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ABSTRACT

Addressed to local school district policy makers, this plan reflects the State of New Jersey Department of Education's continuing effort to respond to the educational technology needs identified by the state's school districts. The purpose of the plan is to describe the department's role in assisting all districts in the development of policies, practices, and programs to increase and extend student learning through the use of educational computing and instructional television. The plan is divided into four major sections: (1) a summary of the rationale for technology use in the classroom as identified on a national and statewide level; (2) a brief review of current practices and research on the instructional uses of computers in education, computer equity, instructional television, and emerging technologies; (3) a discussion of existing technology-related services provided by the New Jersey Department of Education; and (4) a statement of department objectives and strategies for improving technology use in New Jersey schools. Two appendixes include a list of suggested readings on policy and research in the use of various forms of educational technology, and a list of the available resources in New Jersey. (55 references) (GL)

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EDUCATIONAL TECHNOLOGY IN NEW JERSEY: A PLAN FOR ACTION

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COMMISSIONER'S FOREWORD

The age of the computer as a classroom tool has arrived. According to a recent survey, every New Jersey school district that contains a secondary school reports having a computer education program; and almost every elementary school district reports that it provides students with some educational experience with microcomputers.

National reports on the status of education in American public schools recommend that students be able to demonstrate proficiency in using computers prior to high school graduation as a way to prepare for their future academic, business and vocational experiences. These reports also advocate that the use of computers be fully integrated into all curricular areas and used as both an instructional aid for students and as a management tool for teachers to diagnose and address students' needs.

Educational Technology in New Jersey: A Plan for Action reflects the State Department of Education's continuing effort to respond to the educational technology needs identified by New Jersey districts. The purpose of the plan is to describe the department's role in assisting all districts in the development of policies, practices and programs to increase and extend student learning through the use of computers and other forms of educational technology. This plan is addressed specifically to the local district policy makers. Using the resources described in this document, districts are encouraged to develop or expand their own educational technology plans and programs.

Saul Cooperman
Commissioner

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Introduction

The primary mission of the New Jersey State Department of Education is continued educational improvement for all public school students in kindergarten through grade twelve. Educational technology assumes an important role in this mission for educational improvement. The purpose of Educational Technology in New Jersey: A Plan for Action is to encourage districts to develop or expand their educational technology plans. This document describes the department's role in helping districts develop policies, practices and programs to extend student learning through the use of educational technology.

Although the term "educational technology" covers a wide range of processes and devices, this document focuses on the most widely used forms of educational technology in New Jersey: educational computing and instructional television. Future documents will address emerging technologies (e.g., interactive videodisc, microwave transmission, telecommunications) as they prove their value as educational tools.

This plan will present the rationale for technology use in the classroom, discuss current research, describe needs, identify department objectives and strategies for implementation, and outline issues to be addressed by the New Jersey School Leaders in Educational Technology Committee. This advisory committee will develop recommended guidelines for use by New Jersey districts as they develop or expand their educational technology plans.

This document is divided into the following four major sections:

- A summary of the rationale for technology use in the classroom as identified on a national and statewide level;
- A brief review of current practices and research on the instructional uses of computers in education, computer equity, instructional television, and emerging technologies;
- A discussion of existing technology-related services provided by the New Jersey Department of Education; and
- A statement of department objectives and strategies for improving technology use in New Jersey schools.

Two appendices are included. Appendix A contains a list of suggested readings concerning policy and research in the use of various forms of educational technology. Appendix B contains a list of the available resources in New Jersey.

Section I: Identification of Need

Should Computers be Used in the Classroom?

Although many forms of technology are currently available for classroom use, the most prevalent and therefore the focus of this needs section, is the computer. The computer is a powerful and complex tool. Like any educational tool, the computer comes with inherent advantages and disadvantages. It is more appropriate for some instructional uses than others, and is more suited to some teaching styles than others (Kelman et al., 1986). Although the computer is not the single means to improve instruction, it can be an extremely effective educational tool.

Research suggests, and current practices demonstrate, that teachers who use the computer for instructional purposes can enlarge the scope of teaching and student learning by:

- Increasing the range of relevant curriculum materials to support curriculum objectives;
- Selecting appropriate computer materials to correct students' faulty learning strategies;
- Using tutorial programs to assist students in acquiring skills not mastered through other teaching techniques;
- Increasing students' motivation and attention by allowing them to work at their own pace, and to feel in control of their learning process through interacting with the computer;
- Taking advantage of the computer's flexibility to allow for individual instruction and learning styles;
- Tapping the information storage and retrieval capabilities of the computer;
- Bringing simulations, demonstrations and otherwise impossible settings for learning into the classroom;
- Providing a motivating atmosphere for collaborative learning; and
- Providing practical experience for everyday living and for job entry skills.

NOTE: See the Review of Technology Research in Section II of this document for more information on the various uses of computers and instructional television in the classroom.

National Reports - Recommendations on Computer Education

Computers and computer-controlled equipment are affecting every aspect of our lives -- homes, factories and offices (A Nation At Risk, 1983). Several national reports on the status of American education state that the advance

of technology will greatly affect job opportunities and job requirements. These reports recommend that computer literacy be included among the basic skills that are required for all high school graduates (A Nation At Risk, 1983; Action for Excellence, 1983; Academic Preparation for College, 1984; High Schools and the Changing Workplace, 1984).

The Final Report of the Advisory Council on Mathematics and Science Teacher Supply and Demand (1983) recommends that computers be fully integrated into all curricular areas in the public schools and used as both an instructional aid for students and as a management tool for teachers to diagnose and address students' needs. Many school systems are developing specific programs to address the issue of training in the "fifth basic" -- computer literacy.

> For the purpose of this document, computer literacy is defined as the computer-related skills, knowledge and values needed to function effectively in a society that is increasingly dependent on computer technology for handling information and solving problems. The particular skills and knowledge needed will vary from time to time due to student needs and the changing status of computer technology. At a minimum, computer literacy programs* should instruct students in the following:
>
> - How to operate a computer;
> - The capabilities and limitations of computers;
> - The function of computer programming;
> - Common applications (e.g., word processing, database management);
> - The effects of computers on society;
> - The ethical use of computers.
>
> *The term "program" does not necessarily imply a separate course. Currently, two approaches to computer literacy programs are: 1) offering computer literacy as a distinct course, and 2) integrating computers into the existing curriculum (Bork, 1985).

What Other States are Doing in Computer Education

Due to the various local needs identification processes, and the recommendations for computer education outlined in the various national reports just cited, most states have adopted an instructional objective to provide students with computer skills of one kind or another. In some cases, that objective is the result of a state mandate; in others, the result of local decision making (Spain, 1984). Over half of the states -- 26 -- have some form of computer literacy requirement (Reinhold, 1985). These requirements take many forms. In a few states, such as Texas and Tennessee, the Department of Education (DOE) mandates a specific series of goals and teaching strategies. The Texas DOE, not the local school districts, sets the course curriculum and content. In Tennessee, all

students are required to take a standard course called "Computer Skills Next" in the seventh or eighth grade. As in Texas, the course curriculum and requirements are set by its Department of Education, not by the local schools.

Most states have not mandated a statewide curriculum for computer literacy. New York, New Jersey, and Maryland, for example, leave curriculum development to the local districts. The state education departments in these states encourage improvement in district computer education programs primarily by providing support to local initiatives. Other states such as South Dakota and Vermont add the imperative of a legislative mandate to offer computer literacy. For example, in South Dakota, all students must take a required half-unit computer studies course during ninth or tenth grade. The South Dakota DOE recommends guidelines, but course content is designed at the local level. Vermont requires schools to allow students access to computers either through a course or by integration into the curriculum, but leaves the implementation decision to local discretion. In the states previously mentioned, the DOE coordinates activities statewide and provides technical assistance and in-service education. In most cases, these state education departments also disseminate information, and offer recommendations and guidelines for local districts to follow.

Computer Education Needs in New Jersey

In New Jersey, several methods have been used to identify computer education needs. All school districts go through the local district planning process each year. Through this process, needs are identified and priorities established for addressing those needs. In the 1983-84 school year, all 21 county offices of education in New Jersey identified computer literacy for students as either the number one or number two priority of the school districts in their respective counties. More than 70 percent of the northern and central districts, and 84 percent of the southern districts, named computer education as the number one need.

In September 1983, the New Jersey State Department of Education sent out a survey to determine the extent of the instructional uses of computers in New Jersey schools. One section of the survey was devoted to the training needs of teachers. More than 410 of the 595 school districts responded to the survey. Districts indicated a high degree of interest in obtaining training for their teachers in all areas regarding the use of technology as an instructional tool. A second survey on district uses of computers in instructional settings was conducted in the 1984-85 school year. Results show that between 1983-84 and 1984-85, the number of computers used in New Jersey classrooms more than doubled.

