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ABSTRACT

The federally funded Magnet Schools Assistance Program was funded to eight magnet schools in the Wake County (North Carolina) Public School System (WCPSS) to reduce minority group isolation and to strengthen academic offerings, by integrating technology into instruction as a key element. In 1993-94 and 1994-95 grant monies were provided to six elementary schools, one middle school, and one high school. This evaluation examined factors related to the goals and objectives of the program. Parent survey data, student achievement data, and enrollment and magnet school application data were used. The grant provided a full- or half-time instructional technology resource teacher for each school. A variety of technology program components were implemented at grant schools. Teacher attitudes toward technology improved in the grant period, and parent attitudes became more positive. There was moderate success in terms of improved racial balance at five of the schools. Baseline data had shown large differences between majority and minority achievement in these schools; the greatest successes in improving achievement were at the elementary level. The two schools with the full-time instructional technology resource teachers had the greatest success in reaching academic goals in both reading and mathematics. The grant program has demonstrated that technology can improve instruction and achievement if well implemented. Six attachments present overall evaluation results, a glossary, and supplemental materials about the program. (Contains 29 tables and 3 references.) (SLD)

Evaluation Report: Magnet Schools Assistance Program 1993-95

WAKE COUNTY PUBLIC SCHOOL SYSTEM

January 1996

Wake County Public School System
Department of Evaluation and Research
E&R Report No. 95.07

EVALUATION REPORT: MAGNET SCHOOLS ASSISTANCE PROGRAM 1993-95

REPORT SUMMARY

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BACKGROUND

The federally-funded Magnet Schools Assistance Program (MSAP) was funded to eight WCPSS magnet schools to accomplish two basic purposes: 1) to reduce minority group isolation, and 2) to strengthen academic offerings. The grant was provided during the 1993-94 and 1994-95 school years to benefit six elementary schools, Poe, Conn, Bugg, Powell, Fuller, and Hunter, plus Ligon Middle School and Enloe High School. The objectives of the grant were to improve academic achievement and to increase majority enrollment in these magnet schools. Integrating technology into instruction was a key method used to accomplish these goals and objectives.

This evaluation examined factors that related to achieving the MSAP goals and objectives. Parent Survey data were used to examine whether parents believed technology use was important in their children's education; enrollment and application data were used to monitor the success of MSAP related to recruiting new students; and achievement data, both for longitudinal cohorts and for MSAP schools overall, were used to measure effectiveness related to improved achievement for individual students and improved academic climates at MSAP schools.

MAJOR FINDINGS

IMPLEMENTATION

The grant provided each MSAP school with a full- or half-time Instructional Technology Resource Teacher (ITRT) to train and support classroom teachers in using computer labs more effectively, use technology within their curriculum areas, and use a variety of technological tools to meet the learning needs of diverse groups of students. The grant also provided funds for equipment, software, and training. The flexibility of the grant allowed each MSAP school to design and implement program components according to its individual needs and goals.

During the second year of implementation, teachers developed far more lessons which used technology, with the greatest increase at the fourth grade. The impact of efforts was not evident until the second year, when teachers and students were beginning to become more knowledgeable and confident in their technology use.

- At elementary schools, fourth grade teachers received the most training and support from ITRTs during the first year of the grant and they developed nearly three times as many lessons during the second year of implementation.

- The number of lessons developed by teachers at MSAP elementary schools increased from 1,061 in 1993-94 to 1,976 in 1994-95, an increase of 86%.
- In 1994-95 teachers at Ligon Middle developed more than seven times the number of lessons developed in 1993-94 (from 36 in 1993-94 to 263 in 1994-95).
- Teachers at Enloe developed a total of 272 lessons during the second year of the MSAP grant, and this was four times the number of lessons developed during the first year of the grant.

Very few lessons incorporated a lecture approach to instruction during either year, and the percentage involving individual projects increased from 17% to 41% at the elementary school level Although most lessons involved an adaptation of an existing lesson to integrate technology during both years of the grant, ***the percentage of lessons that involved creation of a new lesson increased to at least 42% at each level in 1994-95, suggesting that teachers became more comfortable with the process of experimenting with curriculum integration.*** At elementary and high school, the percentage of lessons that teachers rated as effective increased in nearly all of them (from 82% to 96% at elementary, and from 70% to 96% at high school).

TEACHER USE OF AND ATTITUDES TOWARD TECHNOLOGY

The ITRTs surveyed teachers in their schools in fall 1993, spring 1994, and spring 1995 to determine their attitudes toward using technology, levels of experience, and training needs. Fall 1993 survey results indicated that the majority of teachers at all levels believed technology use would enhance education, but they had little experience using technology. ***The general trend was for attitudes and use of technology to improve across the two years of the MSAP grant.***

PARENTS' ATTITUDES TOWARD TECHNOLOGY

One goal of MSAP was, with the use of additional technology, to make the targeted schools more attractive to Wake County parents who have the option of applying to send their children to these magnet schools in order to reduce or prevent minority group isolation. The WCPSS administered an annual survey to all parents in November 1993 and 1994. This evaluation compared responses to technology-related questions for MSAP schools with non-MSAP schools. At all grade levels across years, an increased percentage of parents at MSAP and non-MSAP schools believed that classroom instruction using computers and related technology helped prepare their child for the future.

RACIAL BALANCE WITHIN MSAP SCHOOLS

A primary MSAP goal was to expand and revitalize targeted magnet school programs by eliminating and preventing minority group isolation. The schools targeted by this grant were in danger of becoming racially isolated. The district's racial composition guideline is no more than 45% minority enrollment. All MSAP schools failed to meet this guideline in 1992-93, and Enloe High (50% minority) and Poe Elementary (51% minority) were considered racially isolated. ***Results showed that progress was made for five of eight MSAP schools in improving racial balance, while four of eight met the goal of no more than 45% minority enrollment.***

STUDENT ACHIEVEMENT

Longitudinal Cohort Results

To gauge the long-term impact of MSAP, End-of-Grade (EOG) mathematics and reading achievement data were collected for 4th grade students at MSAP elementary schools and for a team of 6th grade students who received additional services at Ligon Middle School. The progress of these 1993-94 4th and 6th graders was monitored. The evaluation plan was to compare the percents of the majority and minority students scoring at each of levels I - IV on EOG tests in mathematics and reading for 1992-93 (baseline) and 1993-94 (after one year of MSAP) and 1994-95 (after two years of MSAP). ***Baseline data revealed that a large discrepancy existed between majority and minority EOG performance for the longitudinal cohorts at all schools.***

For four of the six elementary schools, the percentages of both minority and majority students who were reading at grade-level proficiency increased significantly after two years of MSAP implementation. For MSAP elementary schools, the longitudinal cohort EOG reading scores showed that:

- ***In 1992-93, the percentages of minority students scoring at levels III and IV on EOG reading ranged from 38% to 61%; after two years of implementation, these percentages ranged from 63% to 81%.***

- ***In 1992-93, the percentages of majority students scoring at levels III and IV on EOG reading ranged from 68% to 92%; after two years of implementation, these percentages ranged from 81% to 100%.***

- ***At Hunter and Poe, the elementary schools with full-time ITRTs, the increases in the percentages of minority students reading at or above grade level were the greatest: 38% to 81% at Poe and 49% to 77% at Hunter.***

EOG reading scores increased more than EOG math scores, which is consistent with the finding that teachers developed far more reading/language arts lessons than math lessons. However, ***three of six MSAP elementary schools (Conn, Hunter, and Poe) achieved the goal of reducing the gap between the percentage of minority and majority students scoring at levels III and IV by at least 8% on the EOG mathematics test.*** The EOG math scores for the longitudinal cohorts showed:

- ***In 1992-93, the percentages of minority students scoring at levels III and IV on EOG math ranged from 38% to 60%; after two years of implementation, these percentages ranged from 48% to 69%.***

- ***In 1992-93, the percentages of majority students scoring at levels III and IV on EOG math ranged from 70% to 92%; after two years of implementation, these percentages ranged from 74% to 98%.***

When asked about reasons for their success, Poe teachers reported that using technology allowed students to become more active learners, setting their own goals, making choices, and planning learning strategies. Students learned to use computers as writing tools and

teachers emphasized writing across the curriculum. Hunter teachers believed high expectations for all of their students were critical, as was adequate access to computers. According to the literature on which the MSAP strategies were based, minority students are more likely to succeed in the kind of learning environments teachers reported using for MSAP lessons than with a traditional lecture approach (Shade, 1982; Stiff, 1990). Specifically, research suggests technology can increase student achievement if implemented so that: students have sufficient time to use the technology, teachers are involved and well trained, technology is integrated with regular classroom instruction, teachers have adequate technological support, and the technology and software match the curriculum and teaching methods (Prohm and Baenen, 1995).

The evaluator identified a comparison group of students (10th and 11th grade minority students at Enloe in 1991-92 who scored above the 80th percentile on any of the 1990-91 End-of-Course tests) to help determine the impact of the MSAP program on minority student participation and success in advanced courses. On the average, MSAP target-group students successfully completed slightly fewer advanced courses compared with the comparison-group students. ***However, MSAP target-group students were somewhat more successful in the advanced courses they completed.*** Therefore, MSAP services appear to have helped minority students who enrolled in advanced courses, but efforts to encourage these students to enroll in more advanced courses were not successful compared with a control group.

Overall School Achievement

MSAP resources may have impacted overall academic climates at MSAP schools; therefore, overall MSAP school EOG achievement data were examined in mathematics and reading and compared with WCPSS scores. The percentage of students scoring at or above grade level (EOG Levels III and IV) was the success criteria used. The evaluation also reported the gap between the percent of majority and minority students at or above Level III.

In comparing the EOG scores for MSAP schools and WCPSS, the following results were observed:

- In 16 of 31 comparisons (52%), progress was made towards the WCPSS average achievement, and in some cases schools exceeded it. ***Positive changes were most evident at Hunter (with all five comparisons being positive)*** followed by Fuller (with three out of five comparisons being positive) and less evident at Bugg (with one of six comparisons being positive).

- ***Hunter Elementary made the largest improvement towards the WCPSS average for 1993–94, by reducing the fourth-grade math achievement gap by 13% and exceeding the WCPSS average by 6%.***

Comparing the EOG math and reading scores at each of grades 3 through 8 for minority and majority students at MSAP schools, results showed that in 12 of 30 comparisons (40%), the goal of reducing by 8% the gap between the WCPSS EOG scores and school scores was achieved.

RECOMMENDATIONS

Teachers in the schools that showed the most success in raising achievement were interviewed and all reported that they would not have developed and delivered lessons without the support of the ITRTs to initially work with them in their classrooms. They then developed the confidence and expertise to use technology as an integral part of lessons. This is supported by the facts that the greatest achievement gains were at the schools with full-time ITRTs, and that the fourth grade teachers, who received the most support from ITRTs, developed the most lessons during the second year. The gains made in reading scores indicate that WCPSS should consider using the successful schools as models for other schools. Teachers in MSAP schools spent a tremendous amount of time developing lessons and finding ways to use technology in the core curriculum. WCPSS should develop a way to share this knowledge and expertise with other schools. Findings also suggest that elementary school teachers may benefit from additional help in developing math lessons which use technology.

At the high school level, additional efforts are needed to encourage minority students with high standardized test scores to enroll in advanced level courses. Enloe staff found that when minority students were identified and invited to enroll in a summer enrichment course to prepare them for advanced mathematics, response was very good. Similar efforts should be made to identify and counsel minority students to enroll in advanced courses and their prerequisites.

Evaluation Report:
Magnet School Assistance Program 1993-95

TABLE OF CONTENTS

PROGRAM DESCRIPTION

BACKGROUND

In 1994-95, the Magnet Schools Assistance Program (MSAP) was in the second and final year of implementation at six elementary, one middle, and one high school: Poe, Conn, Powell, Bugg, Fuller, Hunter, Ligon Middle School, and Enloe High School. The primary goal of MSAP was to reduce or prevent minority group isolation by making the targeted schools more attractive to Wake County parents who have the option of applying to send their children to these magnet schools. The objectives for meeting this goal included raising schools' End-of-Grade (EOG) mathematics and reading scores if below Wake County Public School System (WCPSS) averages, and reducing the gap between majority and minority scores. The strategies for meeting these objectives were to provide increased technology for use in core courses, train teachers to use the technology, and support teachers as they integrated technology into classroom lessons. These strategies were chosen because increased technology use would allow schools to offer more unique programs, and permit teachers to use alternative teaching methods to meet students' diverse needs.

Technology use allows teachers to employ a greater variety of teaching methods than those that have become the norm (e.g., lecturing and worksheet completion), which may better match student learning styles and facilitate learning in all subjects. Educational research provides evidence that non-white students exhibit field-dependent learning styles and are more motivated to succeed in cooperative rather than competitive learning environments (Shade, 1982; Stiff, 1990). The use of technology in the classroom may permit increased use of cooperative learning activities and therefore help reduce the gap between majority and minority students. For example, when technology is used for computing in mathematics classes, the focus of the class moves toward applications, contexts, relationships, problem solving, and decision making– activities which are conducive to cooperative learning efforts. If teachers have to model how to do computations using lecture-style instruction, little or no time is left for cooperative group work (National Council of Teachers of Mathematics, 1989). In addition, all students may benefit from teachers using a greater variety of teaching methods and from learning higher order skills while mastering the use of technological tools.

THE ROLE OF THE ITRT

In year two of MSAP, all participating schools integrated technology through core and elective courses with support from an Instructional Technology Resource Teacher (ITRT). The grant supported full-time ITRTs in two of the elementary schools, Hunter and Poe, and at middle and high school, and part-time ITRTs at the other elementary schools. This grant-funded position allowed an increased level of individualization of services to students. Program implementation in 1993-94 began with a focus primarily on the ITRT purchasing and installing equipment and software, and training staff to use computers and related technology. Initially, ITRTs in many of the schools also worked to overcome problems with facilities relating to availability of electrical outlets, adequate space with proper lighting, and some security issues. They additionally spent time explaining the program and gaining support for MSAP from the staff in their schools. By the second semester of 1993-94, ITRTs were helping teachers use technology to develop lessons and providing demonstration classes using model lessons. ITRTs also helped teachers make better use of computer labs that were already in their schools.

In 1994-95, the ITRT at each school conducted training in a variety of areas; for example, they frequently trained staff and students to use software packages, CD-ROMs, and telecommunications. During the second year of the grant, ITRTs spent more time helping teachers integrate technology into their lesson plans than in the first year, in which they focused more on

training. The ITRTs worked directly with students in classrooms when teachers needed support to successfully implement lessons they developed that used technology.

All ITRTs received training in 1993-94 in the areas of hardware setup, software evaluation and use, telecommunications and use of multimedia workstations. During the second year of MSAP, the amount of training that ITRTs received was reduced from the first year, and they primarily concentrated on implementing the grant strategies in their schools. ITRTs met regularly to discuss key topics and issues relating to grant implementation. A complete list of ITRT training and a schedule of meeting topics can be found in Attachment 4.

PROGRAM COMPONENTS

Each school designed and implemented program components to meet its individual needs. Individual school plans are summarized in the evaluation design for this project (WCPSS Evaluation and Research Report #94.07P). A summary of the components that were implemented at each school during 1994-95 is provided below. A glossary containing brief explanations of frequently used technology terms and software packages is located in Attachment 2.

