative assessments are used to determine placement in special programs or to measure the achievement of limited English proficient students. Monthly benchmarks monitor whether teachers are teaching to standards.

Because School A is a school for academically gifted students, it implements specific strategies designed to meet the specialized needs of its population. Grade 1 is self-contained, but Grades 2–5 are departmentalized to ensure adequate time to cover all subject areas each day, and to allow teachers to specialize in their subject areas. Differentiation of instruction for teaching gifted students includes questioning at higher levels for critical thinking, encouraging comparison and contrast, requiring creative writing and opinions followed by evaluations, and extending lessons with enrichment activities. Other instructional strategies include an accelerated curriculum, inquiry, problem-solving, broad themes, independent studies, and other in-depth learning.
When asked what student uses of technology have the most significant effect on student achievement, six (54.5 percent) of the 11 teachers and administrators interviewed reported content-specific strategies. Three (27.3 percent) respondents cited research conducted by students, largely accomplished through the use of e-mail and the Internet as a use of technology that strongly impacts student achievement in the classroom. An additional two (18.2 percent) respondents indicated both hands-on, project-based/interactive learning, and the practice of standardized tests.

While student use of technology at School A certainly contributes to academic achievement overall, it also is as much of a practice in technology skills development. Students at School A like to take the skills they learn through the use of technology to help others gain some expertise in its use as well. One teacher observed, “Students share a lot of the information that they find and that they learn. They share it with their parents, extended family, and so as they become educated in the area of technology, they are sharing it beyond the school so that makes the community a better community in the long run at some level.”

Teachers who returned a technology inventory survey most frequently included a word processing program among the top three software titles having the greatest impact on student achievement (n=9). Teachers also reported a Web browser (n=7), mathematics skills programs (n=6), reading skills programs (n=2), and textbook resources (n=2) as having a significant impact on student achievement. Teachers also were asked to indicate the specific reasons for which students use this software. The reported uses were coded by researchers into categories. The most commonly reported purpose was instruction (n=20). Teachers also reported conducting research and gathering information (n=6), creating artifacts such as stories and books (n=4), general writing (n=4), and mathematics skills development and remediation (n=3).

The technology inventory survey also asked teachers to indicate how often they assign their students to use educational technology for 16 specified purposes. Nine of the 17 respondents (53 percent) reported assigning their students to use technology at least weekly to master skills just taught, remediate skills not learned, learn to work collaboratively, and improve their computer skills. Eight (47.1 percent) assign students to use technology at least weekly to conduct research or gather information, as a reward for behavior or free time use, and to learn to work independently. Teachers reported assigning students to use technology least frequently for the other purposes. Thirteen teachers (76.4 percent) reported assigning students to use technology to create multimedia presentations, create publications such as newspapers, and present information to an audience on a monthly basis or less. Ten (59 percent) reported assigning students to publish information on the Web monthly or less. Nine teachers (53 percent) reported assigning their students to use technology to express themselves in writing, graphically organize information or ideas, and communicate with people outside the classroom on a monthly basis or less.

The survey then asked teachers to select three purposes from the list of 16 that have the most significant effect on student achievement, ranking them in order from one to three. Nine respondents (52.9 percent) ranked remediating skills not learned among the top three purposes. Seven respondents (41.2 percent) ranked expressing themselves in writing, and six (35.3 percent) reported mastering skills just taught among the purposes with the greatest effect on student
achievement. Four respondents (23.5 percent) included conducting research or gathering information and analyzing information, or solving problems among the top three purposes.