The first survey revealed that all curricular areas drew requests for training, but a major training interest was computer literacy and computer awareness. This reinforced another finding of the survey, that more than 60 percent of the responding districts had less than half of their teaching staff trained in the uses of computers.

In 1984, the School Leaders in Educational Technology Committee was formed by the Department of Education to serve in an advisory capacity on technology issues. This committee is composed of representatives from two school districts in each county and of representatives from each county superintendent of schools office, regional curriculum services units (RCSUs), New Jersey Network, and the New Jersey State Library. The "School Leaders" committee provides the department with information directly from the field, and meets twice a year to discuss the state of technology in educational settings. The first meeting, in the spring of 1984, was devoted to identifying the needs of classroom teachers regarding the uses of educational technology. The major finding of this session was that training district staff in computer literacy was the first step to bringing computer literacy to students. A second finding was that teachers who were already computer literate needed further training in integrating the computer into all phases of the curriculum.

Finally, professionals from the State Department of Education's Educational Technology Unit and the educational technology training centers (ETTCs) maintain knowledge of current issues, and keep abreast of future trends in educational technology and computing. Thus, indicators from all of the methods used to identify computer education needs in New Jersey point to the same conclusions. The overwhelming consensus is that training teachers is of paramount importance in meeting the needs of students to be computer literate. Further, if a primary goal is integrating computers into all curricular areas, training must be seen as an ongoing process.

Cost Factors for Using Technology in Education

"In all the enthusiasm for classroom computers, an assumption that has gone largely unchallenged is that these machines, with appropriate programs, could teach students knowledge and skills both efficiently and effectively" (Cuban, 1986). Two issues must be addressed to determine whether the use of technology in the classroom is merited in terms of efficiency and effectiveness.

1. Can the computer and other forms of technology be used effectively to prepare students for their academic or vocational futures?

2. Can the use of computers and other forms of educational technology (e.g., television) help students to learn better, faster, and more cheaply than other instructional tactics (Cuban, 1986)?

Naisbitt (1984) projects that computer use in the schools is on the upswing for the following reasons. "First, computers offer a cost-effective albeit capital-intensive way of individualizing education. Second, computers simplify the extensive recordkeeping required for individualized instruction thus providing the teacher with more time to spend with the students. Third, familiarity with computers is now considered a strong vocational advantage, a salable skill (p. 28)."

A student with computer experience possesses a distinct advantage in the job market. Not only have new jobs been created as a result of the expanding computer industry, but careers, for which computer experience formerly was

seen as a bonus, now require computer experience upon entry (Rose, 1982). Arthur Luehrmann, a leader in educational computing, estimates that 10 to 20 hours of actual hands-on computer experience translates into a $1,000 annual salary advantage (in Naisbitt, 1984). Finally, a report published by the National Association of Secondary School Principals (1984), reminds educators that although high-tech costs are great, the costs of not educating students and preparing them for the future are astronomical.

Can computers and other forms of educational technology (e.g., television, interactive videodisc) help students learn better, faster, and more cheaply than other instructional tactics? Individuals differ in their abilities, their rates of learning, and often even in their general approaches to learning. Computers are useful tools for individualizing instruction.

> Unfortunately, the cost of providing individualized instruction that adapts to student differences is prohibitive if it depends on the use of professional teachers. For example, consider what it would cost to reduce present classroom size to four or five students per teacher. The computer offers perhaps the most practical hope for a program of individualized instruction under the supervision of a single teacher in a classroom of 25 to 35 students. The basis for this practical hope is the rapid operation of the computer, which enables it to deal on an individual basis with a number of students simultaneously and thus lowers the cost per student (Suppes, 1967).

An evaluation of computer-assisted instruction (CAI)* made by the U.S. Office of Technology Assessment (OTA), affirmed its effectiveness and relative economy - an argument taken up by manufacturers who have made claims that personal computer instruction may cost as little as 30 cents per student hour, compared with $2 per student hour of conventional classroom instruction (Emmett, 1983). (*See the Review of Technology Research - Section II for more information on the use of CAI.)

In another project, economist Henry Levin and his associates chose four common approaches policy makers take to improve math and reading skills: reducing class size, increasing the amount of time devoted to skill instruction, tutoring, and computer-assisted instruction. According to Cuban (1986), the researchers collected all studies done on these strategies and statistically analyzed their findings. They priced what each component of the strategy would cost. Combining the known effects of each approach with its total costs, the researchers produced a cost-effectiveness ratio. Researchers found that CAI placed second overall in terms of cost effectiveness. CAI was more cost-effective than reducing class size from thirty-five to thirty or even to twenty students. Students teaching students (peer tutoring/collaborative learning) emerged as the most cost-effective approach, and increasing the amount of traditional instruction time devoted to math and reading was by far the least cost-effective (Levin, Glass, and Meister, 1984).

Research is emerging on the use of the computer as a collaborative learning tool (Sheingold, 1983; Daiute, 1986). Students work with their peers at the computer -- writing, sharing ideas, and working through exercises together. The use of the computer as a collaborative learning tool may prove to be a highly cost-effective means for delivering instruction.

Instructional television (ITV) has also been examined in terms of its effectiveness and efficiency in delivering instruction. Research suggests that students can learn quickly and efficiently from ITV and that it is a motivating and cost-efficient means for delivering instruction (Biggy, 1983; Cohen, Ebeling, and Kulik, 1983; Schramm, 1964, 1977). Computers, ITV and emerging forms of educational technology such as the interactive videodisc can be enormously successful and cost-effective in terms of providing simulations, demonstrations and bringing otherwise impossible settings for learning into the classrooms.

In summary, evidence supports the use of the computer and instructional television as both a means for directly preparing students for their vocational and/or academic future, and as an effective and efficient means for delivering instruction.

INITIAL RESPONSE TO IDENTIFIED NEEDS

In response to the needs identified, many states are providing guidelines on the content and objectives of computer education programs. Publishers are marketing textbooks and software for use in these programs. The College Board has suggested computer-related competencies that all college-bound students need; it also has established an Advanced Placement Computer Science course that uses the Pascal programming language. Colleges and universities such as Carnegie Mellon, Drexel, Drew, the New Jersey Institute of Technology and the Stevens Institute of Technology are requiring entering students to purchase computers. Universities are also encouraging students to use computers in their academic work by providing on-campus access to computers and by wiring the campus to facilitate communication among various computer facilities.

In response to the challenge of creating computer education programs to address the needs posed by the increasing use of computers in society, districts and schools are adding or modifying existing courses. Specifically, they are establishing computer literacy courses, expanding their computer science offerings and integrating computers (e.g., word processing, database management, use of spreadsheets) into the curriculum. Some districts are undertaking the more complex task of infusing computer literacy objectives throughout their K-12 program (Report on Educational Uses of Computers in New Jersey School Districts, 1985). The department's goal is to help all districts develop computing and technology-related plans and programs to meet the challenges posed by today's highly technological society.

Section II: Review of Technology Research And Current Instructional Practices

The following section contains a brief review of literature on the uses of computers and television in education. This review is included as background in this area of educational research. The review also contains an examination of research on the social aspects of computer use, specifically focusing on equity issues. To demonstrate those areas in which computers are being used effectively, a summary of current instructional practices is included. Finally, the characteristics of successful educational technology programs and practices are presented.

NOTE: Appendix A contains suggested readings for those who are interested in a more comprehensive review of the computers in education literature. This appendix also contains a list of literature that focuses on other forms of educational technology such as instructional television, film, and interactive videodisc.

THE RESEARCH ON COMPUTERS IN EDUCATION

Much of the research literature related to the educational use of computers discusses issues related to computer instruction (Southeastern Regional Council for Educational Improvement, 1984). These issues involve such questions as:

- What is the most effective use of computers?
- What students will benefit most from using computers, and in what manner?
- How can one select software that best fits teachers' and students' educational needs?
- How do we ensure that all students have an equal opportunity to learn with and about computers?
- What is the best configuration of machines?

These issues should be explored by educators before implementing computer education programs. Although current research does not answer all of these questions, it does provide some direction for the effective use of computers in the classroom. In this research summary, the various forms of educational computing will be classified according to the "tutor/tool/tutee" framework advocated by Taylor (1980). This framework provides a simple scheme for grasping a somewhat confusing range of activities.