ELEMENTARY SCHOOLS COMPONENTS

Bugg Elementary

Students in grades 2-5 at Bugg Elementary continued to receive instruction in both a Mathematics Lab (using IBM computers and Jostens software), and a Communications Center (using Macintosh computers, with The Writing Center and KidWorks software) in 1994-95. Students used a variety of software from all curricular areas, including geography (Where in the USA is Carmen San Diego?) and mathematics (Math Blaster Plus). Several computers were installed in a science laboratory, and a greenhouse program which used technology was implemented for grades 1-5. An Ethernet network was installed in the Macintosh lab and students in all grades used this network to communicate with each other. Students in the Academically Gifted (AG) program in grades 3-5 learned to use Nandoland, a telecommunications provider, so that they could access the Internet.

Additionally, 36 highly able 3rd, 4th, and 5th grade students who were not state-identified as AG received Higher Order Thinking Skills (HOTS) instruction, and 5th grade students learned to use telecommunications software. Students in all grades received science instruction via outdoor weather stations and Windows-on-Science software. Students in grades K-5 participated in a Talents Unlimited program, which involved integrating the HOTS program into the curriculum using a team teaching method. Students in grades K-2 also used The Graph Club software, a program designed to get students to read, interpret, and create graphs.

Poe Elementary

The MSAP program at Poe Elementary in 1994-95 continued to focus on improving student achievement by integrating technology into the core curriculum of regular classrooms. To achieve this goal, students in grades K-5 had access to Macintosh computers in a lab and in classrooms for communicating (word processing and multimedia presentations) and manipulating information (databases and spreadsheets). Teachers used a variety of software with students in all grades. Within mathematics instruction, for example, students in grades 3-5 used the drawing environment of ClarisWorks to create and manipulate geometric figures and kindergarten students used The Graph Club software to create and manipulate graphs. Additionally, students at all grade levels used Math Keys software as math manipulatives to see the correlation between concrete objects and abstract mathematical representation. Writing Center software for language arts instruction was used in all classrooms, K-5.

An elective course titled Search and Research/Scandinavia was offered to 4th and 5th grade students. In this course, students conducted multimedia projects that resulted from intensive study of Scandinavian countries. Students used the computer extensively as a research tool and used MacGlobe software and resources on the Internet to obtain information on their projects. A Lego/Logo course was offered to students at grades 3-5 which facilitated active learning through guided discovery and encouraged higher order thinking skills and problem solving in a variety of content areas. The Logo programming language allows students to "program" by telling a graphic turtle how many steps to take in each direction in order to reach a goal. For example, various routes may use different amounts of "energy," so students may plan, experiment, and use arithmetic and problem-solving skills to help the turtle achieve goals. Lego/Logo incorporates figures that students build from Lego bricks in the problem-solving scenarios.

Conn Elementary

In 1994-95, MSAP implementation at Conn continued to involve the use of Macintosh computers, and a Macintosh lab was established for use by all students. Students in all grades learned word-processing skills, used mathematics and writing software, and were taught reading using CD-ROM technology. Students in grades K-2 learned creative writing and drawing through the Kid Works software package, and used laser disc science software at a multimedia workstation. Students in grades 3-5 improved their thinking and writing skills by using laser-disc technology for social studies, geography and science; also, students worked to publish a school newspaper using The Writing Center software, which emphasized writing skills, such as developing paragraphs and improving vocabulary. Some students at these grade levels also participated in a telecommunications elective, which emphasized improving writing skills, organizing, thinking, and communicating. Students in the elective course also had access to the Internet via Nandoland and to Prodigy, an electronic bulletin board. An elective course on using multimedia/interactive video technology was offered to students in grades 3-5. The ITRT co-taught these two elective courses in order to provide technical support for the teachers involved, and provided numerous "mini-lessons" on using technology to teachers throughout the school year.

Fuller Elementary

Fuller Elementary continued to provide both a small computer lab as a Writing and Publishing Center, and a large lab to house computers and software designed to give students extra help with reading, writing, and mathematics. ClarisWorks was used for students in grades 3-5 for word processing, drawing, and painting. Students in grades K-2 used Kid Works, a word-processing program. Students at all grade levels used CD-ROM technology, including CD-ROM interactive storybooks, in the Writing and Publishing Center. Chapter 1 students used CD-ROM storybooks and wrote about the stories they read on the computer, which resulted in large increases in students' reading scores. Parent volunteers worked in the Writing and Publishing Center during school hours, and all volunteers received computer training. Several technology elective classes were offered, including telecommunications and video production courses, as well as a computer art course which was co-taught by the art and computer teachers. Fuller also improved its arts program by continuing to offer student Arts Clubs in the areas of art, music, dance, drama, service and technology; this resulted in an increased number of students enrolled in arts production electives. A Research Center was developed which housed computers, CD-ROM research materials and telecommunications capabilities. The ITRT worked extensively in 4th and 5th grade classrooms to help integrate technology into the curriculum. Students at all grade levels used computers in their classroom for writing, cooperative group projects, and individual research projects.

Hunter Elementary

Hunter Elementary continued to operate a fully integrated networked Macintosh learning lab with state-of-the-art technology to provide all students with unique, interactive activities designed to

meet individual needs in reading, mathematics, science, and social studies. A file server was added to the lab which allowed increased software use by students.

After the first year, the ITRT discovered that in order to integrate technology use into the core curriculum, as opposed to delivering stand-alone technology lessons (such as using drill-and-practice or tutorial software), core teachers required consistent availability of the lab. To solve this problem, during the second year of MSAP, computers were placed in the kindergarten and first grade classrooms and the students did not use the lab. A regular schedule was prepared for the grade 2 - 5 core subject teachers to use the lab. These teachers then knew they had regular consistent access to the lab and began to integrate technology into the core curriculum.

Once the core teachers were guaranteed access to the lab according to a regular schedule, they developed lessons in which technology was used to support what they were teaching. They used technology to focus on the basics of the curriculum, as opposed to developing enrichment lessons. Students used technology primarily as tools with lessons that focused on basic concepts from the core curriculum. For example, teachers developed lessons in which students learned to write about topics they were studying using word processors on computers. Students learned to edit what they wrote, organize their ideas better, add more descriptive vocabulary to papers, correct grammar and spelling, and refine their writing styles. Teachers reported that extensive editing was much more reasonable using computers than with pencil and paper. Teachers gave students more individual attention and found students were more motivated, expressed more pride in their work, and were more focused on the tasks.

A mini-lab was created in the Media Center which housed Macintosh computers and allowed students to conduct independent research using CD-ROMs. Several new electives were offered, including Hypermedia and Computer Writing. The Hypermedia elective involved students working on presentations and projects in small groups using ClarisWorks (Slide Show) and HyperStudio software. The Computer Writing elective allowed low-achieving students to work on Macintosh computers and receive individualized assistance with their writing skills. The ITRT provided Macintosh training throughout the school year on both a formal and informal basis to teachers and teacher assistants.

Powell Elementary

In 1994-95 students in all grades K-5 used technology to facilitate their learning in a variety of subjects. Students in grades K-2 were offered an Introduction to Computers elective, used Kid Works, Playroom, and MECC software, along with CD-ROMs for reading and mathematics, and teachers were trained in curriculum integration with technology. Computer Writing electives were also offered to students in K-5, and a Telecommunications elective was offered to students in grades 3-5. Teachers at all grade levels received training on how to complete their Professional Growth Plans on the computer, and learned to use spreadsheets and databases for record-keeping functions. Students in grades 3-5 received intensive training in keyboarding skills using the PAWS software program. These students then received writing lessons using a word processor. Teachers at Powell also used Windows on Science, a science software program designed to enhance science learning. An art elective, "Drawing the Line," which integrated art and math curriculum with computer graphics, was also offered, and student work was displayed at the school system's central office. An elective entitled "Sight, Sound and Action" was offered in which students used Persuasion and ClarisWorks software and a digital video camera to create a videotaped morning news production.

A major emphasis at Powell for students in grades 1-5 was the use of Lego/Logo programming which was offered through elective courses. These elective courses allowed students to actively participate in learning while exploring and creating, using the computer and both the LogoWriter programming language and the lego Dacta Control Lab. Students worked independently with a set of LogoWriter commands and were encouraged to problem solve as they developed designs to discover how the commands worked and how to apply the commands to create original designs.

Students then worked cooperatively to build models using Lego Dacta bricks, lights, and elements. Students took time regularly to summarize in their computer journals what they had learned. The basic philosophy of the Lego/Logo electives was that active learning through guided discovery and the use of computer programming encourages higher order thinking skills and problem solving in a variety of content areas.

MIDDLE AND HIGH SCHOOL COMPONENTS

Ligon Middle School

In 1994-95 Ligon Middle School continued operating a Humanities Lab which housed Macintosh computers and a variety of software. A Math/Science Lab was created to facilitate computer use in these subjects. Ligon also used technology to integrate the arts and the classroom instruction of language arts, social studies, mathematics, and science. Approximately 900 students at Ligon were trained to use ClarisWorks, HyperStudio, and MacGlobe software. As a result of the HyperStudio training:

- 6th-grade students were able to use the software to complete a language arts project on reviewing and critiquing books;
- 7th-grade students used the software to complete a project on the tribes in Africa using a multimedia approach and completed multimedia stacks on Battle of the Books recommendations; and
- 8th-grade students used the software to complete multimedia stacks on the Civil War. The multimedia stacks developed were then made available to the entire school population.

The ITRT offered a variety of training to teachers throughout the school year to teach them how to integrate technology with existing curriculum; for example, a workshop was offered on cooperative learning using the Macintosh computer. A new elective was offered which taught word-processing, databases, spreadsheets, and telecommunications technology to students. The ITRT also met with teams and individual teachers to discuss technology integration. Teachers developed lesson plans that were tied to specific curricular goals which incorporated technology into the curriculum. Telecommunications projects were used extensively during 1994-95. For example, a 6th grade team of students became electronic pen-pals with a class of Russian students from Moscow, and several 7th grade students telecommunicated with a student in South Africa and subsequently shared information with their classmates. A telecommunications workshop was offered to all teachers, and all received an account on Nando (a local Internet provider).

A team of students who were targeted to receive additional services in 1993-94 continued to receive additional services as 7th graders in 1994-95. Teachers on these 7th grade teams planned interdisciplinary units, used the computers for writing, and helped children develop multimedia projects.

Enloe High School

Many teachers at Enloe participated in technology training during the summer of 1994 and learned to use a variety of software packages and to integrate the software into subject areas. During the school year, math teachers attended training to learn how to use new math software programs in the math lab, science teachers received training in science probe ware, and foreign language teachers were trained to use a variety of software programs. Other training included Hyperstudio, Nandoland telecommunications training, how to use a scanner, quicktake camera, digitize pictures, and LCD panels. Enloe continued to offer a project-oriented pre-engineering program. For example, students completed a project using a materials-testing system with a controlling computer

to design a solar vehicle. Students also designed a computer-controlled milling machine using the Computer Assisted Drawing (CAD) program, and designed a city using Sim City software.

Enloe staff continued to focus efforts on targeted Black students in 1994-95. Teachers of target-group students in these classes were encouraged to use the MSAP technology labs as frequently as possible, and the Enloe Instructional Technology Resource Teacher (ITRT) worked with these teachers to design lessons that integrated MSAP technology with the curriculum. Efforts were focused on preparing targeted students to enroll in advanced courses and succeed, once enrolled. All students in the targeted classes benefited from MSAP services.

EVALUATION DESIGN AND METHODOLOGY

An independent consultant evaluated the Magnet Schools Assistance Program (MSAP) in 1994-95, with coordination and technical assistance from the WCPSS Department of Evaluation and Research. The evaluator focused on the goals and objectives of the MSAP program: (1) the elimination and prevention of minority group isolation; (2) reduced achievement gaps between majority and minority students; and (3) increased achievement for all students.

The strategies for accomplishing these goals were to train teachers to use technology in core courses, provide technology expertise to support teachers, and provide the appropriate technology. The evaluator collected and analyzed data related to these goals, and summarized implementation data. The implementation data included: a teacher survey which addressed teachers' use of and attitudes towards technology before MSAP and after the first and second years of MSAP, quarterly logs from ITRTs which summarized the extent of program implementation at each site, and data on actual use of MSAP resources by classroom teachers at their schools.

General questions the evaluation addressed were:

- To what extent was MSAP implemented in each school?
- How did teachers' use of and attitudes towards technology change across the two years of the program?
- What were parents' attitudes about technology use in schools during the first and second years of the program?
- Did MSAP affect the racial balance within schools?
- What impact did MSAP have on academic performance and achievement for the grant schools and for a cohort of students followed over time?

DATA SOURCES

IMPLEMENTATION LOGS AND TECHNOLOGY USE DATA

The ITRTs kept logs and reported each quarter to describe program implementation in their schools. The evaluators used data from these logs to describe the implementation process in each MSAP school. Program staff visited each school and reported program implementation they observed. Data were also collected regarding core-subject teachers' technology use. These data provided an indication of how teachers used MSAP resources, whether they considered the lessons successful, and what kind of technical support and training they required.

TEACHER TECHNOLOGY USE SURVEY

All teachers were surveyed in MSAP schools in fall 1993 (just before program implementation), spring 1994 (following the first year of the program) and spring 1995 (following two years of the program) to determine classroom technology use, personal technology use, and attitudes about using technology. Results were analyzed separately for MSAP elementary schools as a group, Ligon Middle School, and Enloe High School. The return rates for the pre-survey were 86% for elementary schools, 84% for Ligon, and 86% for Enloe; return rates for the year 1 post-survey were 80% for elementary, 84% for Ligon, and 86% for Enloe; and return rates for the year 2 post-survey were 84% for elementary, 86% for Ligon, and 70% for Enloe.

PARENT SURVEY

The WCPSS Evaluation & Research Department administered a survey to all parents in November in 1993 and 1994. Return rates for the Parent Survey in 1993-94 were 60% for elementary, 48% middle, and 30% high school; in 1994-95 they were 59% for elementary, 49% for middle, and 31% for high. Several survey questions dealt with the role of technology in education. The evaluation compared answers to technology-related questions for MSAP schools with non-MSAP schools for elementary, middle, and high school levels. The 1993 Parent Survey results served as baseline data, and were compared to results from the 1994 Parent Survey for this evaluation report.

RACIAL BALANCE

The magnet program in WCPSS is part of the district's effort to maintain racial balance in its schools. Many programs that once were unique to the magnet schools have been replicated in other schools, diminishing their ability to attract majority students. The schools targeted by this grant were in danger of becoming racially isolated. Poe Elementary was already considered racially isolated in 1992-93, with 51% of the student body minority. The other schools had slightly under 50% minority enrollment. The evaluation monitored progress of all MSAP schools toward the districts' racial composition guideline of no more than 45% minority enrollment.

STUDENT ACHIEVEMENT

End-of-Grade (EOG) achievement data were collected for all MSAP schools in order to determine if school achievement improved from 1992-93 to 1994-95. EOG tests are given annually in the spring, and are designed to measure student achievement of the knowledge and skills which comprise the North Carolina Standard Course of Study. One method of scoring these tests involves categorizing students into levels of proficiency according to grade level expectations. Levels of proficiency are described below:

LEVEL I: Students performing at this level do not have sufficient mastery of knowledge and skills in this subject area to be successful at the next grade level.