**Technology Use**

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<thead>
<tr>
<th>Research Question: What <em>kinds of educational technology</em> do administrators, teachers, and students in School A use?</th>
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<tbody>
<tr>
<td><strong>Primary Characteristics</strong></td>
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<tr>
<td>Teacher survey respondents most frequently reported using computers, printers, and overhead projectors. Respondents reported using most hardware on a daily or weekly basis, primarily in the classroom.</td>
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<tr>
<td>Teacher survey respondents most frequently reported using word processors and Web browsers. Respondents reported using most software on a daily or weekly basis, primarily in the classroom but also at home.</td>
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<tr>
<td>Teachers used computers in three fourths of the classroom observations during site visits, along with a word processor, Web browser, presentation software, and a variety of education software.</td>
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<tr>
<td>Survey respondents most frequently reported assigning students to use computers and printers. Respondents reported assigning most hardware use on a weekly basis, primarily in the classroom but also in the computer laboratory and at home.</td>
</tr>
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<td>Survey respondents most frequently reported assigning students to use word processors and Web browsers. Respondents reported assigning most software use on a weekly basis, primarily in the classroom.</td>
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<tr>
<td>Students used computers during almost all classroom observations. The majority of observations of student computer use in the classroom were of one student per computer; most observations were of students using word processors and a variety of education software.</td>
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</table>
The administrator who returned a technology inventory survey reported daily use of both a computer and printer in the office at the school. Software reported by the administrator included daily use of a Web browser, and monthly use of word processing and student information software also in the office. The administrator also reported using a Web browser for research and communication purposes, a student information system for maintaining administrator records, and a word processor for keeping in touch with colleagues.

Teachers who returned a technology inventory survey most frequently reported using a computer (n=14), a printer (n=12), and an overhead projector (n=9). Additional hardware use reported includes a scanner (n=6), digital camera (n=5), LCD projector (n=5), TV (n=4), video camera (n=3), DVD player (n=3), opaque projector (n=3), and VCR (n=2). Most hardware is used by teachers on a daily (n=15) and weekly (n=20) basis, and is primarily used in the classroom (n=42) and at home (n=21). Teachers also reported using a variety of software applications, including word processors (n=17), and Web browsers (n=13). Other software includes textbook resources (n=7), presentation (n=4), and spreadsheet (n=2) applications. Teachers reported using most software on a weekly (n=19) and daily (n=18) basis. Five titles are used monthly, and six titles are used less than monthly. Teachers reported using the majority of the software titles (n=35) in their classrooms and at home (n=19), with some use in the computer laboratory (n=18) and the library/media center (n=5).

Of the eight classroom observations made at School A, six (75 percent) found teacher use of a computer. Four observations were made of teachers using a computer were for a period of less than 5 minutes, with no observations exceeding 15 minutes. In two observations, teachers were observed using an overhead projector and, in one classroom, a teacher used a presentation station. Observations of hardware use other than computers were for durations of less than five minutes. Additionally, two classroom observations were made during which teachers did not use any hardware. Two observations (25 percent) were made of teachers using word processing software applications. One teacher also was observed using Web browser and presentation software. Additional uses of a variety of software (e.g., multicurricular skills, reference, and reading skills) were observed as well.

Teachers who returned a technology inventory survey reported assigning students to use a computer (n=16) and a printer (n=10). Other hardware reported more than once includes a scanner (n=3), overhead projector (n=2), VCR (n=2), TV (n=2), projector—not specified (n=2), and digital camera (n=2). The majority of this hardware is assigned and used on a weekly basis (n=19), and is mostly used in the classroom (n=21), computer laboratory (n=16), and at home (n=13). Teachers most frequently reported assigning students to use Web browsers (n=13) and word processing applications (n=11). Other software reported more than once includes a scanner (n=3), overhead projector (n=2), VCR (n=2), TV (n=2), digital camera (n=2), and projector—not specified (n=2). The most common frequency of this software is weekly (n=26), with some use daily (n=5) and monthly (n=7) as well. Teachers reported that students mostly use this software in the classroom (n=34), in the computer laboratory (n=13), and at home (n=10).

Students used computers in seven (87.5 percent) of the eight classroom observations made at School A. Five observations were made of students using computers at a 1:1 ratio. Four of these five observations were for a duration of more than 15 minutes. In addition to computer use, two
observations were made of students using other hardware; one observation was made of presentation station use, and another was made of printer use. Both of these observations were for a duration of less than five minutes. Students were observed using a variety of educational software applications, with two observations made of word processing software use. Additional titles observed being used among students are primarily the same as those other titles used by teachers. Given the overlap of software used between teachers and students, presumably teachers’ use was done for the purposes of modeling use for students, or assisting students in their own use of this software.

Observation and survey data both appear to identify computers, printers, and word processing applications as the predominant hardware and software being used by both teachers and students at School A. Similarly, the patterns of student-assigned hardware and software use clearly appear to be consistent with that the hardware and software that teachers themselves both reported and were observed using.