The Computer as Tutor

To function as a tutor in some subject, computer programs are developed by programmers in conjunction with subject area specialists (Taylor, 1980). Computer-Assisted Instruction (CAI) is an example of using the computer as a tutor. CAI is a method of teaching in which subject material is presented under computer control, the student responds, the computer evaluates the

response and determines what to present next. The following studies represent a sample of the research that has been conducted in the area of CAI.

- Kulik, Bangert and Williams (1983) conducted a meta-analysis to integrate the findings from 51 independent evaluations of computer-based teaching in grades 6 through 12. The analysis showed that students who received computer-based instruction scored better on objective tests than students who received traditional instruction only. These students improved their speed and retention of learning, and developed positive attitudes toward the computer and toward the courses they were taking.

- A four-year study (Rogosta, 1983) conducted by the Educational Testing Service at four elementary schools in the Los Angeles Unified School District dealt with various combinations of CAI in mathematics, reading, and language arts. Each of the three curricula were found to be effective in increasing academic achievement on both standardized and curriculum-specific tests.

- Burns and Bozeman (1981) conducted a study to analyze and integrate research findings relative to the effectiveness of CAI as a supplement to mathematics instruction in elementary and secondary schools. A meta-analysis of the research indicated that mathematics instructional programs supplemented with drill and practice or tutorial CAI was significantly more effective in fostering student achievement than a program utilizing only traditional instructional methods.

A comprehensive review of research on computer-assisted instruction by Gleason (1981) and Atkinson (1984) supports the following conclusions:

- CAI does have a significant effect on student achievement, especially when used with supplementary materials.

- CAI may be especially effective with both lower-ability students and for special education.

- CAI can assist learners in attaining specified instructional objectives.

- A substantial savings (20 to 40 percent) in time can be achieved for learning as compared with "conventional" instruction.

- Retention following CAI compares well with retention following conventional instruction.

- Students can learn faster with CAI.

Despite the positive findings discussed above, CAI is not without its critics. Some teachers prefer to use CAI for minor support in the classroom while others prefer to use the computer in other capacities. Many educators feel that CAI is too controlling and leaves no room for spontaneity. No matter how many options the students have in using a drill program, the program maintains control.

Although not all educators agree that CAI is the best use of the computer, research suggests that it can be effective. Perhaps the most significant finding is that students profess to enjoy working at their own pace, and to feel in control of their learning process through interaction with the computer (Bracey, 1982).

The Computer as Tool

The computer is a tool when it runs programs that perform one specific task (e.g., data processing, word processing). In tool mode computing, the user can explore only those activities and ideas for which the tool at hand is appropriate. Examples of the computer used as an instructional tool include information or data processors, word processors, numerical analysis programs, high resolution graphics software and sound synthesizers. In the tool mode, studerts can use the computer to help them in a variety of subjects. For example, word processing and information management programs can be used effectively across the curriculum.

Research on the effects of using the computer as a tool is minimal. However, various educational groups report on the effects of using the computer as a classroom tool and the results, although not research-based, are encouraging and positive. For example, some teachers have found that children write and revise more willingly and more freely using computer word-processing programs than they do with traditional writing instruments. According to Daiute (1983), word-processing programs are writing tools that can help simplify the physical aspects of writing. When physical burdens such as erasing and recopying are removed, many writers feel they are freer to be creative because mistakes have less physical consequences.

A vital aspect of using computers in instruction, which is being addressed with increasing frequency, is the student's ability to access, manage, and utilize information. According to Hunter (1984), data base management programs that enable users to design, build and use collections of information are providing opportunities for student inquiry, problem solving and skills development. Because of the scope and breadth of information that is exploding into our realm of knowledge, the ability of students to discover and use that information is quickly taking its place along with the basic skills of reading, writing, and mathematics. Therefore, information management may well represent a new basic skill necessary to function productively in an information-oriented society.

The Computer as Tutee

To use the computer as tutee, the student must learn to program the computer. When the student writes a program, he or she is "teaching" the computer to do something. Arthur Luehrmann (in Taylor, 1980) argues that in teaching the computer, the child learns about the process of learning. The programming process also encourages students to reflect on and critically use their own thinking process. According to Taylor (1980), the extended use of the computer as tutee can shift the focus of education in the classroom from end product to process, from acquiring facts to manipulating and understanding them.

Seymour Papert (1980) of the Massachusetts Institute of Technology believes that computer programming involves intellectual activities that improve young programmers' abilities to solve problems. However, as with other forms of research on the effects of computers in education, research on the teaching of computer programming for the development of problem-solving and logical thinking skills is nascent and inconclusive (Pea and Kurland, 1984).

COMPUTER EQUITY RESEARCH

With the introduction of microcomputers into schools, educators are presented with an exciting new and costly tool for instruction. Yet in the midst of this new and exciting technological change, a familiar dilemma is present. Richer schools are acquiring computers more rapidly than poorer schools, giving their students a distinct advantage in competing in the job market of the computer age (Peer Computer Equity Report, 1984). A 1983 Johns Hopkins University study found that only 64 percent of high schools in low income, rural and predominantly minority areas had computers, compared with 86 percent of schools in more affluent suburban communities, particularly in the Northeast. The Department's study, Report on Educational Uses of Computers in New Jersey School Districts (1984), found that districts in higher socioeconomic categories have greater experience using computers, lower student-to-computer ratios, and a greater percentage of staff training than lower socioeconomic level districts.

Basically, there are two main issues relating to computer equity and students: differential access and differential use based on student characteristics such as gender, race, English language proficiency, achievement level, disability or socioeconomic status. Another equity concern is software that is biased or stereotyped.

The American Institute for Research (1985) examined over 300 actual situations and behaviors that impeded student/computer access and use in grades one to nine. Twelve barriers were identified:

- Lack of encouragement for females and minority students to use computers;
- Potential value of computer learning more apparent to males than females;
- Prerequisites irrelevant for computer access and instruction;
- Under-representation of females in computer leadership roles;
- Pressure from peers not to participate in computer activities;
- Under-representation of females and minority students in computer clubs;
- Inappropriate location of computers within schools;
- Shortage of qualified personnel for computer learning;

- Inability of teachers and students to recognize and deal with problems in computer learning;
- Bias against females and minorities in software and advertising;
- Limited computer access for females during free time at school; and
- Dominance by one student over another during computer time.

The department's Office of Equal Educational Opportunity states that, in New Jersey high schools, females are under-represented in computer programming courses and males are under-represented in courses teaching word processing and clerical uses of computers (The New Jersey State Department of Education's Annual Fall Survey, 1983-84). Limited English Proficient (LEP) students may not be able to participate in many instructional uses because software is overwhelmingly in English. In interracial, interethnic situations, there is a need to determine if higher status groups have more access. Girls, minority boys and LEP students need to be targeted and especially encouraged to participate in informal uses of computers such as clubs, newsletters and internal communication systems.

The tutor/tool/tutee (Taylor, 1980) framework can be useful for examining differential computer use based on sex, race, national origin, achievement level, disability or socioeconomic status. For instance, current surveys suggest that although some districts are using computers with all students, use is differentiated, with disadvantaged students most likely to use computers as a tutor for reinforcement of basic skills, and "gifted and talented" students most likely to use the computers as a tool or tutee to develop programs or explore creative uses of computers (Using Computers for Instruction, 1984). According to Rose (1982), at first glance this practice may appear as one that meets individual student needs, but in actuality, it is creating two levels of computer knowledge based on assumptions about student capabilities to deal with technology.

In summary, educators must ensure that all students have an equal educational opportunity to learn. As directors develop and implement comprehensive plans for instructional uses of computers, they need to be alert to any emerging differential access to and usage of computers based on student characteristics of race, sex, national origin, limited English proficiency, achievement level, disability and socioeconomic status.

THE RESEARCH ON INSTRUCTIONAL TELEVISION

Generally speaking, research shows that television can both entertain and instruct. It can impart knowledge, skills and attitudes. Furthermore, children tend to learn what they see on television more thoroughly than through other medium. Some of the research conducted in the 1960s and 1970s on Sesame Street, Electric Company and Freestyle shows that the cognitive and attitudinal skills these series were designed to provide were, in fact, learned by the children viewing them (Johnson, 1984). Significantly, children learned more when these programs were viewed under the direction of a teacher or parent. Research on Sesame Street shows that television can make a child an active participant (Lesser, 1974). Patricia Greenfield,

author of Mind and Media, also notes that while television can create or reinforce stereotypes, it is so powerful a medium that with careful planning it can also be used to break down social stereotypes.