LEVEL II: Students performing at this level demonstrate inconsistent mastery of knowledge and skills in this subject area and are minimally prepared to be successful at the next grade level.

LEVEL III: Students performing at this level consistently demonstrate mastery of grade level subject matter and are well prepared for the next grade level.

LEVEL IV: Students performing at this level consistently perform in a superior manner clearly beyond that required to be proficient at grade level work.

EOG achievement was generally monitored in terms of the percentages of students at MSAP schools scoring at Levels III or IV (at or above grade level) to determine overall progress and whether program objectives were met.

Longitudinal Cohorts

Elementary Schools The evaluation monitored from 1992-93 until 1994-95 the progress of the 1993-94 4th graders at MSAP elementary schools and compared the percents of the majority and minority students scoring at Levels III and IV on End-of-Grade (EOG) tests in mathematics and reading. The 3rd grade 1992-93 mathematics and reading EOG scores for this cohort served as baseline data, and these students' baseline scores are compared in this report with their 1993-94 scores (following year 1 of program implementation) and 1994-95 scores (following year 2 of program implementation) to track progress toward the goal of reducing by 8% the gap between the percentage of majority and minority students at or above Level III on EOG tests in mathematics and

reading. Students were not included in analyses if they did not have test scores for all years of interest.

Middle School At Ligon Middle School, one 6th grade team of teachers and students was targeted for direct services during 1993-94, and these students continued to receive services on different teams in 1994-95. The evaluation tracked from 1992-93 until 1994-95 the achievement of this cohort of 6th graders and compared the percents of the majority and minority students scoring at each of levels I - IV on EOG tests in mathematics and reading. The 5th grade 1992-93 Mathematics and Reading EOG scores for this cohort served as baseline data. The evaluation compares these students' baseline scores with their 1993-94 and 1994-95 scores to track progress toward the goal of reducing by 8% the gap between the percentage of majority and minority students at or above Level III as measured by the EOG reading and mathematics tests.

High School Enloe planned to increase the number of minority students who enrolled in and successfully completed advanced courses. The ITRT and administrative staff identified 1993-94 10th and 11th grade minority students who scored above the 80th percentile on any of the 1992-93 End-of-Course tests, or who were recommended by classroom teachers as having the potential to excel in advanced courses. Many of the targeted students had not completed prerequisite courses to advanced classes or had previously only enrolled in courses that did not prepare them for advanced classes. This targeted group of students was counseled to enroll in advanced courses, and teachers of average classes in which these students were enrolled in 1993-94 and 1994-95 were encouraged to frequently use the Communications and Math labs so that these students would have access to technology. Some of these students also participated in a summer mathematics enrichment class to prepare them to successfully take advanced mathematics courses in 1994-95.

The evaluator identified a comparison group of 1991-92 10th and 11th grade minority students at Enloe who scored above the 80th percentile on any of the 1990-91 End-of-Course tests. The evaluation compared for the MSAP-targeted and comparison groups, the average number of advanced English, social studies, mathematics, and science courses successfully completed with a C or better. The 1993-94 school year data served as baseline information, and the evaluation monitored progress toward the goal of an 8% greater increase in 1994-95 in the average number of advanced courses completed with a C or better as compared with the control group.

Overall School Achievement

All students in MSAP schools benefited from MSAP resources, and the schools' teaching and learning climates may have been impacted. School achievement data may be affected both through the scores for students served by MSAP resources and achievement levels of newly enrolled students. The resulting school achievement data is a factor in school climate that influences whether parents elect to enroll their children in these schools. The evaluation examines the 1993-94 and 1994-95 EOG mathematics and reading scores for the MSAP elementary and middle schools, compared with baseline scores for these schools in 1992-93 and WCPSS scores over the same period. Schools with less than the district percentages of students at or above Level III in reading or mathematics were monitored for progress toward the goal of an 8% reduction in this difference. The evaluation also reports the gap between the percent of majority and minority students at or above Level III in mathematics and reading for the MSAP schools, as this also affects perceptions regarding school climate.

FINDINGS

CLASSROOM TEACHERS' TECHNOLOGY USE

Data were collected from classroom teachers regarding program implementation. Classroom teachers completed Technology Use Data Sheets when they used MSAP resources (see Attachment 5). These data sheets were modified slightly in 1994-95 based on ITRT input in order to collect additional data, and were made scannable for ease of scoring. On the Technology Use Data Sheets, teachers described lessons in which they used technology, rated the difficulty of implementing the lessons, and rated the lessons' effectiveness. This information provided a thorough description of how the MSAP grant was operationalized by teachers at each school to serve students in core courses.

These data must be considered conservative estimates of the amount of technology use by teachers, as ITRTs reported that many teachers failed to complete data sheets consistently. The data are summarized below for elementary, middle and high schools.

ELEMENTARY SCHOOLS

During the first year of MSAP, ITRTs primarily focused on installing equipment and training teachers to use technology, and in the second year, the focus shifted to developing lessons to integrate technology into the curriculum. ***The number of lessons developed by teachers at MSAP elementary schools increased from 1,061 in 1993-94 to 1,976 in 1994-95, an increase of 86%.*** The percentage of lessons that were used with more than one group of students also rose substantially from 21% to 46%. ***The number of lessons reported in 1994-95 ranged from 627 at Hunter Elementary, to 163 at Powell Elementary.*** Below are data which describe the specific aspects of the lessons developed by teachers in 1993-94 and 1994-95.

Grade Level and Curriculum Areas

As shown in Figures 1 and 2, MSAP lessons were most frequently developed for students in the upper grade levels in both 1993-94 and 1994-95, and smaller increases in lessons developed were seen for kindergarten and grade 2. ***The largest increase occurred at grade 4, where more than three times as many lessons were developed during the second year of MSAP as compared with the first year.***

Figure 1. Number of MSAP Lessons Developed by Elementary School Teachers, by Grade Level, 1993-94 and 1994-95

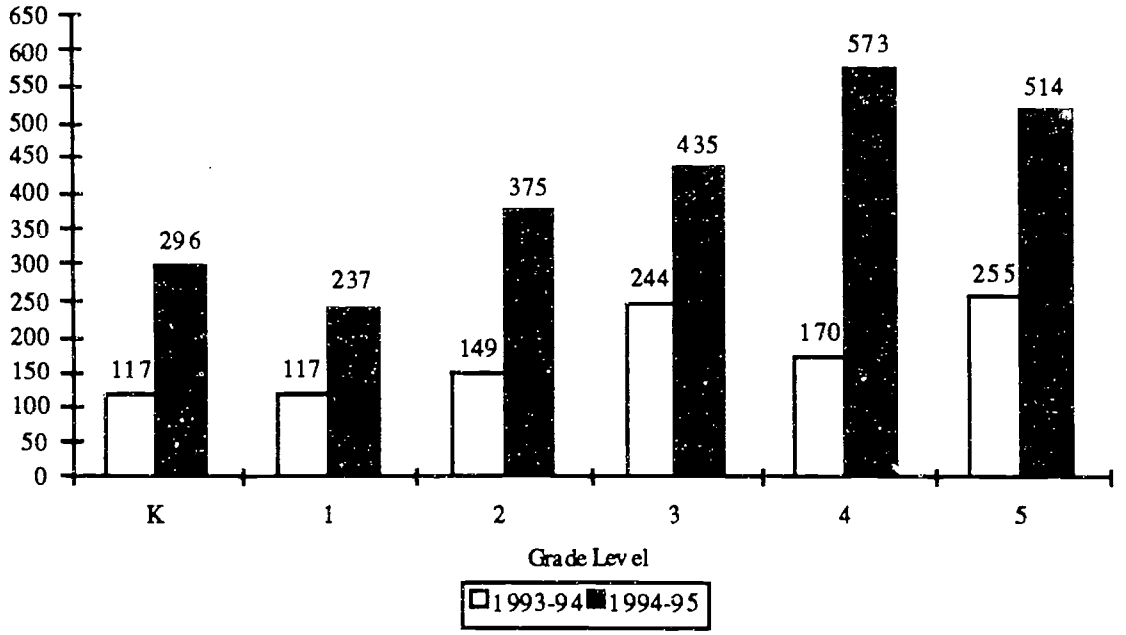
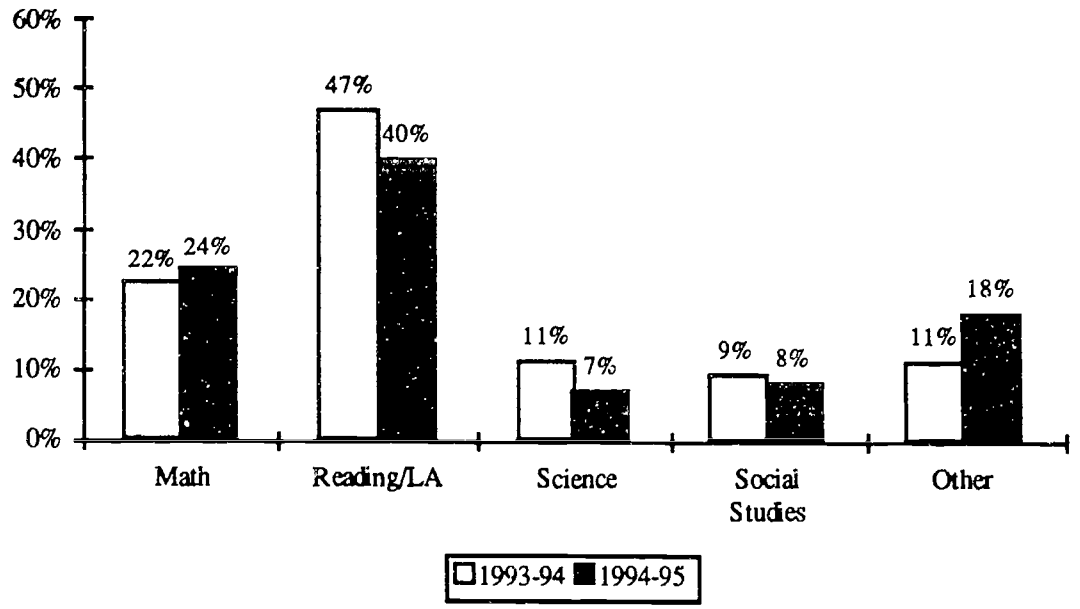


Figure 2. Percentage of MSAP Lessons Developed by Elementary School Teachers, by Curriculum Area, 1993-94 and 1994-95



As Figure 2 illustrates, across the core subject areas (reading, math, science, and social studies), the distribution of lessons remained fairly similar in 1993-94 and 1994-95. The percentage of art and music lessons was less than one percent across both years, so this data is not included in Figure 2. ***The largest percentage of lessons were developed in reading/language arts, with substantially fewer lessons developed in science and social studies.*** The "Other" category consisted of lessons designed to teach students to use the technology and interdisciplinary lessons.

Lesson Context

Across both years of the MSAP grant, the majority of lessons were used with class sizes of more than 20 students. Most of these lessons were conducted with heterogeneous or average groups of students, followed by gifted/advanced and remedial students in both 1993-94 and 1994-95. Slightly more than half of the lessons were intended to supplement or enrich the curriculum rather than simply cover the regular curriculum during both years of the grant. Very few lessons incorporated a lecture approach to instruction during either year, while the percentage of lessons involving cooperative groups rose from 15% to 22% and the percentage involving individual projects increased from 17% to 41%. Although most lessons involved an adaptation of an existing lesson to integrate technology during both years of the grant, ***the percentage of lessons that involved creation of a new lesson increased from 26% in 1993-94 to 42% in 1994-95***, suggesting that teachers became more comfortable with the process of experimenting with curriculum integration.

MSAP Resources Used

Figure 3 shows the percentages of MSAP teacher-developed lessons that used each type of resource in 1993-94 and 1994-95.

- Within the computer hardware category, teachers reported using the Macintosh computer most frequently at MSAP elementary schools during both years of the grant, and the percentage increased from 1993-94 to 1994-95, while the percentage of "other" computers used declined. Although use of other hardware increased slightly across some categories (e.g., modems, CD-ROMs, multimedia, and video), teachers were not significantly using hardware equipment, other than computers and printers.

- Within the software category, word-processing and educational software were most frequently used during both years of the grant, and very few teachers used spreadsheets, telecommunications, or databases either year. A majority of lessons involved use of some type of educational software, and the percentage increased significantly from 1993-94 to 1994-95. The most frequently used type of educational software involved drill, problem solving, games, and "other" which ITRTs indicated often referred to Kid Works, a word- processing program for elementary students. Examples of educational software include TurboMath, Sim City, and Reader Rabbit.

Figure 3. Percentage of Lessons That Used Each MSAP Resource at Elementary Schools, 1993-94 and 1994-95*

	1993-94	1994-95
Computer Hardware		
Macintosh	79%	87%
IBM	1%	<1%
Other	19%	9%
Other Hardware		
Laser disc	5%	2%
Scanner	0%	<1%
Modem	2%	7%
Printer	75%	44%
Fax	0%	<1%
CD-ROM	11%	15%
LCD Panel	5%	8%
Multimedia Station	1%	5%
Lego/Logo	N/A	<1%
Probeware	N/A	<1%
Video Production Equipment	1%	3%
Software		
Word-processing	40%	44%
Spreadsheet	1%	1%
Educational Software (total)	58%	78%
Ed. Software: Drill	N/A	33%
Ed. Software: Problem Solving	N/A	22%
Ed. Software: Tutorial	N/A	12%
Ed. Software: Simulation	N/A	5%
Ed. Software: Games	N/A	21%
Ed. Software: Other	N/A	27%
Telecommunications	1%	1%
Database	N/A	3%

*Additional data were collected during 1994-95, and therefore some data categories are marked N/A for 1993-94.

Difficulty and Effectiveness of Lessons

Almost all teachers at elementary schools reported that the lessons were not difficult to implement in either 1993-94 or 1994-95. Teachers were very positive during both years of the grant about the effectiveness of their lessons, with 82% and 97% reporting that the lessons were effective in the first and second years, respectively. Some insights that classroom teachers at elementary schools wished to share with others regarding the difficulty and/or effectiveness of the lessons they developed were:

- When instructing students to use ClarisWorks to write paragraphs/articles, one teacher stated: "[I had] no problems other than it will require practice time for children to use the program with full understanding. Students began composing paragraphs based on a story previously read. They were very excited about printing their own writing."

- "My biggest insight was the fascination children had with Encarta. They would search, read, and look for things for hours. No child in my class would put that much effort and interest into searching through library encyclopedias."

- One teacher had students listen and watch a CD ROM of "The Tortoise and the Hare" in order to be able to interpret the moral of a fable and apply it to a realistic situation. The teacher commented: "The children loved the story. They enjoyed participating in the story and wanted to try everything just to see what it would do. Even with all the activities they were able to get the moral of the story. It was a fun experience. [One problem was] not enough time to do everything."

- When students used a laser disc program on exploring dinosaurs in order to learn the three theories of extinction, one teacher stated: "This lesson was fantastic because the children used the program to act out the "theories" (i.e., move the snow to cover the Earth to show the volcano theory of dinosaur extinction). The students were extremely successful at learning these theories because they actively participated in "doing" or acting.