**Educational Technology Practices**

| Research Question: What *educational technology practices* do administrators and teachers in School A employ? |
|---|---|
| **Primary Characteristics** | **Secondary Characteristics** |
| Among the common reasons for which technology is used by teachers and administrators—use for communicating with staff, parents, and others—was cited by one half of interview respondents as significantly impacting their professional practices. | About two fifths of administrators and teachers interviewed cited general technology resources and finding, creating, or updating instructional resources as professional uses of technology thought to significantly impact student achievement. One third cited content-specific strategies, and finding professional development resources. |
| Survey respondents most frequently reported that the software types with greatest impact on teaching practices are word processing and Web browsing applications, used predominantly for developing instructional materials and conducting research. | Survey respondents reported using the software with the greatest impact on their practice to support instruction and create documents. |
| At least one half of survey respondents reported using technology on a weekly basis to gather information for lesson planning and presenting information to students. | Almost one half of respondents reported using technology daily or weekly to create instructional materials. At least one fourth of survey respondents reported using technology on a weekly basis to communicate with teaching colleagues, access information on best practices, and keep administrative records. |
| Three fourths of teacher survey respondents ranked gathering information for lesson planning among the top three professional purposes for technology use with the greatest effect on teaching practice, and almost as many respondents included creating instructional materials among the top three purposes. | One third of teacher survey respondents ranked accessing information on best practices and presenting information to students among the top three professional purposes for technology use with the greatest effect on teaching practice. |
When asked about the professional uses of technology that have the greatest impact on their practice and student achievement, seven (54 percent) of the 13 administrators and teachers who were interviewed mentioned communication with staff, parents, and others, which supports other findings discussed earlier concerning the supportive role of School A teachers, parents, and administrators that strongly contributes to student academic success. Five respondents (38.5 percent) reported both general technology resources (including overhead projectors, word processors, and other hardware) and finding, creating, and updating instructional resources via the use of the Internet or e-mail. Four (31.7 percent) participants cited both content-specific strategies and finding professional development resources, while two (15.4 percent) respondents also specified self-directed learning, computers in the classroom, tracking student data, and management/organization as key uses of technology that impacts the professional practices of teachers and administrators.

The administrator who returned a technology inventory survey reported that software for word processing, Web browsing, and student information have had the greatest effect on administrative practices, with Web browsing rated as the most significant software. This software is used primarily for keeping administrative records, accessing information/conducting research, and communicating with colleagues. The administrator reported using technology on a daily basis for the purpose of communicating with colleagues outside of the school. When asked to rank the top three technology uses from a specified list of administrative purposes, the administrator ranked creating administrative materials first, accessing information and research on best practices second, and analyzing student data for school improvement third.

Teachers who returned a technology inventory survey most frequently listed a word processor (n=11) and Web browser (n=11) among the top software titles that have the greatest effect on their teaching practice. Other software reported included textbook resources (n=1), software suites (n=1), reading skills (n=1), music (n=1), and grading software (n=1). Teachers were also 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 of use were for creating instructional materials (n=11), conducting research and finding information (n=9), in support of instruction (n=7), and for creating documents (n=6).

The survey also asked teachers to indicate how often they use technology for each of 10 specified professional purposes. Ten respondents (58.8 percent) reported weekly use to gather information for planning lessons, and nine respondents (52.9 percent) reported weekly use for presenting information to students. Eight respondents (47.1 percent) reported daily or weekly use to create instructional materials. Six respondents (35.3 percent) reported at least weekly use to communicate with teaching colleagues, while five (29.4 percent) reported at least weekly use to access information on best practices and keep administrative records. Teachers reported using technology least frequently to communicate with parents or guardians, communicate with students outside the classroom, publish class information on the Web, and publish student work on the Web; more than 75 percent of respondents reported using technology for each of these purposes monthly or less.
The survey then asked teachers to select the three purposes from the list of 10 that have the most significant effect on their practice, ranking them in order from one to three. Thirteen (76.5 percent) respondents ranked gathering information for planning lessons in the top three, with two (11.8 percent) respondents ranking it first. Twelve (70.6 percent) respondents ranked creating instructional materials among the top three, with five (29.4 percent) indicating this purpose as first. Six (35.3 percent) teachers reported both accessing information on best practices for teaching and presenting information to students among the professional purposes for technology use with the greatest impact on teaching practice. Three respondents (17.6 percent) ranked keeping administrative records among the top three purposes, and no other purpose was included in the top three by more than one respondent.