Instructional television (ITV) series have several integral elements which make them particularly well-suited for use as a classroom learning tool. These elements include the involvement of experts in the areas of content, production and pedagogy; design with a specific audience in mind; and a realistic curriculum with a clear set of goals (Mates, in Palmer and Dorr, 1980). Various studies, from Wilbur Schramm's in 1964 to Virginia Biggy's in 1983, have come to some conclusions about ITV and learning:

- ITV captures students' attention;
- Students can learn quickly and efficiently from ITV;
- ITV can produce significant improvements in academic achievement, despite differences in cognitive skills, resources, and socioeconomic backgrounds. Both the brightest and slowest students can derive some benefits from ITV;
- ITV offers a change of pace from the traditional classroom. It adds variety, range and interest;
- ITV can provide opportunities for learning outside the student's realm of experience;
- ITV is remarkably cost-efficient and inexpensive compared to multiple dollars spent on textbooks and other school materials; and
- ITV motivates future learning.

In view of all these positives, educators are just beginning to realize that they can provide an instructional relationship to their students with television. Research suggests that instructional television is most effective when it is used as a resource which is part of the overall classroom lesson; a resource selected by the teacher as an effective means of instructing students (Corporation for Public Broadcasting, 1976-77, 1982-83).

Corporation for Public Broadcasting (CPB) research has initiated a systematic program of research in the use of the various media in education at both school and home. The CPB research (1976-77, 1982-83) provides the following data:

- An estimated 18.5 million students receive some of their instruction via television in 1982-83; 14.5 million receive such instruction regularly.
- Television for instruction is available to approximately 71 percent of U.S. teachers. Approximately 37 percent use television for instruction in 1982-83; 30 percent use it regularly.

- Across school levels teachers reported increased use of television since 1982. One-third or more teachers reported increased use with the largest increase (38 percent) among senior high teachers. One-fourth reported decreased use with the largest decrease (29 percent) among elementary teachers.

- The videocassette recorder (VCR) assumed an increasingly important role in the classroom. Three-fourths of all schools have one or more recorders available in 1983, compared with just one-third of all schools in 1977.

In summary, the studies indicate that the use of instructional television has remained stable from 1976-77 to 1982-83. Teachers using television are using it more often and spending more time integrating the television lessons into classroom activities.

New Jersey Public Broadcasting Authority's (NJPBA) Division of Educational Services conducted a study, the results of which showed that 40 percent of New Jersey high schools use New Jersey Network (NJN) programming (Temkin, 1982-83). This study indicated that the network's broadcasts are used in nearly one-half million class sessions each year. These sessions account for more than 12 million viewing periods per year. These statistics confirm earlier studies conducted by the New Jersey State Department of Education and NJN which indicate that more than 73 percent of responding New Jersey districts reported using NJN educational services. These studies also indicate that more than 1,800 New Jersey schools at all levels use instructional programming, and that approximately 250,000 New Jersey students view K-12 programming daily.

EMERGING TECHNOLOGIES

The issues being addressed for technology currently in use (e.g., effectiveness, appropriate use, cost efficiency) will undoubtedly arise with new and emerging technologies. The challenge for educators is to explore these new technologies as they are proven to have a positive impact on instruction.

Interactive videodisc (IVD) technology has become increasingly popular in the past few years. IVD technology joins the storage and playback capabilities of video technology with the interactive capabilities of microcomputer technology. This union is highlighted by the use of realistic video images and rapidly accessed segments of information. IVD offers the opportunity to enlarge the scope of relevant curriculum materials by giving students experiences not otherwise available in the classroom. For example, students can interactively journey far into space or deep within the molecular structure - the possibilities are limited only by the imagination.

Similarly, telecommunications, teleconferencing, satellite communications systems and videotext represent some of the new technologies which may have a significant impact on education. Use of these technologies will create a significant challenge for students, educators, the community, and society in general.

CURRENT INSTRUCTIONAL PRACTICES

Nationally, educators are finding effective uses of computers for their instructional programs. The following list illustrates some of these applications. While all of these applications are not widespread in use, they are listed to provide insight on the potential use of computers and computer-related technologies in classroom instruction.

- Science teachers are using the computer as a tool to manipulate laboratory data. These teachers are also finding computer simulation programs in chemistry, biology and physics, a solution to presenting phenomena which are difficult to control and observe under normal classroom conditions.

- Business teachers using integrated accounting packages, electronic mail, scheduling, word processing, spreadsheets and data base management programs are able to prepare their students for careers in information technology and accounting. Marketing education students use microcomputers for training in inventory control, sales control, travel and hotel industries, financial analysis and financial services, advertising, graphics, credit checks, marketing, business management, purchasing and many fields of retailing.

- Health, physical education and home economics teachers are using computer programs which promote the understanding of physical fitness, family life education and nutrition.

- In the area of health occupations, software which mirrors the professional environment is becoming widely used. Computer programs which allow for patient monitoring, retrieving patient drug profiles, patient recordkeeping, patient scheduling and research data bases, are all being used in the classroom. In addition, activities simulate clinical situations which teach students problem-solving techniques.

- Home economics and consumer education teachers are using computers to teach students how to: use money management principles and consumer skills; analyze diets for nutrient content; plan nutritious and cost-effective meals; develop floor plans; analyze interior design models; apply line, color and design principles; identify potential home safety and security problems; and apply theories in child development and family living through simulated experiences. Students also study the impact of changing technology on home and family life. Topics of study may include: computer purchasing; invasion of privacy; changing work roles; and computer-directed home maintenance and operations.

- There are many applications of computers in the home economics related occupational areas. In the commercial food services

areas, for example, students use the computer for food purchasing, inventory, cost analysis and position control. Clothing occupations students learn about the industrial application of computers in design, pattern layout and construction.

- Music teachers are using computers to teach abstract musical concepts and music composition.

- Art teachers are exploring computers as a new medium to help students explore perspective, dimension, spatial relations and composition.

- Trade and industrial education teachers using computers in such areas as computer-assisted drafting, computer-assisted manufacturing, robotics and automated repair are able to train students for future studies and careers in business and industry.

- Agriculture education teachers are using the nationwide Agriculture Education Network to access a dial-up interactive information and communication service. Teachers and students can connect the classroom to the AgriData computers over toll-free lines to obtain educational materials and up-to-the-minute news, market and weather information. Teachers are training students to manage farming and agribusiness operations through the use of microcomputers and appropriate software.

- Special education teachers are using computer-assisted instruction programs to reinforce, enrich and diversify instruction for their students. Physical devices attached to computers provide access to the physically handicapped.

- Bilingual education and foreign language teachers are using the voice synthesis capabilities of computers to assist students in learning languages.

- English teachers are using word processing as a tool to teach writing skills. Story-processing programs that contain word-processing and graphics capabilities are being used as creative writing tools.

- Mathematics teachers are discovering ways in which computers help students with problem-solving activities, mathematics concepts, graphical representations and skill building.

- Programming teachers are using computer languages such as Pascal and Logo to teach structured programming skills. Business-oriented programming languages such as RPG and COBOL are also being offered.

- Social studies teachers are using computer simulation programs to demonstrate abstract concepts such as the dynamics of social, economic and political systems.

- General academic, remedial, computer science, and teachers of the gifted and talented are using computer software to reinforce higher-order thinking skills.

- Database programs that allow students to search for, manage and use information are also providing students with powerful research tools. The use of such tools prepares students for future academic studies.

- Interactive videodisc technology, combining the search and speed capabilities of the computer with the realistic images of video are providing educators with software which can be adapted to a variety of learning experiences.

- Instructional television, film and video are being used in science, social science, language arts and reading classes. Instructional programs are also being developed that involve the use of computers and television or video in the writing class as well as other discipline areas.

- In addition to made-for-instruction television programming, teachers are taping programs that are educationally effective, such as National Geographic specials, Nova and Shakespearean plays.

CHARACTERISTICS OF SUCCESSFUL PRACTICE

The developments noted here provide the basis for evaluating the use of technology in the schools. The effective use of technology directly reflects research related to effective schools and effective teachers. Well-organized strategies, staff development, instructional program development, and careful, long-range planning with goals, policies and guidelines, should be in place in every school system (Boyer, 1985; Becker, 1982).

Research indicates and current practices demonstrate that computers can be used to enhance and extend student learning. The potential and the relative cost of computer technology presents local decision makers with tough choices. No ideal configuration of machines and applications has been developed and evaluated. Instead, each district must consider the options and decide what applications of computers it will implement, what configuration of hardware and software it will purchase, and what resources it will allocate to that effect. Districts that are making the most effective use of technology have the following characteristics:

- Are motivated by specific needs (e.g., achieve specific student outcomes, improve the efficiency of instruction in a content area);
- Establish an ongoing planning process which involves staff in setting goals, studying alternatives, weighing costs and benefits, and developing specific plans;
- Allocate resources not only for hardware and software, but also for management and staff development;
- Monitor implementation and evaluate effects; and
- Take corrective action based on information collected.