MIDDLE SCHOOL

In 1994-95 teachers at Ligon Middle developed more than seven times the number of lessons developed in 1993-94 (from 36 in 1993-94 to 263 in 1994-95). The percentage of lessons that were used with more than one group of students also increased dramatically from 17% to 86%. Below are data which describe the specific aspects of the lessons developed by teachers in 1993-94 and 1994-95.

Grade Level and Curriculum Areas

As shown in Figures 4 and 5, the majority of lessons were used for 6th graders in 1993-94, whereas the number of lessons developed in 1994-95 were fairly evenly distributed across all grade levels. This is in part likely due to the fact that during the first year a 6th grade team of students was targeted to receive additional services. It is important to note that numbers of lessons added up to more than 263 in 1994-95 because some teachers indicated that they taught lessons to multiple grade levels (teachers were not given the option of selecting multiple grade levels in 1993-94).

Figure 4. Number of MSAP Lessons Developed by Middle School Teachers, by Grade Level, for 1993-94 and 1994-95

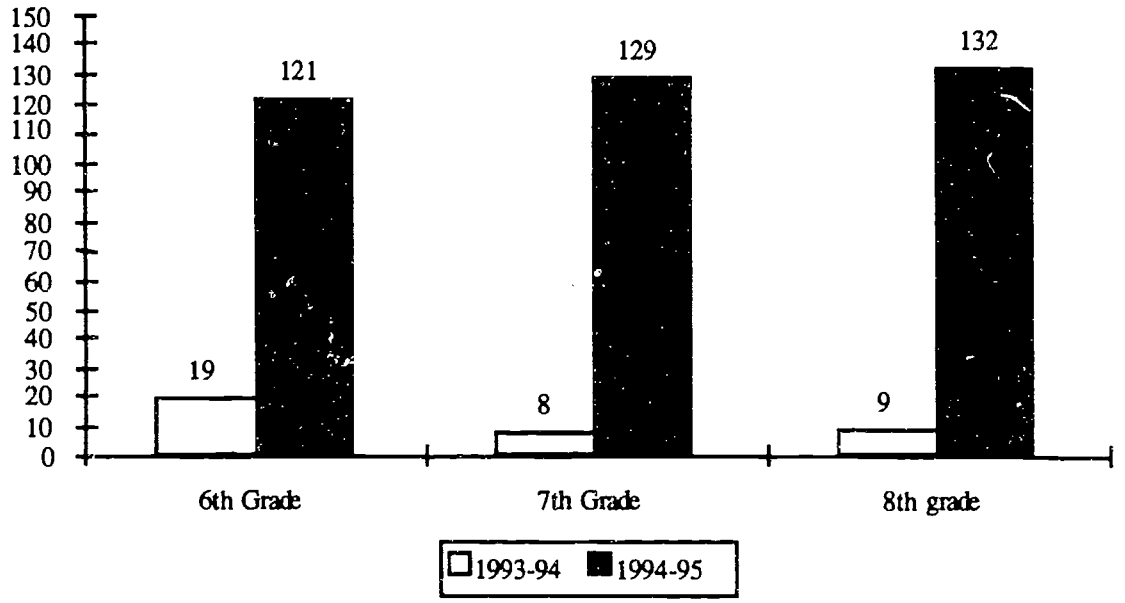


Figure 5. Percentage of MSAP Lessons Developed by Middle School Teachers, by Curriculum Area, 1993-94 and 1994-95

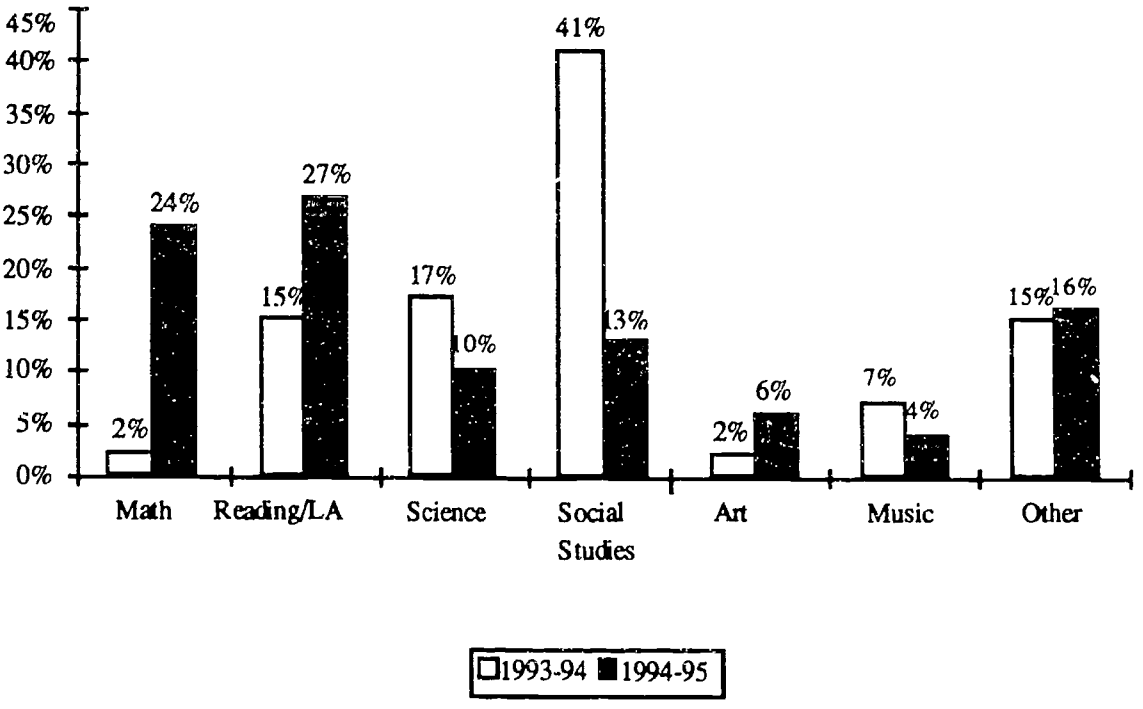


Figure 5 illustrates that the majority of lessons were developed in core subject areas in both 1993-94 and 1994-95. ***The percentage of lessons developed in math and reading/language arts rose substantially, while far fewer lessons were developed in social studies, and slightly fewer were developed in science.*** The "Other" category consisted of lessons designed to teach students to use the technology and interdisciplinary lessons.

Lesson Context

During the first year of the MSAP grant, most of the lessons (63%) were developed with class sizes of fewer than 20 students, but in the second year most (57%) were developed for classes of more than 20 students. A majority of these lessons were conducted with heterogeneous or average groups of students, followed by gifted/advanced and remedial students in both 1993-94 and 1994-95. Slightly more than half of the lessons were intended to supplement or enrich the curriculum rather than simply cover the regular curriculum during the second year of the grant, while these percentages were equal in 1993-94. ***Very few lessons incorporated a lecture approach to instruction during either year, while the percentage of lessons involving cooperative groups remained approximately the same (15%) and the percentage involving individual projects increased from 15% to 26%.*** Although a majority of the lessons involved an adaptation of an existing lesson to integrate technology during both years of the grant, the percentage of lessons that involved creation of a new lesson increased somewhat from 48% in 1993-94 to 57% in 1994-95, suggesting that teachers became more comfortable with the process of experimenting with curriculum integration.

MSAP Resources Used

Figure 6 provides information on the types of MSAP resources which were used by Ligon teachers during 1993-94 and 1994-95.

Figure 6. Percentage of Lessons That Used Each MSAP Resource at Ligon Middle School, 1993-94 and 1994-95*

	1993-94	1994-95
Computer Hardware		
Macintosh	100%	79%
IBM	0%	6%
Other	0%	10%
Other Hardware		
Laser disc	26%	5%
Scanner	17%	3%
Modem	0%	3%
Printer	35%	28%
Fax	0%	0%
CD-ROM	5%	6%
LCD Panel	9%	5%
Multimedia Station	4%	9%
Lego/Logo	N/A	0%
Probeware	N/A	2%
Video Production Equipment	4%	14%
Software		
Word-processing	33%	30%
Spreadsheet	8%	3%
Educational Software (total)	59%	73%
Ed. Software: Drill	N/A	21%
Ed. Software: Problem Solving	N/A	24%
Ed. Software: Tutorial	N/A	14%
Ed. Software: Simulation	N/A	10%
Ed. Software: Games	N/A	17%
Ed. Software: Other	N/A	27%
Telecommunications	0%	1%
Database	N/A	8%

*Additional data were collected during 1994-95, and therefore some data categories are marked N/A for 1993-94.

Teachers reported using the Macintosh computer most frequently at Ligon Middle during both years of the grant, although use of IBM or "other" computers increased slightly during the second year due to the installation of these computers in some classrooms. The most commonly used among other types of hardware were printers, with a decrease in use the second year. Laser discs were used more in 1993-94 than in 1994-95, with video production equipment showing the opposite pattern.

Approximately one-third of the lessons involved use of word- processing software during both years of the grant, and very few teachers used spreadsheets either year. A majority of lessons involved use of some type of educational software, and the percentage increased significantly from 1993-94 to 1994-95. Examples of educational software used include Maps and Navigation (designed to teach map reading skills), HyperStudio (an authoring tool that allowed students to create a multimedia presentation on the fall of Troy), and MacGlobe (used to teach Russian geography skills to students).

Difficulty and Effectiveness of Lessons

A vast majority of teachers at Ligon reported that the lessons they used were easy to implement during both 1993-94 (79%) and 1994-95 (71%). Teachers were overwhelmingly positive about the effectiveness of their lessons both years, with at least 95% reporting that the lessons were effective. Some insights that classroom teachers at Ligon wished to share with others regarding the difficulty and/or effectiveness of the lessons they developed were:

- Regarding students using HyperCard and scanning software on a Macintosh to create stacks relating to literature: "This was very good for students learning to organize things sequentially. I enjoyed learning right along with the students. Students could be as simple or as detailed as they wanted. Students got so 'into it' that it took longer to complete than anticipated."

- Regarding students using HyperStudio to create a presentation on Book II of The Aenead for a Latin class which will be used to introduce the material to another Latin class: "This motivated a very negative, non-participatory group of students!"

- Regarding use of a spreadsheet to teach graphing in a math class: "The spreadsheet made changing graphs with the same data very easy and quick for students (e.g., interchanging line, bar, and circle graphs using the same data)."

HIGH SCHOOL

Teachers at Enloe developed a total of 272 lessons during the second year of the MSAP grant, and this was four times the number of lessons developed during the first year of the grant. The percentage of lessons that were used with more than one group of students also increased substantially from 26% to 73%.

Grade Level and Curriculum Areas

As shown in Figure 7, the number of lessons used for all grade levels increased substantially, particularly for 11th and 12th graders. It is important to note that numbers of lessons added up to more than 263 in 1994-95 because some teachers indicated that they taught lessons to multiple grade levels (teachers were not given the option of selecting multiple grade levels in 1993-94) the second year of the grant; however, there was a slight increase in math and a slight decrease in reading/language arts. There were no lessons during either year which involved music, so this The distribution of lessons by subject area (see Figure 8) did not change much from the first to category is not included.

Figure 7. Number of MSAP Lessons Developed by High School Teachers, by Grade Level, for 1993-94 and 1994-95

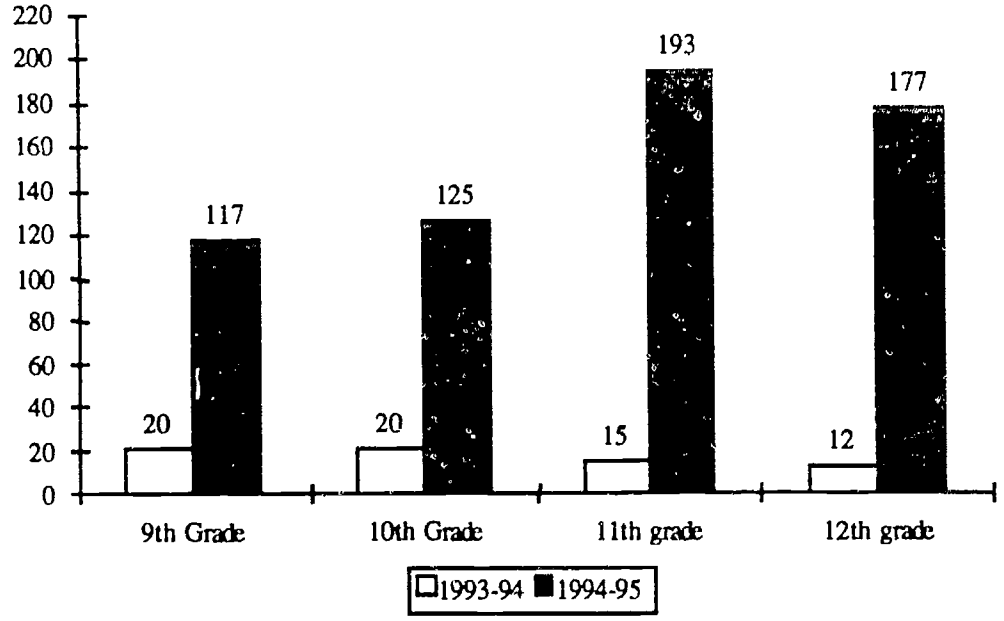
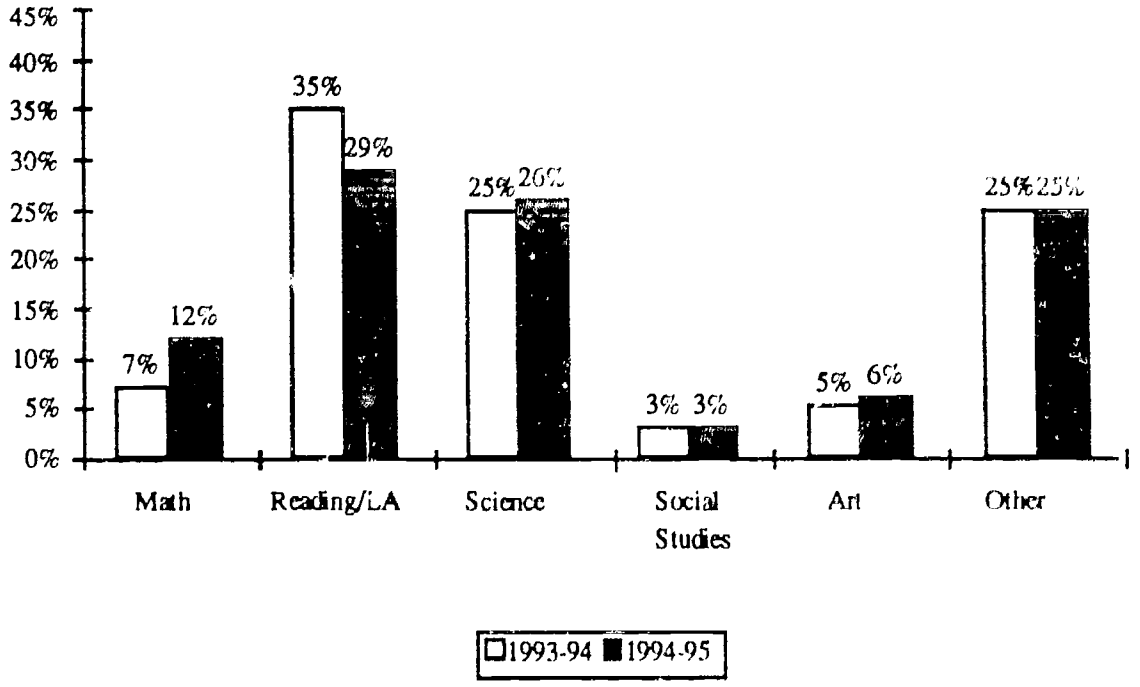


Figure 8. Percentage of MSAP Lessons Developed by High School Teachers, by Curriculum Area, 1993-94 and 1994-95



Lesson Context

During the second year, high school teachers were more comfortable developing and using technology-enriched lessons with regular classes in core subjects. While a majority of the lessons developed during the first year of the grant were used with class sizes of fewer than 20 students, the pattern changed during the second year with 51% of lessons developed for class sizes of more than 20 students. For both years, approximately one-half of the MSAP lessons were taught to average or heterogeneous students, 36% to advanced students, and 9% to remedial students. While most lessons were intended to supplement or enrich the curriculum rather than simply cover the regular curriculum in 1993-94, the percentages were roughly equivalent in 1994-95. Very few of the lessons used a lecture approach during either year; however, the percentage of lessons using cooperative learning and individual projects rose slightly during the second year. Similar to the elementary and middle school levels, most lessons involved adaptation of an existing lesson to use new technology, although the percentage creating a new lesson rose somewhat from 38% to 42%.