Eight classes were observed during the winter site visit at School A; one kindergarten, second-, fourth-, and fifth-grade classes and two first- and third-grade classes. One half of observations were made in a classroom setting, while the other half occurred in computer laboratories. Dominant subjects observed were science (n=2), mathematics (n=2), language arts (n=2), computers/technology (n=1), and social studies (n=1). Eight different activity structures were observed; adult-led large group and individual structures were observed in seven out of eight observations, collaborative pairs and small groups were observed among three classes, adult-led small group, adult tutoring, and peer tutoring were each observed two times, and rotating centers was observed once. Individual and collaborative small groups were each recorded as the dominant work structures in three of the eight observations made, the adult-led large group was the dominant structure in two observations, and the adult-led large group structure was dominant in one class.

While teachers and administrators use many of the same software applications to do their jobs, the reasons for which each uses these applications are quite differentiated. For administrators at School A, technology is used primarily for communication purposes, and for conducting research that contributes in a meaningful way to school planning. Teachers, on the other hand, use technology in support of their instruction practices, including planning and executing lessons in the classroom.

Educational Technology Policies

<table>
<thead>
<tr>
<th>Research Question: What educational technology policies do administrators and teachers in School A implement?</th>
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<tbody>
<tr>
<td><strong>Primary Characteristics</strong></td>
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<td>One half of interview respondents reported the technology resources provided to the school as a school or district policy benefit.</td>
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The administrator at School A was asked to indicate the priority of 20 given objectives for educational technology for this school on a scale of one to five, with one being the lowest priority and five being the highest priority. This administrator indicated 10 objectives that delineate School A’s highest priorities: improving student achievement on state assessments, improving students’ computer skills, improving students’ basic skills, improving students’ 21st century learning skills, improving administrators’ computer skills, improving administrative efficiency, making school improvement decisions more data driven, supporting school-reform efforts, improving parents’ computer skills, and publicizing student and school accomplishments. From this administrator’s perspective, School A appears to be strongly focused on two primary areas: technology literacy among students, teachers, administrators, and parents, and school improvement and accountability. The administration at School A generally views technology integration as key to addressing these overarching priorities.

Accordingly, School A has a technology plan in place in an effort to increase the overall use of technology. School A’s technology initiative is aligned with school and district academic expectations. The plan requires all students to demonstrate mastery of technology skills through products and exhibits, while at the same time showing at least a 5 percent increase in academic achievement on state assessments each year. Further, the district policy of maintaining a standard curriculum is viewed positively by many teachers because it ensures that all students are exposed to the same content, which helps students as they transfer in and out of the school. The district adheres closely to standards, and technology purchases must be correlated with these standards. Both the district and school technology plans acknowledge the need for ongoing technology professional development, and encourage frequent computer use by all students. In general, School A teachers and students use computers in the following ways: computer assisted instruction and remediation, word processing, video media, CD-ROM technology, Internet research and enrichment, Hypertext/hypermedia-based learning, and work place simulations.

When asked about the perceived benefits of school and district policies for technology use at School A, seven (54 percent) of the 13 teachers and administrators who were interviewed reported the provision of general technology resources, such as televisions and VCRs. Only one (8 percent) individual within this group reported that the current technological resources of the school are inadequate. Four (31 percent) respondents indicated computers in the classroom, three (23.1 percent) cited plans, policies, and standards, professional development, the computer laboratory, and technology support for staff, and two (15.4 percent) reported staff team work as school/district policies that benefit this school’s use of technology for teaching and learning.

When asked about those school/district policies that make it more difficult to use technology in ways that contribute to student achievement, four (31 percent) of the 13 respondents cited insufficient technology support. For example, teachers commonly reported a demand for e-mail, which has ceased to exist since the school performed a complete overhaul on their computer systems. They suggested a need for a new technology professional to assist them in reestablishing and assisting them in the use of e-mail applications throughout the schools. The principal cites that the school’s lack of a dedicated computer teacher constrains the school’s overall use of technology. The principal stated, “I would prefer a computer teacher because we already have people who will repair computers. And she would set up the system and I would
know what the skills they were [learning] every day and she would run off this sheet to me and let me know their progress. I still want that.”