In summary, each school and district must have a systematic approach to the use of computers and other forms of educational technology. Haphazard purchase, location, and scheduling of equipment must be avoided. Technology is part of the student's future, and educational policy makers must accept the responsibility of sensible planning in the present.

Section III: Existing State Services in New Jersey

This section outlines services that are currently provided by the state to local educational agencies.

The New Jersey State Department of Education has formed an information network committed to assisting districts to develop and expand their educational technology programs to ensure equal opportunity for students and training opportunities for teachers.

This network:

- Maintains three regional educational technology training centers (ETTCs) under the governance of the regional curriculum services units (RCSUs). The ETTCs provide the following services to New Jersey educators:

  - Training workshops in the application and evaluation of hardware and software;
  - Demonstration sites for hardware and software:
  - Information dissemination;
  - Public domain software depository;
  - Review library which contains over 400 pieces of software, technology-related books, periodicals and curriculum materials; and
  - Evaluation services: EPIE (Educational Products Information Exchange) Software and Hardware Profiles; TESS Software Directory; Digest of Software Reviews: Education.

  ETTC services are available free of charge to teachers, administrators, support staff and board of education members concerned with the education of K-12 students. The location of each ETTC is listed in Appendix B.

- Maintains and disseminates information pertaining to technologies that impact education.

- Maintains ongoing communication with districts through News CLIPS, the Technology Unit's newsletter. Reports promising practices both statewide and nationally; describes new and emerging technologies; and identifies knowledgeable people to share ideas and develop plans.

- Operates the Educational Technology Network (ETN), a statewide telecommunications network to link districts with the central office and the regional curriculum services units (RCSUs). This telecommunications network provides immediate access to current research, software evaluations and technology-related activities available throughout the state.

- Addresses one issue of the equitable use of technology by establishing pilot programs in three urban districts. These programs include the creation of 31 classroom computer laboratories and extensive teacher and administrator training.

- Provides information about computer hardware/software evaluations through a contract with the Educational Products Information Exchange (EPIE).

- Cooperates with the New Jersey Network in supporting various instructional television programs in such areas as problem-solving, writing and computers.

- Conducts statewide surveys on the educational uses of computers and disseminates findings to all local school districts.

Computer and technology-related activities are occurring in other educational areas. Some of these activities are highlighted below.

- In special education, the Learning Resource Center Projects are providing the following computer-related activities and services during the 1985-86 school year:

  First, the four learning resource centers (LRCs) for special education have each developed a software preview center for teachers, parents and students. The centers will be completing software description forms on all software that is available at each center. These descriptions will be made available at the LRCs and possibly via SpecialNet--a telecommunications system for special education.

  Second, the Division of Special Education sponsors an annual computer conference for special education teachers on such topics as hands-on training in specific applications to meet classroom needs.

  Third, the division conducts training sessions in computer-assisted instruction for resource room teachers. The sessions are designed to:

  - Familiarize resource room teachers in the use of computer-based learning materials;

  - Provide resource room teachers with a model for effective use of existing computer-based learning materials; and

  - Provide strategies for building problem-solving skills through the use of open-ended tools.

- In vocational educatior, funding is provided to districts under the Carl D. Perkins Vocational Education Act of 1984 (Public Law 98-524). The funding has provided equipment to the districts to prepare students for entry level positions in the areas of industrial technology, business education, agriculture education, marketing education, health occupations education and home economics education.

Technology for Children, a program for students in grades K-8 which integrates technology topics into other subjects, is also funded through vocational education sources.

In the areas of agriculture, business, health and home economics occupations, in-service activities for teachers to demonstrate the uses of microcomputer technology in preparing students for employment. The programs range from computer literacy to advanced microcomputer applications for skill development in all areas of vocational education.

Industrial technology programs statewide are upgrading their curricula as a result of the changing technologies. These technological advances are being introduced at both the secondary and adult program levels. High school students, technicians, mechanics, craftworkers, business owners and managers, registered apprentices, licensed engineers, drafters, and journeyworkers are all receiving initial training and upgrading in the new technologies through vocational programs. Most notable are the technical applications and equipment listed below.

- Laser technology is being applied in auto body repair, avionics equipment repair and the construction trades.

- Computer technology has had an extensive impact in auto maintenance and repair, automotive energy systems repair and maintenance, phototypesetting, imagery color mixing, cosmetology, drafting, manufacturing and in the electronic security area of police and fire science.

- Computer Science curriculum, developed by an industrial committee with the aid of staff from the Division of Vocational Education, provides students with the technical skills, scientific methodologies and techniques needed to develop computer-based solutions to problems.

Finally, standards of excellence in the occupational areas of agriculture, business, health occupations, industrial arts and home economics education have been developed or are in the process of being completed for teachers and administrators to use as instructional resources.

- In the area of equal educational opportunity, a computer equity checklist has been developed so that districts can address equitable access and usage. In addition, this checklist includes suggested equity indicators for evaluating instructional software as required by New Jersey Administrative Code 6:4-1.3(e). The Office of Equal Educational Opportunity (OEEO) assists local districts in evaluating and promoting computer equity, as well as awareness workshops and print materials. OEEO also loans videotapes featuring women and minorities in computer-related careers.

- The New Jersey State Library is training librarians and media specialists in the use of computers for library services. The following workshops are conducted with an emphasis on library applications:

  - Introduction to computers
  - Word processing
  - Data base management
  - Spreadsheet analysis

  The State Library publishes Microcomputer Use in New Jersey Public School Library/Media Centers and Microcomputer Use in New Jersey Public Libraries. Both publications include a listing of libraries currently using computers, the equipment that is available and the applications being used. The State Library also maintains a file of software reviews and information on library software packages.

- New Jersey Network (NJN), working with the Department of Education's initiative to provide statewide in-service models for adoption by local school districts, has provided the following in-service television series to provide professional development in the indicated priority areas:

  - Teaching Writing - writing instruction
  - Bits and Bytes - computer literacy
  - Teaching Students with Special Needs - special education at high school level
  - Teaching Students with Special Needs - special education at elementary level

- Several projects have been proposed across the country for using existing public television telecommunications networks to provide public schools with cost-effective means of making the microcomputer a pervasive part of modern instruction. Therefore, the New Jersey Software Communications Network (NJSCN) has been proposed. A steering committee has been established in order to develop a New Jersey pilot to investigate how we might participate in the national effort for the use of telecommunications to transmit instructional software.

- Specific task forces involving department staff are addressing issues such as: equity, teacher certification, mathematics and science requirements, special education and alternative education.

Section IV: Plan for Improving Technology Use in New Jersey

This section includes a discussion of the philosophy behind Educational Technology in New Jersey: A Plan for Action, and the department objectives and strategies for improving the use of technology in New Jersey schools.

PHILOSOPHY

Educational technology, specifically computers and instructional television, can provide rich tools to support the curriculum and to increase student learning. The department recognizes that technology is not an educational panacea. Like any educational tool, technology comes with inherent advantages and disadvantages. The department's intention is to assist school districts in the development of policies, practices, and programs which make the most effective use of educational technology as guided by quality research and successful practices. The department will disseminate research information, and with the assistance of the New Jersey School Leaders in Educational Technology Committee, will develop recommended guidelines for effective technology use.

Current Diversity in Use of Educational Technology

Many districts have incorporated such technologies as television, computers, videodiscs and robotics into their instructional programs. The use and advancement of technology in the classroom is unique to every school, and ultimately, to each teacher and student. School administrators and board members must consider the needs of all their schools, teachers, students and communities, and select programs which meet these needs and create a balance. Currently, districts report that they are addressing three major goals associated with their schools' use of computers.

- To prepare students to live, learn, and work in an information society;
- To help students acquire and maintain fundamental language and mathematical skills; and
- To improve learning of specific concepts and processes associated with other subject areas.

Emerging Research and Rapidly Changing Technology

Because of the rapidly changing status of technology, specifically computer hardware and software, the New Jersey State Department of Education will continue to disseminate information about the state-of-the-art in computer hardware and software. Also, since many schools of thought on the appropriate role for technology in education are evolving, the state will continue to provide and update information about technology-related educational research and practices. Ultimately, each district must consider the options and decide for itself what applications of computer and computer-related technology it will implement, and what configuration of hardware and software it will purchase.