MSAP Resources Used

Figure 9 provides information on the types of MSAP resources which were used by Enloe teachers during 1993-94 and 1994-95.

Figure 9. Percentage of Lessons that Used Each MSAP Resource at Enloe High School, 1993-94 and 1994-95*

	1993-94	1994-95
Computer Hardware		
Macintosh	84%	77%
IBM	10%	17%
Other	6%	<1%
Other Hardware		
Laser disc	21%	6%
Scanner	0%	9%
Modem	0%	8%
Printer	68%	45%
Fax	0%	<1%
CD-ROM	4%	6%
LCD Panel	0%	8%
Multimedia Station	4%	10%
Lego/Logo	N/A	<1%
Probeware	N/A	4%
Robotics	1%	<1%
Video Production Equipment	2%	5%
Software		
Word-processing	60%	44%
Spreadsheet	2%	4%
Educational Software (total)	38%	60%
Ed. Software: Drill	N/A	18%
Ed. Software: Problem Solving	N/A	21%
Ed. Software: Tutorial	N/A	20%
Ed. Software: Simulation	N/A	10%
Ed. Software: Games	N/A	3%
Ed. Software: Other	N/A	21%
Telecommunications	0%	4%
Database	N/A	2%

*Additional data were collected during 1994-95, and therefore some data categories are marked N/A for 1993-94.

As Figure 9 illustrates:

- Although a majority of lessons during both years involved use of a Macintosh computer, the percentage reporting using lessons in the IBM Mathematics Lab increased from 1993-94 to 1994-95.

- The use of laser discs and printers decreased, while only slight increases were seen across other types of hardware.

- Fewer lessons involved word-processing, and the percentage involving use of educational software increased substantially from the first to second year of the grant. Examples of educational software used include Persuasion (allowing creation of a "slide show" presentation using graphics, animation, etc.), TurboMath (designed to reinforce

basic mathematics skills), and Pagemaker (designed to produce sophisticated publications using word processing and graphics).

Difficulty and Effectiveness of Lessons

Most teachers reported that the lessons they developed were easy to implement during both years of the MSAP grant. ***The percentage of teachers who reported that the lessons they developed were either effective or very effective for their students increased from 70% in 1993-94 to 96% in 1994-95,*** suggesting that by the end of the grant, nearly all believed that technology impacted their students very positively.

Some insights that classroom teachers at Enloe wished to share with others regarding the difficulty and/or effectiveness of the lessons they developed were:

- In a math class using Maple V software designed to give students a visual experience of a 3-dimensional figure, "The software gives students immediate feedback on 3-D diagrams. It is much more difficult to do this with pencil and paper (2-D) diagrams. Maple V gives them pictures in various colors to demonstrate the important concepts. Students were excited about using the software. It gives the student a different perspective on the concepts being taught. The students really enjoyed the change of pace and expressed an eagerness to return to their computer work."

- In a geometry class using Geometric Supposer software, "Mainly the only problem I had was keeping everyone on task with different students doing things at different rates, but once everyone got adjusted it went well."

TEACHER TECHNOLOGY USE SURVEY

A survey which assessed teachers' attitudes towards and use of technology in the classroom was administered by ITRTs to teachers in all MSAP schools in October 1993 and May 1994, and again in April, 1995 through the Department of Evaluation and Research. The survey results were analyzed for the elementary schools, Ligon Middle School, and Enloe High School. Return rates for the fall 1993 survey were 86%, 84%, and 86% respectively; for spring 1994 were 80%, 84%, and 86%, respectively; and for spring 1995 were 84%, 86%, and 70%, respectively. A copy of the survey is available in Attachment 5. The results from the fall survey served as baseline information, and changes in teachers' perceptions and behaviors were measured at the end of the 1993-94 and 1994-95 school years to track teachers' changing attitudes and behaviors related to technology use in the classroom.

TEACHERS' ATTITUDES

The survey results indicated that ***teachers generally believed computers and related technology could enhance their instruction and have a positive impact on students' education*** (see Figure 10), and the ***general trend was for attitudes to improve across the two years of the MSAP grant.*** At both the elementary and middle school level, the percentage of teachers who indicated that they don't use computers because they don't have enough time to cover the regular curriculum declined, suggesting that teachers became better able to integrate technology with the regular curriculum. High school teachers' attitudes did not change on this item during the grant, with about one-fourth agreeing. The percentage of MSAP teachers who agreed that computers help with their instructional tasks (e.g., calculating grades) increased considerably at all levels. This finding may be due to teachers becoming more aware of the

benefits of computers through increased access to and use of tools such as word processing and spreadsheets as the grant progressed.

Figure 10. Percentage of MSAP Teachers Who Agreed or Strongly Agreed With Items Relating to Attitudes About Technology, 1993-1995

Survey Item	Elementary			Middle			High		
	Fall 1993	Spr. 1994	Spr. 1995	Fall 1993	Spr. 1994	Spr. 1995	Fall 1993	Spring 1994	Spring 1995
Computers will change the way my subject is taught.	67%	68%	67%	58%	76%	64%	74%	75%	80%
Increased use of computers in education will result in more individual attention for students.	64%	67%	73%	60%	76%	58%	68%	56%	63%
Using computers provides more opportunities to develop higher order thinking skills.	69%	73%	77%	61%	75%	63%	69%	61%	66%
I do not use computers because there is not enough time to cover the curriculum.	17%	13%	11%	39%	38%	18%	22%	27%	23%
Computers help me do my instructional tasks more efficiently.	48%	61%	76%	46%	54%	60%	56%	66%	70%

TEACHERS' EXPERIENCE

The survey results indicated that many teachers did not have much access to technology prior to the MSAP, but generally reported increased access by the end of the second year of the grant (see Figure 11). The increase was particularly noticeable at Enloe High, where set-up of labs and other technology required more time than at the elementary or middle school level. Middle school opinions on technical assistance did become less positive in 1995 after a big improvement in 1994.

Figure 11. Percentage of MSAP Teachers Who Indicated They Had Access to Computer-Related Technology and Assistance, 1993-1995

Survey Item	Elementary			Middle			High		
	Fall 1993	Spr. 1994	Spr. 1995	Fall 1993	Spr. 1994	Spr. 1995	Fall 1993	Spring 1994	Spring 1995
I have access to a computer for classroom instruction.	38%	61%	68%	63%	73%	64%	52%	51%	60%
I have access to a computer lab.	63%	75%	78%	50%	81%	76%	35%	55%	75%
I have access to a computer for teacher tasks.	68%	82%	90%	65%	74%	76%	68%	73%	79%
I receive technical assistance at school when I need it.	69%	83%	83%	53%	71%	46%	56%	53%	63%

Figure 12. Percentage of MSAP Teachers Who Frequently or Very Frequently Used Selected Technology, 1993-1995

Survey Item	Elementary			Middle			High		
How often do you use the following for instructional preparation and/or presentation?	Fall 1993	Spr. 1994	Spr. 1995	Fall 1993	Spr. 1994	Spr. 1995	Fall 1993	Spring 1994	Spring 1995
Word Processing	20%	59%	75%	36%	54%	57%	58%	70%	80%
Spreadsheet	4%	9%	12%	19%	13%	19%	22%	28%	27%
Database	4%	9%	13%	16%	24%	17%	17%	24%	21%
Telecommunications	3%	7%	7%	11%	11%	9%	13%	12%	22%
Graphics Software	9%	23%	36%	14%	18%	20%	16%	17%	23%
Scanners	1%	5%	4%	11%	2%	2%	4%	11%	8%
Laser discs	3%	16%	13%	7%	10%	6%	5%	16%	17%
CD-ROM	5%	26%	31%	9%	11%	8%	7%	12%	24%
Authoring Software	4%	7%	7%	6%	2%	11%	5%	5%	5%
Programming	7%	13%	6%	9%	5%	6%	4%	6%	4%

At all levels, the percentage of teachers who reported using many of the technological tools frequently or very frequently increased across the two years of the grant. Word processing was by far the most frequently used technology at all levels. At the elementary level, graphics software and CD-ROM were the second and third most frequently used types of technology, respectively; at the middle school level graphics software and spreadsheet, and at the high school level spreadsheet and CD-ROM. The percentages of types of technology used are higher in many cases on the

teacher survey than on the technology use data sheets; this suggests possibly that many teachers were not completing the data sheets but were using the technology.

PARENT SURVEY

As Figures 13 and 14 show, the Parent Survey results indicated that across both years of the grant the majority of parents of students at MSAP and non-MSAP schools believed that their child used a computer at school. There was some indication that parents at MSAP schools were slightly more likely to believe that their child uses a computer at school than parents at non-MSAP schools, particularly at the middle and high school level. ***At all grade levels across years, an increased percentage of parents at MSAP and non-MSAP schools believed that classroom instruction using computers and related technology helped prepare their child for the future.***

Figure 13. Survey Results to Item: "My Child Uses a Computer at School"

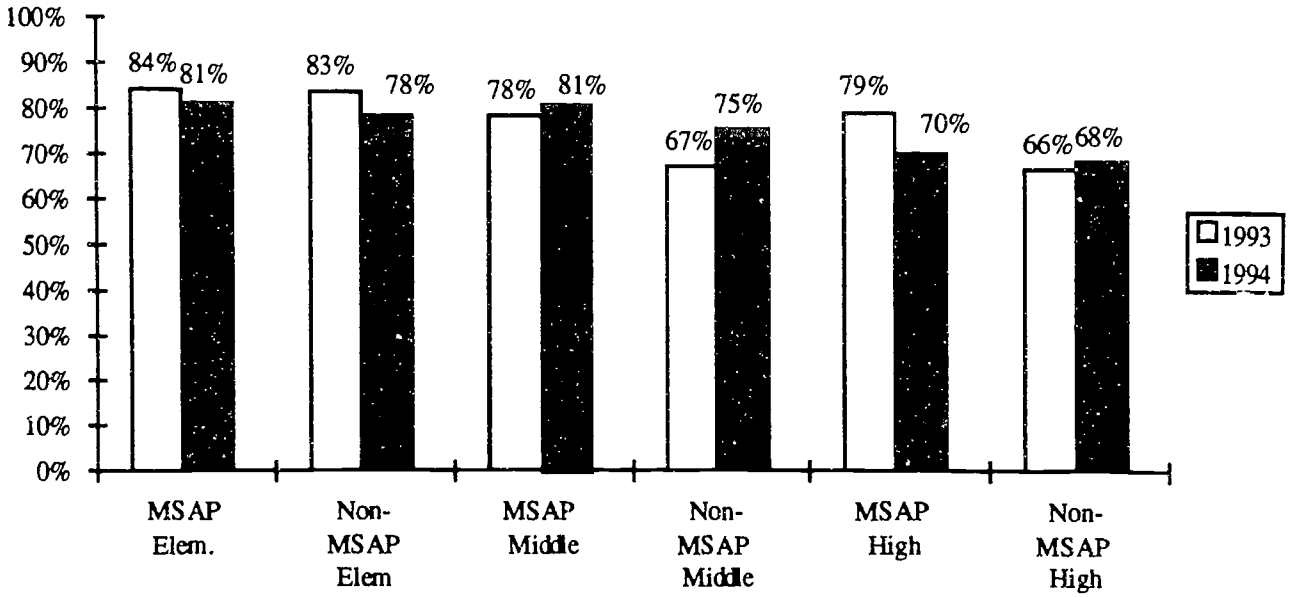
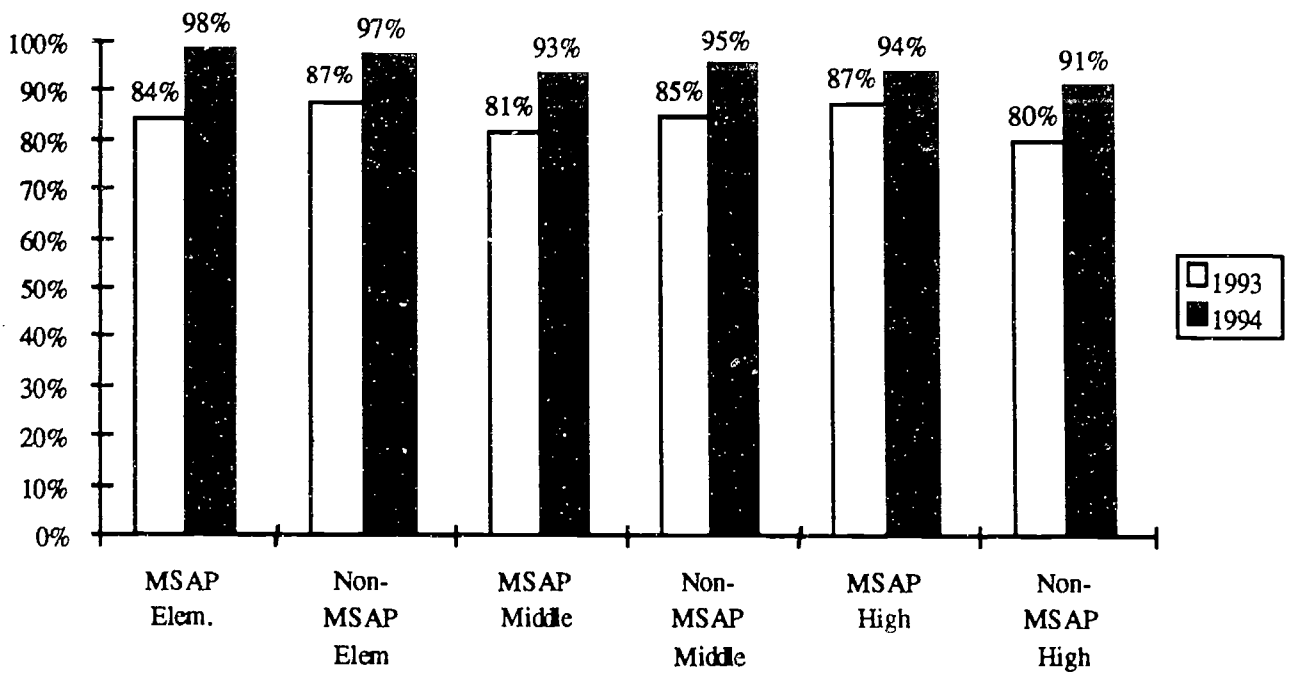


Figure 14. Survey Results to Item: "Using Classroom Instruction Based on Computers and Related Technology Prepares My Child for the Future"



RACIAL BALANCE

The WCPSS goal for racial balance in the magnet schools is no more than 45% minority enrollment. Schools with greater than 50% minority enrollment are considered racially isolated. The 1992-93 racial balances for MSAP schools indicated that they were either racially isolated or at risk of racial isolation. Figure 15 shows the baseline data on minority enrollment (before MSAP) and preliminary data for 1995-96 (following two years of MSAP) which incorporated end-of-year enrollment for 1994-95 with accepted applications for 1995-96. ***Results showed that progress was made for five of eight MSAP schools in improving racial balance, while four of eight met the goal of no more than 45% minority enrollment.*** Demographic changes in the base populations of some schools may have accounted for increased racial isolation and may have prevented improvement in racial balance for others. Further efforts are planned to enhance programs at the magnet schools that continue to have higher minority enrollment than desired.