In terms of state and federal policies, the primary benefit cited by two (29 percent) of the seven administrators interviewed was money and grants for the purposes of integrating and maintaining technology systems at the school. According to one School A administrator interviewed, the federal policy, Title VI, Technology for Professional Use, has been viewed as a very positive force within the school: “If we’re looking at the federal level, what has helped [School A] in our district the most is the E-Rate that has provided us with the funding that has enabled us to put technology into schools and make it available to students.” Although these policies are integral to technology integration at this school, there seems to be a consensus that the money made available to School A for this purpose is still insufficient. Two administrators (29 percent) reported that federal policies concerning funding and money or grants are inadequate. One administrator (14.3 percent) reported that state funding is insufficient. A major concern has been seen in terms of available funding for technology-related supplies, such as printer replacement cartridges. Also, as a result of insufficient funding, the school now shares its technology specialist with another school, which situates teachers who are not trained in technology as primary technology support for students.

Technology Capacity

<table>
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<tr>
<th>Research Question: How does the technology capacity of School A affect administrator, teacher, and student use of educational technology?</th>
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<tbody>
<tr>
<td><strong>Primary Characteristics</strong></td>
</tr>
<tr>
<td>School A has one computer laboratory and at least three networked multimedia computers in each classroom with Internet access. The computer laboratory also has printers and scanners available to students. Respondents view technology as being highly accessible to students and teachers.</td>
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</table>

School A did not return a technology infrastructure inventory.

School A is equipped with one computer laboratory and at least three multimedia computers in each classroom. Network connections allow students to access their work either in the classroom or in the lab. Printers and scanners are available in the computer laboratory, and printers are available in classrooms. Students use a variety of resources and tools including online research tools, CD-ROM encyclopedias, magazines, a software suite, and instructional software made available through a Project 4 R’s grant. District and school administrators encourage technology use for research and as a means of producing professional-looking documents and other products. The school has become more technologically dependent as teachers and students become more familiar and skilled with the available technology. The onsite technical assistant
position was cut to half time in 2002–03, which has reduced the amount of support available to teachers.

All of the classrooms, library media centers, and computer laboratories within this school district are electronically connected to the district network and have Internet access. Installation of new automation software provides access to all library media resources from any computer in the district, as well as to regularly update educational Web sites. Two-way interactive video distance-learning laboratories are installed in all secondary schools in the district. Elementary schools, including School A, have been paired with the secondary schools to allow all students access to the educational offerings, electronic expeditions, and collaborative learning experiences available over the distance-learning network. TV cameras, monitors, microphones, and speakers allow students at multiple sites to simultaneously communicate with one another using fiber optic telecommunication technology.

The Internet is used to communicate within the school and district as well as outside of the district. The school offers a homework hotline through the Internet. Students with computers at home have access to this. If they do not have computers at home, they have access in the library. One teacher estimates that about 70 percent of the students have computers at home. Another teacher said that about 65 out of 75 students have computers at home but not all are connected to the Internet. Finally, the school is currently working on password access for students at home.

When asked what characteristics of School A’s technology environment facilitate use of technology in ways that contribute to student achievement, five (38.5 percent) of the 13 teachers and administrators who were interviewed mentioned software. Software mentioned includes subject specific CDs, many of which came with textbooks, including electronic encyclopedias and geographical databases. Overall, however, standard software suite applications appear to be the primary tool for teachers, students, and administrators alike. There were no comments that the software is inadequate, except for difficulties related to textbooks on tape. Additional characteristics each cited by four (31 percent) participants include content-specific strategies, the school’s computer laboratory, general technology resources, and computers in the classroom. Three (23.1 percent) participants cited technology support for staff, while two (15.4 percent) reported communication with staff, parents, or others, other instructional practices, professional development, and computers in general.
Resources, Strategies, and Structures

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

<table>
<thead>
<tr>
<th>Primary Characteristics</th>
<th>Secondary Characteristics</th>
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<tbody>
<tr>
<td>Four fifths of interview respondents reported general technology resources and one half reported content-specific strategies, other instructional practices, and classroom materials and supplies as a primary characteristic of the school’s learning environment. However, one half of teachers interviewed reported that the physical space of the learning environment is inadequate. When administrators were asked about the specific resources used to develop these characteristics, more than one half cited software applications used for word processing, and creating presentations and spreadsheets.</td>
<td>High-achieving students and other general school characteristics also were identified by slightly less than one half of participants as key resources used to develop School A’s characteristics. When asked about the specific resources used to develop the school’s technology environment, one fourth of administrators reported general technology resources, including TVs and overhead projectors. One third of teacher interview respondents each referred to ambience, class discussions, hands-on or project-based interactive learning, student-grouping strategies, professional development, computers in the classroom, and meeting students’ individual needs as aspects of the learning environment that contribute to student achievement.</td>
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</table>