District Changes Due to Local Factors

Districts often have different needs and a varying intensity of need dependent upon their student population, teaching staff, and other resources including commitments that they may have already made to the use of technology. These needs are continually changing due to such factors as declining enrollment, teacher turnover, and changes in computer education programs which may occur, for example, when computer literacy needs have been met at lower grades. Recognizing the variety of needs of individual districts, the state will provide a wide range of information and services to assist districts in implementing their technology programs.

DEPARTMENT OBJECTIVES AND STRATEGIES

Based on the department's philosophy for using technology in the classroom, previously presented research and current practices, the State Department of Education will address the identified needs for technology use with the following objectives and strategies.

In-Service Training

Need - In-service training programs are necessary for educators to: 1) integrate technology into the curriculum; 2) keep abreast of new educational technology equipment and software; and 3) understand the potential and limitations of educational technology.

Objective - Provide regional and statewide in-service training opportunities in educational technology.

Strategies

1. Review the need for in-service training programs by evaluating current offerings, analyzing needs assessment data, and projecting future needs.

   Timeline: ongoing

2. Maintain the regional educational technology training centers (ETTCs) at each of the RCSUs which provide: in-service training, demonstration sites for hardware and software, a large selection of technology-related books, periodicals, curriculum materials, and software.

   Timeline: ongoing

3. Maintain the learning resource centers 'LRCs) and vocational education resource center (VERC) to provide instructional and professional resources and training for school district personnel.

   Timeline: ongoing

4. Conduct statewide professional development conferences on the uses of technology in various instructional settings.

   Timeline: ongoing

5. Identify promising district practices using technology in all subject areas and program areas, and describe those successful practices through statewide workshops and conferences.

   Timeline: 6/86 (ongoing)

6. Provide current information regarding professional development opportunities through the Educational Technology Network (ETN). ETN is a communications network hat allows educators in New Jersey to send messages via personal computer. The network links the department's central, regional and county office to participating local districts.

   Timeline: ongoing

Evaluation - The following items correspond directly to the items numbered under "Strategies."

1. Evaluate responses to feedback forms; conduct follow-up interviews; review needs assessment data (e.g., response rates of questionnaires, consistency and interpretability of responses both across and within years).

2. Included as part of overall evaluation of educational technology training centers (ETTCs).

3. Expand LRC and VERC evaluations to include specific aspects of technology component. Specific measures will include: usage rates of technology-related materials and services, training requests and attendance, feedback forms from users of materials and attendees at training sessions, number of professional referrals and follow-up interviews of those using referral services.

4,5. Feedback forms, follow-up interviews and selective examination of participating districts' technology curriculum.

6. Included as part of overall evaluation of ETN.

Software Evaluation

Need - The screening and evaluation of software is essential for educators in order to make informed instructional and purchasing decisions. Educators should be familiar with software evaluation techniques and with qualified organizations that provide such services.

Objective - Provide computer hardware/software evaluation information. All subject and program areas will be included (e.g., business education, special education, as well as general academic education). Computer software will be evaluated as required by NJAC 6:4-1.3(e).

Strategies

1. Provide Educational Products Information Exchange (EPIE) evaluation services to all school districts through the RCSUs and county offices.

   Timeline: ongoing

2. Provide evaluations on a regular basis from MicroSIFT, the Digest of Software Reviews, and other review sources such as educational computing journals.

   Timeline: ongoing

3. Hold regional software evaluation fairs for teachers to share evaluation information based on their classroom experiences.

   Timeline: 1986-87 school year

4. Develop lists of quality software based on feedback from software evaluation fairs.

   Timeline: Available June 1987

5. Prepare and disseminate resource guides containing high quality software that supports the skills assessed on the High School Proficiency Test in reading, writing and mathematics.

   Timeline: Available June 1986

6. Prepare and disseminate a resource guide which identifies computer and video materials that support the Elementary Science Curriculum.

   Timeline: Available June 1986

7. Disseminate software evaluations through News CLIPS and electronic mail via the Educational Technology Network (ETN).

   Timeline: ongoing

8. Help to form user groups to share software evaluation and other technology-related information.

   Timeline: ongoing

Evaluation - The following items correspond directly to the items numbered under "Strategies."

1,2. Feedback forms will be completed by those borrowing/using evaluation materials; follow-up interviews will be performed for subset of users.

3. Attendance, amount and type of participation will be determined. Feedback forms, follow-up interviews and amount and type of networking among participants following presentation will be evaluated.

4. Lists disseminated will be completed within stated objectives and timelines. Lists will contain feedback forms. Follow-up interviews of select users will take place.

5,6. Resource guides will contain feedback forms. Follow-up interviews of select users will take place.

7. Included as part of overall evaluation of News CLIPS and ETN.

8. Memberships and activity rates of groups, and requests from such groups for departmental and outside consultation will be determined; interviews will be conducted with participants; and benefits derived from membership in user group will be evaluated.

District Policies Must Be Guided by Research and Practice

Need - School districts need to develop educational technology policies and programs that are guided by quality research and effective practices related to the educational and developmental outcomes of using technology in the classroom.

Objective - Provide research, information and curriculum materials to guide local school districts as they develop educational technology plans and programs.

Strategies

1. Conduct workshops to assist districts in developing policies and practices for the use of educational technology in the instructional setting.

   Timeline: 1986-87 school year

2. Disseminate information regarding successful educational technology programs and research through News CLIPS, the Educational Technology Network, research monograph and professional conferences.

   Timeline: ongoing

3. Develop and disseminate recommended guidelines for the effective use of technology in the classroom. Guidelines will be developed with the assistance of the New Jersey School Leaders in Educational Technology Committee and will address such issues as equity, ethics, planning and policy development, in-service training and new and emerging technologies.

   Timeline: 1986-87 school year

4. Maintain a comprehensive set of curriculum materials, planning and policy development materials at the educational technology training centers.

   Timeline: ongoing

5. Disseminate information on emerging technologies as they are proven to have a positive impact on instruction. These technologies include robotics, interactive videodisc, Instructional Television Fixed Systems (ITFS), and telecommunications.

   Timeline: ongoing

6. Conduct and disseminate results from three computer education pilot evaluation projects. The purpose of these projects is to improve the basic skills performance of participating eighth grade students in each of three urban districts by using comput[illegible] to supplement instruction.

   Timeline: Summary report available 9/87

Evaluation - The following items correspond directly to the items numbered under "Strategies."

1. Included as part of overall evaluation of ETTCs. Feedback forms will be completed by workshop participants. Follow-up interv'ews of select participants will be performed.

2. Included as part of overall evaluation of News CLIPS and ETN; research monographs and professional conferences will include feedback forms; follow-up interviews will take place for selected users who have had the opportunity to incorporate information presented in each component of this strategy.

3. Guidelines will be developed within stated objectives and timelines. Guidelines will be disseminated to districts within stated timelines and will contain feedback forms. Follow-up interviews will be conducted with select users.

4. Usage rates of these materials will be included as part of overall evaluation of ETTCs.

5. Included as part of overall evaluation of News CLIPS and ETN; research monographs and professional conferences will include feedback forms; follow-up interviews will take place for select users.

6. Pilot projects will be evaluated in terms of: 1) effectiveness of teacher training through the ETTCs; 2) the application of computer skills acquired through ETTC training into the classroom (e.g. lesson plan reviews, self-report, observation); 3) student participation (improved performance on district standardized tests, increased motivation); and 4) the role of the facilitator team (interviews, observation). Dissemination of project results will be included as part of overall evaluation of News CLIPS and ETN.

Support Materials for the High School Proficiency Test

Need - Software and video instructional materials that support the skills assessed on the High School Proficiency Test (HSPT) are available. It is essential to identify appropriate quality instructional materials and to disseminate this information to teachers.

Objective - Provide teachers with support materials to help prepare their students for the High School Proficiency Test.

Strategies

1. Survey currently available commercial and public domain software, and identify those programs which support the skills assessed on the High School Proficiency Test in the areas of reading, writing and mathematics.

   Timeline: ongoing

2. Prepare and disseminate resource guides which list high quality software and video programs that support the skills assessed on the HSPT in reading, writing and mathematics.

   Timeline: Available 6/86 - updated regularly

3. Develop and disseminate a resource guide which describes computer systems and software that enables teachers to manage the monitoring of student competencies for the skill clusters tested on the HSPT.

   Timeline: Available 9/86

4. Conduct in-service training on the appropriate use of computer and video instructional materials to support skills assessed on the High School Proficiency Test.

   Timeline: ongoing

Evaluation - The following items correspond directly to the items numbered under "Strategies."

1. Survey results and reports concluded within stated timelines; materials located should meet stated criteria for inclusion.