Figure 15. Racial Balance Data for MSAP Schools

	Percent Minority 20-Day Enrollment in 1992-93	Preliminary Minority Enrollment for 1995-96	Change
Bugg	49%	50%	+1
Conn	49%	44%	-5
Fuller	49%	45%	-4
Hunter	46%	35%	-9
Powell	49%	42%	-7
Poe	51%	60%	+9
Ligon Middle	47%	47%	0
Enloe High	50%	47%	-3

STUDENT ACHIEVEMENT

ELEMENTARY LONGITUDINAL COHORT RESULTS

Figures 16 and 17 show the progress of the 4th-grade target- group students on the 1992-93 (baseline), 1993-94 (after one year of MSAP), and 1994-95 (after two years of MSAP) EOG reading and mathematics tests, respectively. The majority of lessons involving technology were developed for reading/language arts classes, and this is reflected in the academic outcomes. (For four of the six elementary schools, the percentages of both minority and majority students who were reading at grade-level proficiency increased significantly after two years of MSAP implementation.)

- At Bugg, the percentages of both majority and minority students who scored at or above grade level in reading increased at about the same rate (13% and 14%), so this success in bringing most of the students up to grade level is not reflected by the program goal of reducing the gap.

- ***At Poe and Hunter, the elementary schools with full-time ITRTs, the increases in the percentages of minority students reading at or above grade level was the greatest (43% and 28%).*** *Poe more than doubled the percentage of minority students on grade level by increasing from 38% to 81%.*

Figures 18 and 19 illustrate that although the gap between minority and white students was still large at some schools following the two years of MSAP, ***three of six MSAP elementary schools (Hunter, Poe and Powell) reduced the gap by 8% or more in reading,*** and three of the six in mathematics, thus successfully meeting program goal of reducing achievement gap by eight percentage points. Gap reductions were more noticeable on the reading than the math test.

Figure 16. Fourth Grade Elementary Cohort Results: Percentage of Students Scoring at Levels III or IV on End-of-Grade Reading Test

	Bugg		Conn		Fuller		Hunter		Poe		Powell	
Year	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.
1992-93	68%	56%	84%	61%	92%	54%	89%	49%	89%	38%	86%	54%
1993-94	74%	68%	85%	53%	85%	52%	91%	64%	86%	43%	95%	58%
1994-95	81%	7[illegible]%	92%	63%	91%	50%	93%	77%	100%	81%	96%	75%
Change 93 to 95	+13%	+14%	+8%	+2%	-1%	-4%	+4%	+28	+11%	+43%	+10%	+21%

(The pre and-post Ns are as follows: 79 to 58 for Bugg, 76 to 64 for Conn, 104 to 80 for Fuller, 104 to 82 for Hunter, 56 to 38 for Poe, and 74 to 57 for Powell) .

Figure 17. Fourth Grade Elementary Cohort Results: Percentage of Students Scoring at Levels III or IV on End-of-Grade Mathematics Test

	Bugg		Conn		Fuller		Hunter		Poe		Powell	
Year	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.
1992-93	70%	53%	86%	42%	84%	46%	92%	49%	85%	38%	83%	60%
1993-94	76%	65%	87%	43%	86%	60%	96%	62%	90%	32%	92%	63%
1994-95	74%	59%	84%	48%	88%	56%	98%	65%	93%	56%	92%	69%
Change 93 to 95	+4%	+6%	-2%	+6%	+4%	+10%	+6%	+16%	+8%	+18%	+9%	+9%

FOURTH GRADE ELEMENTARY COHORT RESULTS:

Gap Between Percentage of Majority and Minority Students Scoring at Levels III or IV on EOG (Majority minus Minority)

Figure 18. EOG Reading (Majority minus Minority)

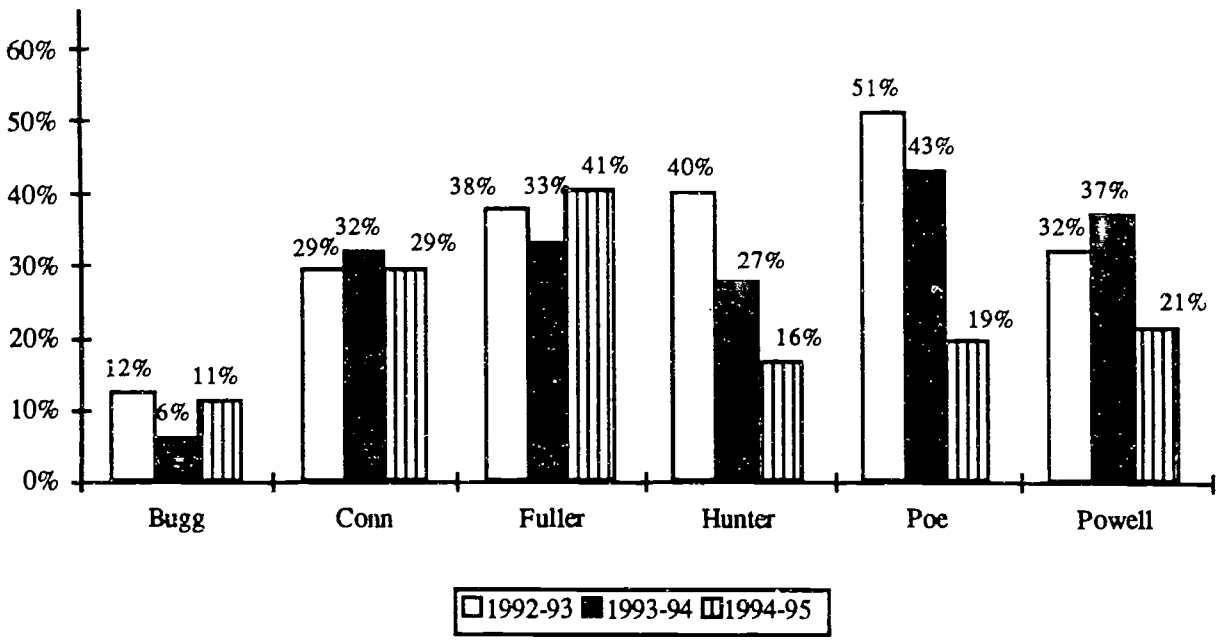
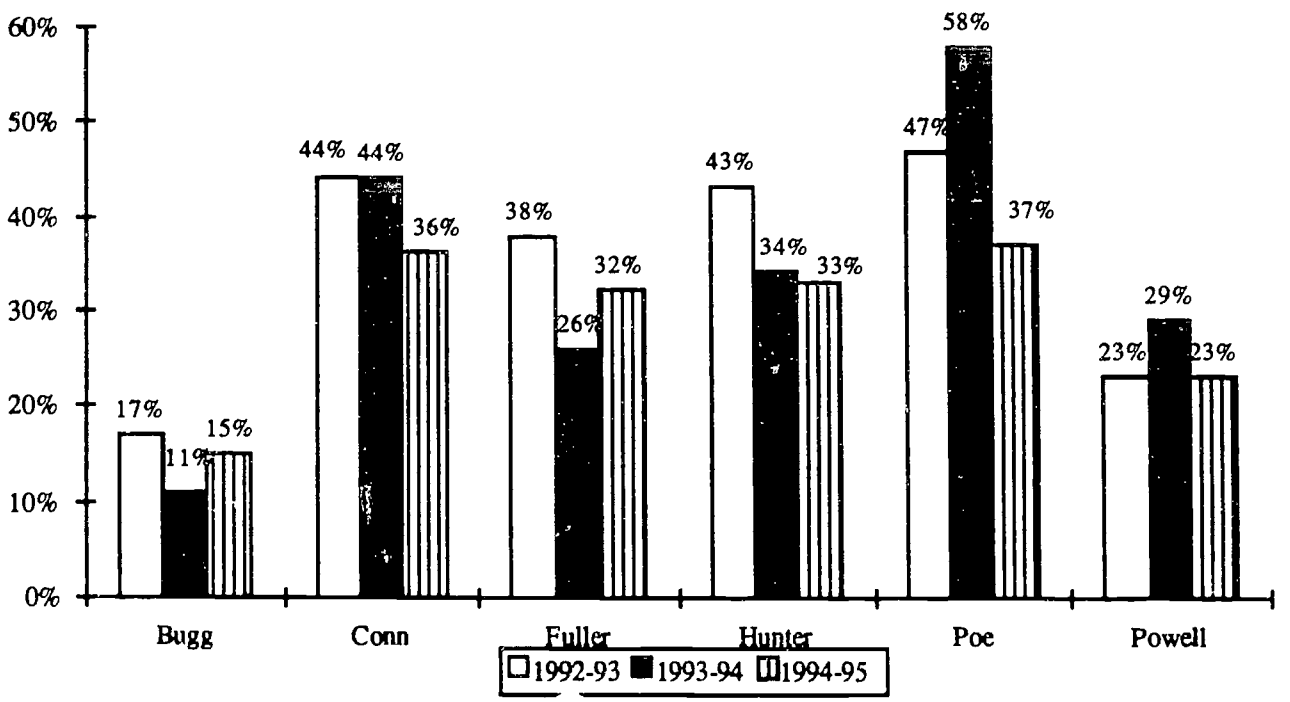


Figure 19. EOG Mathematics Test (Majority minus Minority)



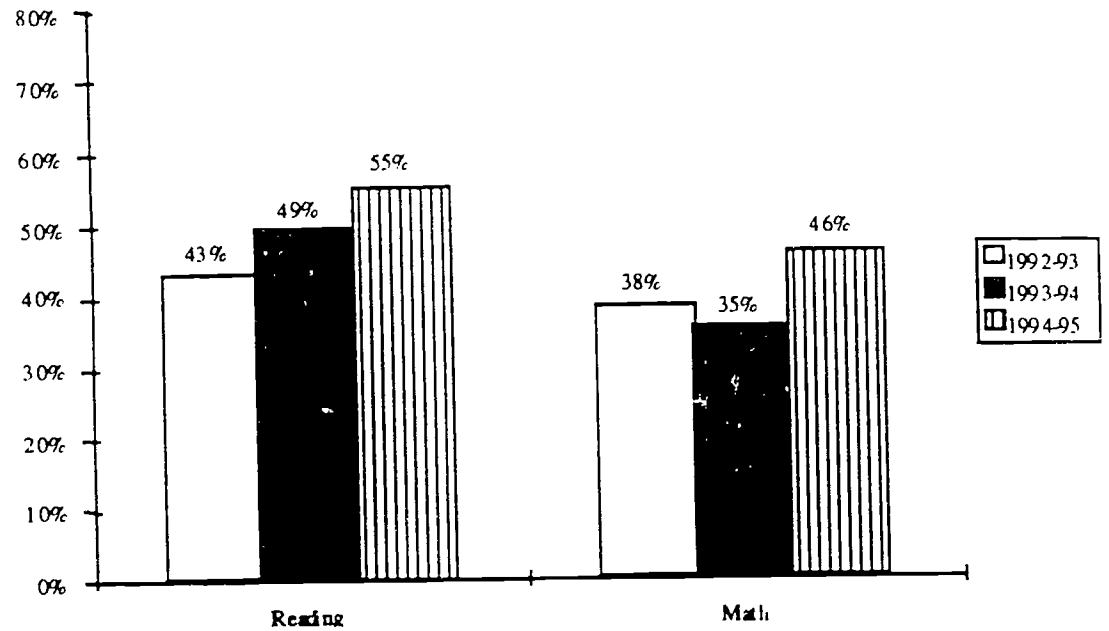
MIDDLE SCHOOL COHORT RESULTS

A 6th grade cohort of students received additional MSAP services in 1993-94 on one team at Ligon Middle School; in 1994-95 these students were served on two different teams as 7th graders. The cohort contained 64 students in 1993-94 and 56 in 1994-95. Of the 56 students, 40 of them were on the same team as 7th graders, and had access to computers all year. The other 16 were on a team housed in trailers and did not have computers in their classes until February 1995. Figure 20 shows that most of the 6th grade cohort of majority students were performing at or above grade level as 6th and 7th graders for both reading and mathematics; however, ***a large discrepancy existed between white and minority student performance both before and after two years of the MSAP program.*** In fact, the gap between majority and minority performance increased from 1992-93 to 1994-95 for both reading and mathematics (see Figure 21).

Figure 20. Ligon Middle School Cohort Results: Percentage of Students Scoring at Levels III or IV on End-of-Grade Reading and Mathematics Tests

	Reading		Mathematics	
Year	Majority	Minority	Majority	Minority
1992-93	87%	44%	83%	45%
1993-94	85%	36%	89%	54%
1994-95	96%	41%	88%	42%

Figure 21. Ligon Middle School Cohort Results: Percentage of Sixth Grade Majority and Minority Students Scoring at Levels III or IV (Majority minus Minority)



HIGH SCHOOL LONGITUDINAL COHORT RESULTS

The evaluation plan outlined in the MSAP grant application called for monitoring progress toward the goal of increasing the average number of advanced courses that high-achieving Black students successfully completed, as compared with a similar group of high achieving Black students from the years prior to MSAP implementation. Figure 22 provides the average number of advanced courses completed overall and by subject area for target-group and comparison-group students.

Figure 22. Advanced Courses Taken and Successfully Completed for the Target- and Comparison-Group of High-Achieving Black Students as 10th and 11th Graders

	Overall		By Subject Areas			
Group	Average No. of Advanced Courses Completed	Average No. of Advanced Courses Completed with "C" or Better	Average No. of Advanced English Courses Completed with "C" or Better	Average No. of Advanced Math Courses Completed with "C" or Better	Average No. of Advanced Science Courses Completed with "C" or Better	Average No. of Advanced Social Studies Courses Completed with "C" or Better
Target (n=108)	2.79	2.32	0.79	0.63	0.43	0.47
Comparison (n=111)	2.89	2.18	0.68	0.35	0.66	0.50

On the average, target-group students successfully completed slightly fewer advanced courses compared with the comparison-group students. However, target group students were somewhat

more successful in the advanced courses they enrolled in. The target group of 108 students completed a total of 310 advanced courses and passed 83% of them with a C or better (successfully completed); the 111 comparison-group students completed a total of 321 advanced courses and passed 75% of them with a C or better. Therefore, MSAP services appear to have helped students who enrolled in advanced courses.