School A teachers receive regular professional development in technology use. They are equipped with Internet resource materials by subject, as well as a variety of educational computer games and programs that are designed to make learning more enjoyable. Each student is given equal time during group work on computers, or individual computers are available to students. Students and teachers appear to be enthusiastic about using the computer and the contribution technology makes to instruction and learning.

When asked about the primary characteristics of the typical classroom learning environment at School A, five (83.3 percent) of the six teachers interviewed reported the school’s general technology resources, including overhead projectors, VCRs, and boards. Three (50 percent) teachers cited each of the following: the physical space of the learning environment is inadequate, other instructional practices, content-specific strategies, and classroom materials/supplies. Two (33.3 percent) teachers indicated ambience, class discussions/communication among students, hands-on project-based/interactive learning, student grouping strategies, professional development, computers in the classroom, and meeting the individual needs of students.

When administrators were asked about the specific resources used to develop these characteristics, four (57.1 percent) of the seven who were interviewed cited software, including
word processing and spreadsheet applications, as well as presentation software. Two (28.6 percent) of the seven administrators also reported high achieving students and other general school characteristics.

When asked about the specific resources used to develop the school’s technology environment, two (28.6 percent) of the five administrators reported general technology resources, including TVs and overhead projectors. No other response was coded for more than one administrator.

Classroom Vignettes

At School A, one classroom observation was made of a first-grade mathematics class of 25 students. Next, a fifth-grade mathematics class of 23 students was observed. A third observation of a language arts lesson was made in the school’s computer lab, directed toward 23 third-grade students. Of the three observations made at School A, only two involved the use of technology; these two observations are detailed below. In both 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.

First-Grade Mathematics Lesson

<table>
<thead>
<tr>
<th>Class 1</th>
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<tbody>
<tr>
<td>Grade:</td>
<td>1</td>
</tr>
<tr>
<td>Subject:</td>
<td>Mathematics</td>
</tr>
<tr>
<td>Setting:</td>
<td>Classroom</td>
</tr>
<tr>
<td>Teacher Hardware Used:</td>
<td>Overhead projector, computer</td>
</tr>
<tr>
<td>Teacher Software Used:</td>
<td>Web browser, search engine</td>
</tr>
<tr>
<td>Student Hardware Used:</td>
<td>Computer</td>
</tr>
<tr>
<td>Student Software Used:</td>
<td>Web browser, search engine</td>
</tr>
</tbody>
</table>

Before the mathematics lesson observation, the teacher stated that, in accordance with the local and state standards for mathematics, the students would identify and model specific fractional parts of a whole. The teacher would use the overhead projector to model how fractional parts work with the assistance of the overhead projector and mathematics game quizzes on the computer. The overhead would maximize students’ opportunities to observe the information, and an interactive CD-ROM would help students review and reinforce the information in a different format. The teacher planned to assess the students through observation of their work during the hands-on and computer components of the lesson, and by grading their workbook assignment.

During this lesson observation, 25 first-grade students sat at individual desks. One area was designated for computer use with three desktop computers available to students. This classroom
also was equipped with two printers, an overhead projector, video player, and television. A reading area with storybooks was available, and tables were set up for student use. Walls were decorated with student work. During the lesson, the teacher was briefly observed using both a computer and an overhead projector, as well as a Web browser and mathematics software games geared toward the day’s lesson. Students were only observed using computers, with approximately three students per computer. Although computers were described by teachers prior to the observation as being a primary method of teaching and reinforcing the day’s lesson, students spent a relatively short amount of time (approximately less than five minutes) actually using computers. Students also were observed using the same software as the teacher, who modeled software use and assisted students with the navigation of these applications.

The teacher began the first lesson by using an overhead with slides to describe different, but equal, parts of a whole. The teacher asked the students to name the fraction amounts for these examples. The students were then given sheets of paper. The teacher demonstrated how to fold the papers into fractions and how to write fractions. The teacher instructed students to color the paper to signify the appropriate fractions. Following this hands-on activity, two groups of three students each worked at two computers on mathematics quizzes on the district Web page.