2,3,4. Feedback forms and follow-up interviews will be used to check how materials were received and implemented. Eventually, HSPT scores should rise though causal relations will be extremely difficult to demonstrate short of control group examination. (NOTE: Using control groups, we may be able to show that some districts followed our suggestions and their HSPT scores improved.) Examine other testing and non-testing data from districts (e.g., standardized tests, class grades).

Information Processing

Need - It is increasingly important to use technology as a management tool to process the large amounts of information available in today's society.

Objective - Continue to inform local school districts about the capabilities of technology for information management and retrieval.

Strategies

1. Provide training on the use of the Educational Technology Network (ETN), an electronic mail system which links all districts, the county, regional and central offices of the department.

   Timeline: 2/86 - ongoing

2. Research and disseminate information on the feasibility, cost-effectiveness and instructional effectiveness of developing an electronic network for the distribution of software, databases and video programs.

   Timeline: 9/86 - ongoing

3. Disseminate information on the use of adaptive testing and other types of computerized test administration, to local school districts. Provide training programs on the use of adaptive testing as new software becomes available.

   Timeline: ongoing

4. Produce and distribute a resource guide on computer-managed instruction. This guide will identify computer systems and software programs that teachers may use to track student progress in reading, writing, mathematics or science skills.

   Timeline: Available 9/86

5. Provide in-service training on the use of various software packages for information management.

   Timeline: 1986-87 school year

6. Conduct a study on the advantages, disadvantages and cost effectiveness of using microwave for the transmission of instruction. Disseminate results.

   Timeline: Available 12/86

7. Conduct workshops and disseminate information that will assist teachers to instruct students in the skills necessary to critically evaluate the large amount of information accessible through electronic means.

   Timeline: 1986-87 school year

Evaluation - The following items correspond directly to the items numbered under "Strategies."

1. Included as part of the overall evaluation of ETN.

2. Report will meet stated objectives and be completed within stated timelines.

3,4,5. Feedback forms will be obtained from in-service training participants and from resource guide users. Follow-up interviews of selected users and participants will take place.

6. Report will meet stated objectives and be completed within shared timelines.

7. Included as part of overall evaluation of ETTCs, ETN and News CLIPS. Workshop participants will complete feedback forms, and follow-up interviews will be conducted with select participants.

The Equitable Use of Computers

Need - Although the computer provides educators with a powerful new tool for instruction, a familiar dilemma is present. There are substantially fewer computers in low-wealth school districts compared to higher wealth districts. Educators must be familiar with these and other equity issues related to differential student access to and usage of computers based on gender, race, English language proficiency, achievement level, disability and socioeconomic status.

Objective - Assist districts in the evaluation and remediation of equity issues related to differential student access to and usage of computers based on gender, race, English language proficiency, achievement level, disability and socioeconomic status.

Strategies

1. Research differential student access to and usage of computers based on gender, race, English language proficiency, achievement level, disability and socioeconomic status.

   Timeline: ongoing

2. Identify and disseminate information on specific technology-related programs which address the equity issues (e.g., bilingual, vocational, special education, Chapters 1 and 2).

   Timeline: Available 9/86

3. Support three pilot programs as part of Operation School Renewal. These programs increase urban students' access to computers by improving the student-computer ratio, and provide in-service training to district staff.

   Timeline: 1984-85 through 1986-87 school year

4. Fund a pilot project t esearch factors which may influence differential use of and ess to computers on the basis of sex. Disseminate findings to local school districts.

   Timeline: 8/85 - 6/86

5. Conduct in-service training for urban district staff through the educational technology training centers.

   Timeline: ongoing

6. Disseminate information on research related to computer equity, and provide materials to assist districts in assessing the issues of equitable computer access and usage.

   Timeline: ongoing

Evaluation - The following items correspond directly to the items numbered under "Strategies."

1. Report should be generated summarizing research findings. Report will meet stated objectives and will be completed within stated timelines.

2. Materials produced will contain feedback forms. Follow-up interviews of select users will take place. Dissemination results will be included as part of the overall evaluation of News CLIPS and ETN.

3. Equity issues will be part of overall examination of technology component of Operation School Renewal (OSR).

4. Report of research findings should be timely; dissemination of results will be evaluated through feedback forms and follow-up interviews.

5. Equity issues will be part of overall evaluation of ETTCs including such factors as number of urban districts served, number of students in participating urban districts, and impact on urban district practices.

6. Feedback forms will be included in all materials disseminated and at all conferences where such information is presented; follow-up interviews will be conducted.

The Ethical Use of Technology

Need - Educators need to understand the ethical issues related to educational technology. Districts should adopt policies prohibiting computer fraud and software and video copyright violations.

Objective - Guide local districts in the development of policies and practices which promote the ethical use of educational technology.

Strategies

1. Continue to disseminate current information on the copyright laws as they pertain to computer software and videotapes.

   Timeline: ongoing

2. Develop and disseminate guidelines which define policy pertaining to the ethical use of educational technology to local school districts.

   Timeline: 2/87

3. Encourage districts to adopt strict policies prohibiting illegal copying of software and illegal access to information banks.

   Timeline: ongoing

4. Encourage districts to include information pertaining to the proper use of computers in curriculum policy.

   Timeline: ongoing

5. Cooperate with AT&T and the New Jersey Bell Telephone Company to facilitate the development and dissemination of telecommunications/computer fraud deterrent programs.

   Timeline: 1985-86 school year

Evaluation - The following items correspond directly to the items numbered under "Strategies."

1. Feedback forms will be included with all materials.

2. Guidelines should be developed within stated timelines and contents should match stated objectives.

3. Survey of select district policies concerning the ethical use of technology including such issues as written versus non-written policy and source of policy.

4. Survey of select district curriculum concerning the ethical use of technology.

5. Review of products derived from department/private industry activities; review efficacy of such products through interviews of participants; dissemination of products evaluated by feedback forms and follow-up interviews.

Instructional Television

Need - Instructional television (ITV) is an effective and cost-efficient means for delivering instruction. Educators should receive quality instructional television programs and training on the use of television in the classroom.

Objective - Provide quality instructional television programs and in-service training on the effective use of ITV to local school districts.

Strategies

1. Provide in-service training workshops on current instructional television offerings and their appropriate use in the classroom.

   Timeline: ongoing

2. Develop and disseminate resource guides which identify instructional television programs in reading, writing and mathematics that support the skill areas assessed on the High School Proficiency Test.

   Timeline: 6/86

3. Cooperate with New Jersey Network (NJN) and the Agency for Instructional Technology to purchase rights, and distribute quality instructional television programs.

   Timeline: ongoing

4. Participate on the New Jersey Network and Cable Television Network advisory boards.

   Timeline: ongoing

Evaluation - The following items correspond directly to the items numbered under "Strategies."

1. Feedback forms will be completed by training participants and follow-up interviews will be conducted.

2. Reports and products will meet stated objectives and be completed within stated timelines.

3. Amount and types of programs purchased and distributed will be monitored; distribution effects will be examined by feedback forms and follow-up interviews.

4. Effects of participation will be examined against stated expectations prior to participation.

Funding Sources

Need - Additional sources of funding are required to enable the Department of Education to conduct pilot programs on the effective uses of technology in classroom and vocational settings, and to help districts implement technology programs.

Objective - Seek grant, foundation, and corporate funds to support the use of technology in the schools.

Strategies

1. Promote school and business partnerships. Provide workshops for school district personnel on establishing such partnerships.

   Timeline: 1986-87 school year

2. Complete grant applications requesting funding for pilot programs in educational technology.

   Timeline: 3/87

3. Provide funding to school districts to establish pilot programs using various forms of educational technology.

   Timeline: ongoing (as funds become available)

4. Provide funding to districts to establish programs that prepare students for entry level positions in the areas of Industrial Technology, Business Education, Agriculture Education, Marketing Education, Health Occupations Education and Home Economics Education.

   Timeline: ongoing

5. Provide Technology for Children (T4C) which integrates technology topics into other subject areas in grades K-8.

   Timeline: ongoing

Evaluation - The following items correspond directly to the items numbered under "Strategies."

1. Number of partnerships will be determined. Feedback forms from workshops will be evaluated; follow-up interviews of participating district and business personnel will be conducted.

2. Number and type of grants completed and obtained will be determined; information on the amount of money received at the state and district level will be included.

3. Grants will be assigned within stated timelines, meeting stated objectives. Evaluation will take place for each project completed.

4. Projects will be reviewed; amount and types of placements will be determined.

5. Interview group of participating district personnel; feedback forms will be obtained from select districts, examination of increase in subject area performance will be evaluated.