OVERALL SCHOOL RESULTS

To determine whether MSAP resources impacted academic climates at participating schools, overall school EOG achievement data in 1992-93 (baseline), 1993-94 (following year 1 of MSAP), and 1994-95 (following year 2 of MSAP) were examined for MSAP elementary schools and Ligon Middle School. These data are reported in terms of percentages of students at proficiency levels III or IV (students considered to be working at or above grade level) on EOG reading and mathematics subtests. All MSAP schools were attempting to reduce the existing performance gap between majority and minority students by at least 8% at each grade level. Also, schools that were below WCPSS percentage for the number of students at or above proficiency levels III and IV were attempting to reduce that difference by 8%.

Attachment 1 provides the overall EOC results for each MSAP school. When reading and math scores were examined across schools by grade and subject area, the following positive changes in reducing the majority-minority achievement gap were evident from 1992-93 to 1994-95:

- In 17 of 42 comparisons (40%), the achievement gap decreased by at least 8% between majority and minority students. Positive changes were most evident at Hunter (five of six comparisons met the goal), followed by Powell (four of six comparisons met the goal), and Conn and Ligon (half of the comparisons met the goal for each).

- The smallest achievement gap between majority and minority performance occurred at Bugg by 1994-95, with a 3% gap in 3rd-grade reading and a 11% gap in 3rd-grade math and 5th-grade reading.

In terms of attempting to reduce the performance gap between MSAP schools and WCPSS, in 12 of 30 comparisons (40%), schools achieved the goal of reducing the gap by 8% .

SUMMARY AND CONCLUSIONS

To what extent was MSAP implemented, and how did teachers' attitudes towards and use of technology change across the two years of the grant?

By the end of 1994-95, a variety of technology program components at all levels had been successfully implemented due to the MSAP grant. The total number of lessons involving MSAP resources increased dramatically from the first to the second year of the grant, suggesting that the technology components were in place and teachers were familiar with how to use them with their instruction. Teachers were still predominantly using more traditional technological tools (e.g., word processing, printers) rather than tools like CD-ROM or telecommunications; however, even after two years of the grant. If changes in 1994-95 patterns of use are desired, technologies may require more training to build teachers' comfort with integrating these tools into their instruction.

Teacher attitudes about using technology improved across the two years of the grant, as they gained training and experience. There was also evidence that teachers felt increasingly comfortable with the technology they were using because an increased percentage of the lessons developed involved creation of a new lesson rather than adaptation of an existing one. Teachers at all levels reported more positive attitudes on the benefits of technology, and more reported that computers helped them with their instructional tasks (e.g., using spreadsheets to record grades). They also reported increased access and use of computers; however, there was some evidence that satisfaction with technical assistance declined at the middle school level. ITRTs reported that many teachers purchased their own personal computers for home use as they became more familiar with technology uses.

What were parents' attitudes about technology use in MSAP schools?

Parent attitudes remained fairly stable with respect to their perceptions of whether their children use technology in the classroom; a majority of parents at all grade levels believe that their children use computers at school. Parents at MSAP schools became more positive across the two years of the grant regarding the importance of technology in preparing their children for the future.

Did MSAP affect the racial balance within schools by the end of 1994-95?

By the end of the second year of the MSAP program, there was moderate success in terms of improved racial balance among MSAP schools, with five of eight schools reporting improved racial balance. However, several of the MSAP schools were still considered racially isolated, and changes at these schools are underway to promote a more balanced population.

What impact did MSAP have on academic achievement for the grant schools and for cohorts of students followed over time?

Baseline data at each MSAP school showed large differences between majority and minority achievement in these schools; in addition, all schools had some students below WCPSS proficiency-level percentages. High school comparison-group data showed that academically-advanced minority students successfully completed very few advanced courses, even when data were examined by students' subject areas of strength.

The greatest success in the grant was at the elementary level. By 1994-95, the greatest increases in achievement were consistent with the focus of implementation. The majority of the lessons were

developed for language arts and the most success was seen in reading. In the elementary schools, the 1993-94 fourth grade classes were targeted for services. **The two schools with full-time ITRTs, Hunter and Poe, had the greatest success in meeting the academic goals in both reading and math for this group.**

At Ligon Middle School, administrative changes and changes in the implementation design during the second year of MSAP may have contributed to lack of program success regarding academic achievement of the cohort. The original design at Ligon planned for the cohort, which was targeted for additional services as sixth graders in 1993-94, to stay together as a group on the same seventh grade team. However, other scheduling needs made it impractical to keep these students together and they were distributed to different teams, along with other students. The ITRT then attempted to serve all seventh grade teams to the extent planned originally for one team. Doing this was more of a challenge, especially since one of the teams was housed in trailers and did not have easy access to classroom computers. Also, because the longitudinal cohort of students was combined with students who had not used technology to the same extent, their classes had to spend more time on basic skills than was hoped for the second year. Some of these obstacles may have been responsible for the decline in support for MSAP at Ligon during the second year, and for the lack of success in improving achievement.

At Enloe High School, additional efforts are needed to enroll high-achieving minority students in advanced courses. Results indicated that minorities are more likely to succeed once enrolled in advanced courses, when compared to a control group, but did not enroll at a greater rate.

What factors led to the consistent academic achievement success at Hunter Elementary School?

At Hunter Elementary, where the most consistent success was observed in achieving the academic goals of the program for all students, program staff were interviewed to identify factors that contributed to the success. In the first year of the grant, Hunter had a new principal who proved to be very supportive of the program. At the beginning of 1992-93, Hunter realigned its school improvement plan so that it was consistent with the goals of its technology plan. Both plans were rewritten to focus on using technology in the core courses to enrich writing, reading, and math. The full-time ITRT provided leadership and support to help the staff become technologically literate. Staff development and ongoing assistance from the ITRT resulted in a high rate of technological literacy in a staff that had previously not used or known how to use technology. At the same time, the students learned how to use technology.

According to teachers, administrators, and program staff, having a full-time ITRT who supported teachers while they were delivering lessons was important to give teachers the confidence to try new teaching styles using technology. The ITRT was a strong leader, very knowledgeable about technology, and worked well with the teachers in the school. Staff development was well received at Hunter. Teachers reported that the ITRT delivered technology lessons to their classes in order to show teachers how to use technology. Teachers felt comfortable making the transition from observer/learner to teacher at their own paces. As teachers became more knowledgeable and experienced at integrating technology into their lessons, they helped other teachers.

Teachers used a wide variety of teaching styles when delivering lessons in which students were to use technology and were able to give students more individual attention. Teachers at Hunter reported that they did not have any prior expectations for success or failure of groups of students because the technology lessons required students to use skills that were new to both teachers and students. According to the literature on which the MSAP strategies were based, minority students are more likely to succeed in this kind of learning environment (Shade, 1982; Stiff, 1990).

Because the lab use was limited to the core teachers during the second year, teachers could develop lessons within their curriculum topics and deliver them at the appropriate time. Once the core teachers were guaranteed access to the lab according to a regular schedule, they began to develop lessons in which technology was used to support what they were teaching. They used technology to focus on the basics of the curriculum as opposed to developing enrichment lessons. Students learned to use technology primarily as tools and the focus of the lessons was on basic concepts. For example, teachers developed lessons in which students learned to write about topics they were studying. They would use word processors on computers. Then they would edit what they wrote, focusing on how to organize their ideas better, add more descriptive vocabulary, correct grammar and spelling, and refine their style. Extensive editing was much more reasonable using computers than with pencil and paper. Teachers were able to give students more individual attention and found students were more motivated, expressed more pride in their work, and were more focused on the tasks. Teachers felt that the extensive writing and editing students did using technology helped them to learn the core curriculum better and improved their reading and writing skills.

Teams of teachers began planning together to share lessons and integrate subjects; for example, students began writing about what they were studying in all of their subjects using computers. Students learned to use editing tools in the word-processing programs to help them write, which integrated language skills and writing with the other core subjects. Administrators and staff shared a common vision regarding how they were to use the technology provided by the MSAP grant and communicated high expectations for all the students.

What factors led to the academic achievement success at Poe Elementary School?

Staff at Poe Elementary School who had worked with the longitudinal cohort of students reported that a full-time ITRT was an essential component leading to the successful implementation of MSAP. The ITRT worked with teachers during class to help them and their students. Four computers were placed in each classroom and teachers emphasized writing across the curriculum, using computers as a writing tool. Teachers reported that they believed the extensive use by students of a multimedia authoring package, *Hyperstudio*, helped students become motivated and stay motivated to write. This program encourages reading through its use of on-screen instructions and promotes higher order thinking skills. Students enjoyed using this program.

Students with particular needs were identified and MSAP resources were used in elective courses to help them overcome weaknesses. In addition, the elective curriculum was aligned to more closely reflect the goals of the North Carolina Course of Study.

Teachers also reported that integrating technology into the curriculum empowered students in the learning process. Technology use allowed students to have more input on learning goals and planning strategies for meeting the goals they set because lessons could be more individualized. Students were provided with choices of appropriate learning activities. Students became active, rather than passive learners, and they were held accountable when goals were not met.

What have we learned from this grant which can be applied to other schools in WCPSS?

First, technology can improve instruction and achievement if well implemented. The elementary models met with more success than the secondary sites, although all schools reported some success. The fact that both majority and minority students appeared to benefit, especially in reading, provides encouragement that technology *can* be a tool to help close the achievement gap. Other schools could certainly benefit from exploring what was effective (and ineffective) within these magnet schools.

Second, technology is most likely to make a difference, if, as reported in research, students have sufficient time to use the technology, teachers have adequate technological support, and the technology and software matches the curriculum and teaching methods. Further, the more active learning styles typical with technology improves student learning, especially for minority students. It may not be coincidental that the two schools which had full-time instructional resource technology teachers (ITRTs) showed the greatest success. It is difficult to find time to develop a cohesive program and purchase, install, and maintain hardware and software, train teachers, provide ongoing support to teachers, and develop lessons with teachers within normal school staffing. It may be that, at least for the initial year or two of implementation of extensive technology plans, it is cost effective to have a person in this type of position within a school.

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ATTACHMENT 1

OVERALL MSAP SCHOOL RESULTS

Overall Bugg Elementary School Outcome Data: Percentage of Students Scoring at Levels III or IV on 1992-93, 1993-94, and 1994-95 End-of-Grade Tests

		3rd		4th		5th	
		Reading	Math	Reading	Math	Reading	Math
Bugg	Majority	72%	72%	66%	81%	74%	66%
1992-93	Minority	62%	49%	55%	63%	58%	50%
	Total	67%	61%	62%	73%	67%	58%
	Maj-Min gap	10%	23%	11%	18%	16%	16%
Bugg	Majority	67%	74%	74%	76%	61%	50%
1993-94	Minority	46%	37%	68%	65%	64%	46%
	Total	55%	54%	71%	71%	62%	49%
	Maj-Min gap	21%	37%	6%	11%	-3%	4%
Bugg	Majority	58%	59%	66%	79%	82%	75%
1994-95	Minority	55%	48%	48%	50%	71%	56%
	Total	57%	54%	56%	64%	78%	67%
	Maj-Min gap	3%	11%	18%	29%	11%	19%
WCPSS 1992-93	Total	74%	72%	74%	76%	75%	74%
WCPSS - 1992-93	Bugg	7%	11%	12%	3%	8%	16%
WCPSS 1993-94	Total	71%	72%	77%	78%	77%	77%
WCPSS - 1993-94	Bugg	16%	18%	6%	7%	15%	28%
WCPSS 1994-95	Total	74%	74%	75%	78%	80%	77%
WCPSS - 1994-95	Bugg	17%	20%	19%	14%	2%	10%

Overall Conn Elementary School Outcome Data: Percentage of Students Scoring at Levels III or IV on 1992-93, 1993-94, and 1994-95 End-of-Grade Tests

		3rd		4th		5th	
		Reading	Math	Reading	Math	Reading	Math
Conn	Majority	84%	86%	76%	84%	91%	93%
1992-93	Minority	52%	41%	42%	42%	52%	50%
	Total	69%	65%	63%	67%	72%	72%
	Maj-Min gap	32%	45%	34%	42%	39%	43%
Conn	Majority	76%	80%	85%	87%	77%	82%
1993-94	Minority	54%	51%	53%	43%	42%	41%
	Total	66%	67%	72%	70%	63%	66%
	Maj-Min gap	22%	29%	32%	44%	35%	41%
Conn	Majority	87%	84%	83%	90%	93%	86%
1994-95	Minority	53%	47%	58%	56%	60%	46%
	Total	74%	70%	72%	75%	77%	68%
	Maj-Min gap	34%	37%	25%	34%	33%	40%
WCPSS 1992-93	Total	74%	72%	74%	76%	75%	74%
WCPSS - 1992-93	Conn	5%	7%	11%	9%	3%	2%
WCPSS 1993-94	Total	71%	72%	77%	78%	77%	77%
WCPSS - 1993-94	Conn	5%	5%	5%	8%	14%	11%
WCPSS1994-95	Total	74%	74%	75%	78%	80%	77%
WCPSS - 1994-95	Conn	0%	4%	3%	3%	3%	9%

Overall Fuller Elementary School Outcome Data: Percentage of Students Scoring at Levels III or IV on 1992-93, 1993-94, and 1994-95 End-of-Grade Tests

		3rd		4th		5th	
		Reading	Math	Reading	Math	Reading	Math
Fuller	Majority	87%	76%	85%	89%	92%	92%
1992-93	Minority	48%	33%	60%	58%	54%	39%
	Total	70%	58%	74%	74%	74%	67%
	Maj-Min gap	39%	43%	25%	31%	38%	53%
Fuller	Majority	80%	84%	85%	86%	89%	86%
1993-94	Minority	44%	44%	52%	60%	65%	75%
	Total	62%	64%	72%	75%	79%	81%
	Maj-Min gap	36%	40%	33%	26%	24%	11%
Fuller	Majority	93%	89%	85%	85%	88%	87%
1994-95	Minority	52%	44%	55%	60%	46%	50%
	Total	74%	68%	70%	72%	71%	72%
	Maj-Min gap	41%	45%	30%	24%	43%	37%
WCPSS 1992-93	Total	74%	72%	74%	76%	75%	74%
WCPSS - 1992-93	Fuller	4%	14%	0%	2%	1%	7%
WCPSS 1993-94	Total	71%	72%	77%	78%	77%	77%
WCPSS - 1993-94	Fuller	9%	8%	5%	3%	-2%	-4%
WCPSS1994-95	Total	74%	74%	75%	78%	80%	77%
WCPSS - 1994-95	Fuller	0%	6%	5%	6%	9%	5%

Overall Hunter Elementary School Outcome Data: Percentage of Students Scoring at Levels III or IV on 1992-93, 1993-94, and 1994-95 End-of-Grade Tests