After the observation, the teacher indicated that the objective of the lesson was accomplished, but noted that because some students needed more time to adjust to changes in learning strategies (from the overhead to the computer), students should have been given more practice using the computer games. With regard to the methods themselves, the teacher felt certain that the overhead helped them visualize and see the divisions of parts better, and that the computer reinforced their hands-on activity while modeling different applications of the concepts.

### Third-Grade Language Arts Lesson

<table>
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<tr>
<th>Class 2</th>
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<tbody>
<tr>
<td>Grade:</td>
<td>3</td>
</tr>
<tr>
<td>Subject:</td>
<td>Language Arts</td>
</tr>
<tr>
<td>Setting:</td>
<td>Computer lab</td>
</tr>
<tr>
<td>Teacher Hardware Used:</td>
<td>Overhead projector; computer</td>
</tr>
<tr>
<td>Teacher Software Used:</td>
<td>Web browser</td>
</tr>
<tr>
<td>Student Hardware Used:</td>
<td>Computer</td>
</tr>
<tr>
<td>Student Software Used:</td>
<td>Web browser</td>
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</tbody>
</table>

This day’s lesson focused on reading comprehension; the teacher’s specific objective was to assist students in identifying the main idea of a story, as well as the supporting details to facilitate their overall understanding and comprehension of reading material. According to the teacher, this competency is expected to be met by all third graders. Prior to the observation, the teacher planned to use the overhead projector for demonstration of the day’s lesson, computers and Internet access for independent practice in identifying main idea and supporting details, and worksheets to assess comprehension.

The second lesson observed at School A was conducted in the computer laboratory with 23 third-grade students. In the lab, 33 desktop computers and two printers were available for student use.
The computer lab also was equipped with an overhead projector, which the teacher used as a primary method of delivering her lesson to students. In addition to the overhead, the teacher was also briefly observed using a computer and a Web browser. Every student was observed using a computer for a duration of about five minutes, with only one student working at each computer in the lab. Students also used a Web browser to access the Web sites used to practice identifying main ideas and supporting details.

At the beginning of the day’s lesson, the teacher provided an introduction to the “main idea” and “supporting details” of a story. Using an overhead projector, the teacher read aloud the beginning of a story and pointed out the main idea and supporting details. The teacher then asked students to write out the supporting details and main idea of the story on sheets of paper. Students then approached the board and taped their sheets of paper under the appropriate categories labeled “main idea” and “supporting details,” placing them in sequential order. Next, students read a short story and the teacher questioned them about the main idea and supporting details. Finally, the teacher instructed students to use the computers to access a Web site that offers practice in reading comprehension. The teacher handed out ditto sheet quizzes, similar in content and format to a standardized test on the subject, which they used to record their responses to the Web site activity they completed. Students also used a computer program to answer a series of multiple choice questions relating to a passage they read.

After the observation, the teacher stated that the students did well in understanding the main idea, but needed more practice with the supporting details. The teacher attributed their difficulty with understanding supporting details to her choice of worksheet. To reinforce this concept in future lessons, the teacher suggested integrating an activity that asks students to remove sentences from a reading passage that do not contribute to the main idea. The teacher also expressed confidence in the assessments used to evaluate student learning based on the lesson taught, and states that they were effective in directing her future instruction in the area of reading comprehension based on current student progress.

In both lessons, students and teachers generally had a comfortable rapport, and students moved around the rooms freely. Teachers utilized different areas of their classrooms for the varied instructional techniques used during the lessons. Students sat at desks and tables, working in groups of two or three; others utilized the computer areas. During the computer laboratory lesson, students remained at their computers. All teachers were helpful to students and students assisted each other in learning.

Additionally, both lessons assumed a similar structure; teachers primarily used technology to model an activity related to the lesson while students used technology to reinforce and evaluate what they learned and identify areas of deficiency. Each teacher began their lesson orienting the students to the lesson topic and modeling the work students will eventually be asked to do for themselves. Students were then provided the opportunity to model the focus of the lesson for themselves with some guidance from the teacher, using specific artifacts (such as paper and written stories) to facilitate this process. Finally, students were assigned computer and software use to help reinforce and assess the knowledge acquired as a result of the day’s lesson.
References