School Leaders in Educational Technology

A committee of school leaders in educational technology has been established which represents urban, suburban and rural local school districts, the divisions of County and Regional Services, General Academic, Special, Vocational, Adult and Continuing, Compensatory and Bilingual Education, the Department of Higher Education, the Audio-Visual Aids Commissions, New Jersey Network, New Jersey State Library and business and industry.

The School Leaders in Educational Technology Committee will serve as advisors to the department in addressing the following issues:

- What computer skills are necessary to prepare students for surviving in a technological age?
- How will both male and female students of all ages, achievement levels, abilities, races, language proficiencies, and in all classroom groupings and secondary course offerings such as general academic, vocational and business have equitable access to educational technology programs?
- What can be done in schools to promote the ethical use of computers?
- What are the skills that all teachers need to acquire in their pre-service and in-service training?
- How should all teachers be trained in computer literacy, and what opportunities will exist for advanced training?
- How should existing resources in educational technology be identified and used?
- How should educational technology programs be monitored and evaluated?
- How should schools address new and emerging forms of technology (e.g., interactive videodisc, videotex, electronic mail, microwave transmission)?

Timeline for Implementation of the Educational Technology Plan for Action

May 1986	Completion of Educational Technology in New Jersey: A Plan for Action.
June 1986	Educational Technology in New Jersey: A Plan for Action disseminated to chief school administrators.
June - October 1986	New Jersey School Leaders in Educational Technology Committee convenes to assist department in developing recommended guidelines on issues raised in this plan.
September 1986 - June 1987	Implementation of objectives and strategies outlined in Educational Technology in New Jersey: A Plan for Action.
September 1986 - June 1987	Department of Education develops recommended guidelines.
June 1987	Recommended guidelines disseminated to districts.

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Appendix A: Suggested Readings

The literature on computers and their educational applications is voluminous. The following is a representative sample of the kinds of materials available to the interested educator. This list is continually updated through the Technology Unit's newsletter, News CLIPS, and through the statewide Educational Technology Network (ETN).

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Appendix B: Educational Technology Resources in New Jersey

The following section lists places to go for help. This assistance is available to any school teacher or district. Includeo are professional associations, user groups, and resource people in the state.

New Jersey State Department of Education Training Facilities

The educational technology training centers (ETTCs) provide in-service training for educators throughout the state. The centers are demonstration and evaluation sites for hardware and software, and they contain a large selection of technology-related books and periodicals, software and product evaluations.

Educational Technology Training Center - North
100 Evergreen Place
East Orange, NJ 07017
(201) 266-8694
Coordinator: David Lush

Educational Technology Training Center - Central
(at Regional Curriculum Services Unit - Central)
200 Old Matawan Road
Old Bridge, NJ 08857
(201) 390-6030
Coordinator: Ruth List

Educational Technology Training Center - South
(at Gloucester County College)
Tanyard & Salina Road
Sewell, NJ 08080
(609) 468-5530
Coordinator: J. Evans Jennings, Jr.

Other Regional Services

There are four learning resource centers (LRC) that are available for assistance in Special Education.

LRC North
(at RCSU - North)
15 South Munn Avenue
East Orange, NJ 07817
(201) 266-8665

LCR North-Satellite
Normandy Park Administration Center
Normandy Parkway
Morristown, NJ 07960
(201) 539-0331

LRC Central
(at RCSU - Central)
200 Old Matawan Road
Old Bridge, NJ 08857
(201) 390-6030

LRC South
(at Educational Improvement Resource Center)
207 Delsea Drive
Route #47
RD #4 - Box 209
Sewell, NJ 08080
(609) 228-6000

Local Resources

New Jersey State Department of Education computer education contacts at the county level:

(All contact people on this list are located at the respective county office of education.)

County	Name	Phone
Atlantic	Mr. William Hall	(609) 625-7000
Bergen	Mr. David Livingston	(201) 935-1500
Burlington	Ms. Laura Mays	(609) 261-5060
Camden	Mr. Joseph Corcoran	(609) 627-1556
Cape May	Ms. Betty Zaleski	(609) 465-7911
Cumberland	Ms. Jean Nocon	(609) 451-8000
Essex	Ms. Susan Steele	(201) 673-8030
Gloucester	Mr. Glen Earl	(609) 853-6200
Hudson	Ms. Monica Tone	(201) 795-6547
Hunterdon	Mr. Frank Arch	(201) 788-1414
Mercer	Dr. Kenneth Charlesworth	(609) 989-6851
Middlesex	Dr. John Coogan	(201) 390-6000
Monmouth	Mr. Michael Maddaluna	(201) 431-7823
Morris	Ms. Doris Smith	(201) 285-6151
Ocean	Ms. Janet Beronio	(201) 929-2079
Passaic	Mr. John Zeug	(201) 881-7123
Salem	Ms. June Lang	(609) 769-2700
Somerset	Mr. Sal Abitanta	(201) 231-7171
Sussex	Dr. Judith Kohlbach	(201) 383-2521
Union	Mr. Stanley Rothman	(201) 233-9310
Warren	Ms. Jane Gould	(201) 475-5361

State Level Resources

Educational Technology Unit
Carol Scelza, Manager
New Jersey State Department of Education
225 West State Street, CN 500
Trenton, NJ 08625
(609) 984-1805

Office of Equal Educational Opportunity
Susan Davis, Coordinator
New Jersey State Department of Education
CN 500
Trenton, NJ 0862[illegible]
(609) 292-4343

New Jersey State Library
Marilyn Veldof, Assistant Coordinator
School Media Services
CN 520, 185 West State Street
Trenton, NJ 08625
(609) 984-3293

New Jersey Public Television
Walter Freas, Director
Educational Programs
1573 Parkside Avenue
Trenton, NJ 08625
(609) 530-5215

Vocational Education

Sylvia Kaplan, Coordinator
Technology for Children
New Jersey State Department of Education
Division of Vocational Education
225 West State Street, CN 500
Trenton, NJ 08625
(609) 292-5720

Richard Van Gulik, Program Specialist
Trade and Industrial Education
New Jersey State Department of Education
Division of Vocational Education
225 West State Street, CN 500
Trenton, NJ 08625
(609) 292-6565

Rosemary Harzmann, Program Specialist
Home Economics and Consumer Education
New Jersey State Department of Education
Division of Vocational Education
225 West State Street, CN 500
Trenton, NJ 08625
(609) 292-6580

John K. Grover, Program Specialist
Agriculture and Agribusiness Education
New Jersey State Department of Education
Division of Vocational Education
225 West State Street, CN 500
Trenton, NJ 08625
(609) 292-6584

Melvin Schwartz, Program Specialist
Marketing Education
New Jersey State Department of Education
Division of Vocational Education
225 West State Street, CN 500
Trenton, NJ 08625
(609) 292-6575

Michael G. Curran, Jr.
Business Education Program Specialist
New Jersey State Department of Education
Division of Vocational Education
225 West State Street, CN 500
Trenton, NJ 08625
(609) 292-6572

Gweneth Fell, Program Specialist
Health Occupations Education
New Jersey State Department of Education
Division of Vocational Education
225 West State Street, CN 500
Trenton, NJ 08625
(609) 292-6593

Other Resources:

Asbury Park Computing Cooperative
c/o Robert Osgoodby
Asbury Park School District
1506 Park Avenue
Asbury Park, NJ 07712
(201) 776-2600
(Office computing services to school districts)

Computers, Learners, Users Education Association (CLUES)
c/o Henry Peterson, Executive Director
50 Nellis Drive
Wayne, NJ 07470
(A professional organization for teachers)

Educational Improvement Resource Center (EIRC)
Richard Titus, Director
207 Delsea Drive
Route #47
RD #4 - Box 209
Sewell, NJ 08080
(609) 228-6000

Network for Action in Microcomputer Education (NAME)
c/o Jim Jeakel/Henry Petersen
Fallon Center
51 Clifford Drive
Wayne, NJ 07470
(201) 696-3157
(Technical aid, in-service training, information for educators)

New Jersey Educational Computer Network (NJECN)
3900 Park Avenue
Edison, NJ 08820
(201) 549-9700

New Jersey Vocational Education Resource Center
Cambridge Park School
Crest Way
Aberdeen, NJ 07747
(A source of software and information about microcomputers for teachers.)

Southern New Jersey Computer Awareness Project
c/o Dr. Francis Masat
Glassboro State College
Department of Mathematics
Glassboro, NJ 08028
(A computer project for teachers in South Jersey)

Wayne Computing Cooperative
c/o Henry Petersen
50 Nellis Drive
Wayne, NJ 07470
(A software clearinghouse, a source of MECC materials, and a library of general information)

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