		3rd		4th		5th	
		Reading	Math	Reading	Math	Reading	Math
Hunter	Majority	90%	91%	96%	94%	92%	94%
1992-93	Minority	44%	44%	47%	50%	41%	48%
	Total	69%	70%	69%	69%	73%	77%
	Maj-Min gap	46%	47%	49%	44%	51%	46%
Hunter	Majority	96%	96%	91%	96%	97%	97%
1993-94	Minority	49%	53%	64%	62%	53%	65%
	Total	78%	79%	82%	84%	76%	82%
	Maj-Min gap	47%	43%	27%	34%	44%	32%
Hunter	Majority	91%	88%	96%	95%	94%	97%
1994-95	Minority	65%	54%	53%	67%	70%	61%
	Total	78%	72%	80%	84%	85%	85%
	Maj-Min gap	28%	35%	43%	28%	23%	36%
WCPSS 1992-93	Total	74%	72%	74%	76%	75%	74%
WCPSS - 1992-93	Hunter	5%	2%	5%	7%	2%	-3%
WCPSS 1993-94	Total	71%	72%	77%	78%	77%	77%
WCPSS - 1993-94	Hunter	-7%	-7%	-5%	-6%	1%	-5%
WCPSS1994-95	Total	74%	74%	75%	78%	80%	77%
WCPSS - 1994-95	Hunter	-4%	2%	-5%	-6%	-5%	-8%

Overall Poe Elementary School Outcome Data: Percentage of Students Scoring at Levels III or IV on 1992-93, 1993-94, and 1994-95 End-of-Grade Tests

		3rd Reading	3rd Math	4th Reading	4th Math	5th Reading	5th Math
Poe	Majority	75%	70%	80%	84%	86%	79%
1992-93	Minority	40%	33%	45%	48%	55%	52%
	Total	60%	55%	65%	70%	70%	65%
	Maj-Min gap	35%	37%	35%	36%	31%	27%
Poe	Majority	73%	76%	86%	90%	81%	83%
1993-94	Minority	38%	32%	43%	32%	56%	52%
	Total	59%	58%	65%	62%	70%	70%
	Maj-Min gap	35%	44%	43%	58%	25%	31%
Poe	Majority	86%	76%	88%	94%	100%	90%
1994-95	Minority	39%	23%	37%	50%	64%	43%
	Total	58%	45%	64%	73%	83%	68%
	Maj-Min gap	48%	53%	50%	44%	36%	47%
WCPSS 1992-93	Total	74%	72%	74%	76%	75%	74%
WCPSS - 1992-93	Poe	14%	17%	9%	6%	5%	9%
WCPSS 1993-94	Total	71%	72%	77%	78%	77%	77%
WCPSS - 1993-94	Poe	12%	14%	12%	16%	7%	7%
WCPSS1994-95	Total	74%	74%	75%	78%	80%	77%
WCPSS - 1994-95	Poe	16%	29%	11%	5%	-3%	9%

Overall Powell Elementary School Outcome Data: Percentage of Students Scoring at Levels III or IV on 1992-93, 1993-94, and 1994-95 End-of-Grade Tests

		3rd		4th		5th	
		Reading	Math	Reading	Math	Reading	Math
Powell	Majority	93%	95%	91%	91%	91%	82%
1992-93	Minority	60%	60%	57%	57%	59%	54%
	Total	76%	77%	77%	77%	73%	66%
	Maj-Min gap	33%	35%	34%	34%	32%	28%
Powell	Majority	80%	81%	95%	92%	91%	89%
1993-94	Minority	66%	52%	58%	63%	59%	48%
	Total	77%	73%	76%	77%	75%	68%
	Maj-Min gap	14%	29%	37%	29%	32%	41%
Powell	Majority	94%	94%	88%	92%	91%	89%
1994-95	Minority	74%	64%	68%	74%	72%	68%
	Total	85%	81%	80%	85%	81%	77%
	Maj-Min gap	20%	30%	20%	18%	19%	21%
WCPSS 1992-93	Total	74%	72%	74%	76%	75%	74%
WCPSS - 1992-93	Powell	-2%	-5%	-3%	-1%	2%	8%
WCPSS 1993-94	Total	71%	72%	77%	78%	77%	77%
WCPSS - 1993-94	Powell	-6%	-1%	1%	1%	2%	9%
WCPSS1994-95	Total	74%	74%	75%	78%	80%	77%
WCPSS - 1994-95	Powell	-11%	-7%	-5%	-7%	-1%	0%

Overall Ligon Middle School Outcome Data: Percentage of Students Scoring at Levels III or IV on 1992-93, 1993-94, and 1994-95 End-of-Grade Tests

		6th		7th		8th	
		Reading	Math	Reading	Math	Reading	Math
Ligon	Majority	90%	90%	90%	92%	93%	91%
1992-93	Minority	61%	54%	56%	56%	60%	52%
	Total	78%	74%	74%	75%	77%	73%
	Maj-Min gap	29%	36%	34%	36%	33%	39%
Ligon	Majority	93%	96%	94%	94%	94%	93%
1993-94	Minority	54%	71%	65%	64%	70%	57%
	Total	74%	84%	81%	81%	83%	76%
	Maj-Min gap	39%	25%	29%	30%	24%	36%
Ligon	Majority	97%	98%	96%	94%	96%	96%
1994-95	Minority	69%	69%	61%	56%	76%	67%
	Total	83%	86%	79%	75%	87%	84%
	Maj-Min gap	28%	28%	35%	38%	21%	29%
WCPSS 1992-93	Total	70%	73%	72%	74%	76%	75%
WCPSS - 1992-93	Ligon	-8%	-1%	-2%	-1%	-1%	2%
WCPSS 1993-94	Total	74%	78%	76%	78%	77%	74%
WCPSS - 1993-94	Ligon	0%	-6%	-5%	-3%	-6%	-2%
WCPSS1994-95	Total	77%	80%	80%	81%	84%	83%
WCPSS - 1994-95	Ligon	-6%	-6%	1%	6%	-3%	-1%

ATTACHMENT 2
GLOSSARY OF TECHNOLOGY TERMS

GLOSSARY OF TECHNOLOGY TERMS

Adobe Photoshop:	A sophisticated program that allows the user to edit scanned images, photographs, etc.
Children's Writing and Publishing Center:	A popular creative writing program for elementary grades; allows students to add illustrations to their stories, articles, poems, etc.
ClarisWorks:	A software package which includes word processing, spreadsheet, and graphics capabilities.
HyperStudio:	An authoring tool (software) that allows the user to produce interactive multimedia presentations; similar to Hyper Card; popular with students because of its user-friendly appeal.
KidsNet:	A telecommunications network service for children.
KidWorks:	A word-processing program for children.
Lego/Logo Robotics:	A concept for learning that combines the Logo programming language with Lego constructions. Children follow diagrams to build constructions and physically connect them by way of an interface box to the computer. They then write programs which enable models to carry out commands. The program teaches the foundations of physics to elementary and middle school students.
MacGlobe:	Geography software designed to teach and reinforce middle and high school students' geography skills.
MECC software:	Software produced and distributed by Minnesota Educational Computer Corporation; addresses primarily the four core subject areas, grades K-12.
PageMaker:	A graphics, word-processing software package which facilitates formatting text and graphics.
PAWS Keyboarding:	An interactive software package designed for individual keyboarding instruction.
Persuasion:	A computer program that allows the user to create a "slide show" presentation; presentations may include graphics, quicktime movies, animation, interesting transitions, and more; useful as a teaching tool and also as a student productivity tool.
PrintShop:	A graphics software package designed for making banners, greeting cards, and signs.
TurboMath:	An educational software package for reinforcing basic mathematics skills.

SimCity:	A software package that simulates running a city, including the effects of economical, educational, social, and political decision making.
Vernier Probes:	An apparatus that allows a student to conduct science experiments; plugs into the Macintosh computer and measures temperature, for example, and subsequently stores the temperature data in a file on the computer.
Weather Station:	Proposed by Bugg Elementary as a station equipped with scientific equipment where students might have first-hand experience studying the weather.
Windows on Science:	A series of laser discs that teach various units in science accompanied by teacher guides; producers claim that this set is a complete science curriculum for grades K-8.

ATTACHMENT 3

ENLOE ADVANCED COURSES LIST

List of Advanced courses for Enloe:

Course Name	Course Number
English	
AG English 9	0915
C&C 9 GTC	1000
AG English 10	1026
AG English 11	1036
Paideia 10	1932
Paideia 11	1934
College Wrt. GT	1095
College Wrt. II	1096
Social Studies	
World Civ. GT	4071
Adv. U.S. Hist.	4070
AP U.S. Hist.	4086
Math	
Geometry GT	2204
Algebra II GT	2304
Adv. Math GT	2402
Pre-Cal. GTC	2105
Calc	2421
Calc	2422
Science	
Adv. Biology	3112
Adv. Biology GTC	3114
An. Phys. GT	3992
Adv. Chem	3209
Adv. Chem GTC	3212
AP Chem GTC	3150
Adv. Physics	3310
AP Physics B GTC	3312
AP Physics C GTC	3326

55

ATTACHMENT 4

TRAINING FOR INSTRUCTIONAL TECHNOLOGY RESOURCE TEACHERS

Workshop/Seminar*	Date
Apple/IBM Hardware Demonstrations	8/31/93
P.E.T.A.L.S. (Parent Exploring Teaching and Learning Styles)	9/15 - 9/17/93
Explorations in Instructional Software	10/1/93
Evaluating Instructional Software	10/13/93
Macintosh Basics: From Setup to System 7	10/28 10/29/93 and 11/12/93
The Art of Persuasion: A Tool for Teaching	11/18 - 11/19/93
NCetc, Technology Conference	11/29 - 12/1/94
Advanced ClarisWorks	2/3 - 2/4/94 and 2/25/94
Making the Most of the Quadra 660AV	2/18/94
NandoLand: Gateway to the Internet	3/18/94 and 3/24/94
Network Administrator Training	4/29/94 and 5/6/94
Tapping the Power of Today's Technology	5/13 - 5/14/94, 5/27/95, and 6/3/94
Video Production and Authoring Interactive Multimedia	6/13 - 6/17/94

*All ITRTs participated in each of these workshops.

ATTACHMENT 5
TECHNOLOGY USE DATA SHEETS

TECHNOLOGY USE DATA SHEET

Please complete this data sheet after you have implemented your lesson using technology. Your cooperation is critical to ensure that we obtain information that will help us in planning for future resources and training. If the appropriate choice is not provided on a question, please write in your response. Thank you!

GENERAL INFORMATION

1. Name_____Date of lesson:_____
2. Subject Area of Lesson _____
3. Grade Level _____
4. Class Size: (circle one)
   1-5 6-10 11-15 16-20 21-25 26-30 30+
5. Ability Level of Class: (circle one)
   remedial regular gifted heterogeneous (not tracked)

TYPE OF TECHNOLOGY USED

1. Hardware: Circle all that were used in the lesson:
   a. Computer: Macintosh IBM Other
   b. Modem c. Printer d. Fax Machine
   e. CD-ROMf. LCD Panels g. Multimedia Stations
   h. Robotics i. Laser discs
2. Software Circle all that were used in the lesson:
   a. word processor b. spreadsheet c. E-Mail
   d. Educational software (please specify) _____
3. Video Production Equipment
4. Other (please specify)_____

SETTING OF THIS LESSON & INSTRUCTIONAL STYLE

1. Time of lesson: (circle one)
   a. during school b. before school c. after school
2. Student grouping: (circle one)
   a. Individual (one on one) b. small group c. whole class
   d. With how many classes did you use this lesson?_____

3. Type of instruction: (circle one)
   a. lecture b. cooperative learning c. projects
   d. lab e. other or combination, please

DESCRIPTION OF LESSON

1. How long did it take you to design the lesson? (in minutes)
   _____
2. Did you adapt an existing lesson, or create a new one? Explain.

3. Was the lesson: (circle one)
   a. interdisciplinary b. single subject
4. Was the lesson designed to: (circle one)
   a. cover the regular curriculum b. supplement/enrich curriculum
   c. teach students to use the technology
5. Describe the goal of the lesson.

LESSON OUTCOMES

1. How difficult was it to implement the lesson? Rate on a scale of 1 to 5, with 1=easy, 5=difficult.
   1 2 3 4 5
2. How effective was the lesson? Rate on a scale of 1 to 5, with 1=not at all, 5=very effective.
   1 2 3 4 5

3. Please share any insights about this lesson that might benefit others.

4. Describe any problems you encountered implementing this lesson.

ATTACHMENT 6

MSAP TEACHER SURVEY

TEACHER SURVEY

The Wake County Public School System is conducting a survey to find out how teachers feel about technology, to what extent they use technology in their classes, and how they feel it impacts instruction.

DIRECTIONS: Use a number 2 pencil to answer the questions on the answer sheet provided. Fill in the name of your school in the space marked LAST NAME and fill in your school code in the space marked IDENTIFICATION NUMBER on side 1 of your answer sheet. Please read each question carefully and follow all directions. Where a selection asks you to specify, write your response on this survey in the blank provided.

1. Total years of teaching experience:
   a. 0-3
   b. 4-6
   c. 7-9
   d. 8-10
   e. 11+
2. Your age:
   a. 21-30
   b. 31-39
   c. 40-49
   d. 50+

3. What grade do you teach?
   a. K-1
   b. 2-3
   c. 4-5
   d. 6-8
   e. 9-12
   f. specialist, Please specify here:_____

4. Major subject areas you are now teaching:
   a. elementary, all core subjects
   b. elementary, specialist
   Middle or High school:
   c. math
   d. language arts
   e. science
   f. social studies
   g. health and PE
   h. vocational education
   i. computer studies
   j. other, Please specify here:_____

5. Highest degree you presently hold:
   a. High School Diploma
   b. Associate Degree
   c. Bachelors Degree
   d. Masters Degree
   e. Sixth Year (Advanced Certificate)
   f. Doctorate Degree

For questions 6-15 use the following scale:

a. Strongly Agree
b. Agree
c. Undecided
d. Disagree
e. Strongly Disagree

6. Computers will change the way my subject is taught.
7. I feel personal satisfaction when I learn something new on the computer.
8. Increased use of computers in education will result in more individual attention for students.
9. Use of computers and related technology in the classroom increases student motivation.
10. Using computers provides more opportunity to develop higher order thinking skills.
11. Computers and related technology can efficiently reinforce what is taught.
12. I believe all teachers should become competent in using computers.
13. I do not use computers because there is not enough time to cover the curriculum.
14. Computers help me do my instructional tasks more efficiently.
15. I think money spent on instructional technology could be better spent on other materials.

For questions 16-27 use the following scale to indicate how often you each technology for instructional preparation and/or presentation.

a. Never
b. Seldom
c. Occasionally
d. Frequently
e. Very Frequently

16. Word processing
17. Spreadsheet
18. Database
19. Telecommunications
20. Graphics software (e.g., MacDraw)
21. Scanners
22. Laser discs
23. CD-ROM
24. Authoring software (e.g., Hypercard or Linkway)
25. Video camera and/or editing equipment
26. Programming
27. VCR

For questions 28-32 use the following scale to indicate whether you feel you can access and use technology:

a. Yes
b. Sometimes
c. No

28. I have access to a computer for classroom instruction.

29. I have access to a computer lab.

30. I have access to a computer for teacher tasks.

31. Every teacher should be provided with a personal computer.

32. I receive technical assistance at school when I need it.

For questions 33-38 use the following scale to estimate the percent of instructional time you use for each teaching activity:

a. 0%
b. 1-25%
c. 26-50%
d. 51-75%
e. 76-100%

33. Lecture

34. Class discussion

35. Student questions/answers

36. Inquiry or guided discovery

37. Cooperative learning groups

38. Other. Please specify here:_____

Note: Some of the items on this survey were adapted from a survey for the National Science Foundation - 21st Century.

Evaluation Report:
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