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ABSTRACT

This practicum was designed to increase the use of computer technologies, which would enhance student learning outcomes. The primary goal was to improve the language arts skills of third, fourth, and fifth grade students by using specific software and related activities. A secondary goal was to raise teachers' computer comfort levels and skills. With the help of classroom teachers, software was selected and units of study were incorporated with the selected software. Software training sessions were conducted with teachers prior to using the software with their students. Teachers were also assisted in conducting computer lab sessions in which students published their writing. Positive results were perceived from the 12-week implementation. Teachers gained expertise and confidence in using computers. Students independently chose to access academic software programs, and the number of lesson plans including computer software as an instructional resource rose from less than 3% to more than 24%. Five expected outcomes are listed, all of which were met or exceeded through this practicum. Data is presented in seven tables. (Contains 19 references.) (MAS)

Using Technology to Enhance Student Learning Outcomes

by

Lu Cain

Cluster 62

A Practicum I Report Presented to
the Ed.D Program in Child and Youth Studies
in Partial Fulfillment of the Requirements for the
Degree of Doctorate of Education

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Abstract

Using Technology to Enhance Student Learning Outcomes. Cain, Lu, 1995: Practicum Report, Nova Southeastern University, Ed.D. in Child and Youth Studies. Descriptors: School Library Media/Instructional Resources/ Computer Technology/Staff Development Training.

This practicum was designed to increase the use of computer technologies which would enhance student learning outcomes. The primary goal was to improve the language arts skills of third, fourth, and fifth grade students by using specific software and related activities. A secondary goal was to raise teachers' comfort levels and skills with computers.

The writer worked with classroom teachers to select software, plan units of study which incorporated the selected software, and conducted support sessions with the teachers prior to their using the software with their students. The writer also assisted teachers in conducting computer lab sessions in which their students published their writing. These finished products were publicly displayed for the enjoyment of students, teachers, staff members, and the community at large.

The results of the practicum were positive. Analysis of data revealed that computer technologies could enhance student learning outcomes in the language arts curriculum and that classroom teachers could comfortably and skillfully use software and hardware in conjunction with traditional instructional methods when supported by a technology-literate mentor.

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January 18, 1995 (date)

Lu Cain (signature)

Practicum Approval Sheet

This practicum took place as described.

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This practicum report was submitted by Lu Cain under the direction of the adviser listed below. It was submitted to the Ed.D. Program in Child and Youth Studies and approved in partial fulfillment of the requirements for the degree of Doctorate of Education at Nova Southeastern University.

Approved:

Jan. 29, 1995
Date of Final Approval of Report

Wm. W. Anderson
William W. Anderson, Ed.D., Adviser

Acknowledgement

The writer wishes to express appreciation to her husband, D. C., for encouragement and support, to her daughter, Leah, for patience and understanding, and to her kindred spirit, Algene, for her many enabling talents. Appreciation is also extended to her adviser, Dr. William W. Anderson, for his sincere, positive guidance.

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CHAPTER 1

INTRODUCTION

Description of Community

The writer's community is a small historic county in a rural, mountainous southern state. Two small towns coexist in this sleepy tourist region. One township serves as the county seat; it was founded in 1822 by a group of white settlers who came over mountain wilderness to build homes in a valley secured by the state government from a treaty with the Cherokee Nation. The other town is a tourist village established during the 1950s to improve economic conditions in the area.

In 1858, the original county plat was divided from state land lot properties into three new county plats, each with a separate county government. At that time the writer's setting was named in honor of military officers whose families were among the original settlers to the area. Gold was discovered and heavily mined; outsiders scurried to make their fortunes in the mines and mountain streams. Railroads were built only to later be abandoned when the ore deposits dwindled; the miners and their families then moved westward searching for new fortunes and opportunities leaving behind the original settling families to tend their farms.

The county's present population is approximately 12,000. Of the total

residents, 2,300 live in the tourist township area, Another 3,700 citizens reside within the county seat's city limits, and the remainder inhabit the more rural areas of the county.

The area has one public school system which serves more than 2,800 students and is comprised of four schools: a primary school housing prekindergarten through second grade, an elementary school housing third through fifth grades and three sixth grade classes, a middle school housing sixth, seventh, and eighth grades, and a high school housing ninth through twelfth grades and an alternative school. One private school academically serves approximately 100 students in kindergarten through eighth grade and provides its student body with religious instruction. A private junior college is also located in this county. The federally funded program, Head Start, serves four-year-old children who are not enrolled in state funded prekindergarten classes.

The area is presently experiencing rapid growth; all public schools are filled to capacity, and portable units have been leased to serve as classrooms until a new high school can be completed in the near future.

Students in these schools come from a wide variety of ethnic and religious backgrounds and from all socioeconomic levels. The majority of students are white; minorities include African Americans, Japanese, Native Americans, and Hispanics.

Writer's Work Setting and Role

The writer's work setting is within the elementary school which houses third through fifth grades and three sixth grade classes. The students involved in the educational problem are from third, fourth, and fifth grade

language arts classes and come from all academic ability levels and school programs. The third grade class is self-contained and functions under a state supplemented program which utilizes heterogeneous grouping and center-oriented activities as its instructional approach. This class is limited to twenty-one students, one certified teacher, and one certified paraprofessional. The fourth grade class is a "regular" classroom setting which is heterogeneously grouped; special education and remedial students are served via a pull-out program and attend some classes with teachers who help them with specific skills. Fourth grade classes function with one certified teacher with no assistance other than resource and special teachers; class size is limited to thirty children. The fifth grade class is composed of gifted and high-achieving students served by one certified teacher for the gifted and a part-time certified paraprofessional. Class size is limited to thirty-five students per class.

Students at this site have consistently scored below state norms on basic writing skills assessments. The majority of the third grade class comes to the school with reading scores below the 60th percentile on the Iowa Test of Basic Skills. This is quite disturbing since these students have extremely high scores in language and reference skills. The state mandates that students in third through fifth grades be tested in composition skills using the Georgia Competency Based Assessment which is a spiraling skills instrument. Skills taught from kindergarten through third grade are tested on the third grade testing program. Skills taught from kindergarten through fifth grade are assessed on the fifth grade level test.

This setting is one of the most technologically endowed schools in the state. Each classroom has at least one computer for student use that is

connected to a network file server that holds more than 1,000 software programs. Fifth grade and special education teachers have networked administrative workstations on their desks; the majority of third grade teachers also have these networked administrative workstations. The school system plans to complete the teacher administrative network in the near future. Two classrooms are equipped with mini-labs that are networked to the main file server. Two other networked computer labs that can serve entire classes are located in the media center.

Other technologies present at this site include an automated library circulation and catalog system with lookup stations for student and faculty use, interactive compact disk players, and reference resources on compact disk. Students, faculty, and staff have ready resources at the touch of a computer key. The administrative office is networked to a local area system network which connects via modem to the state network. Modems, closed circuit television systems, and satellite distribution are also available school-wide. All classrooms are equipped with televisions, video cassette players/recorders, overhead projectors, and call-button intercom services to the administrative offices.

The writer's role in the elementary school is media specialist for the facility's faculty, staff, and students. One area of the media program is to assist teachers with instructional strategies and the selection of instructional resources.

The writer's background experience includes seven years as a classroom teacher in a junior high school teaching English, reading, and science, two years in a middle school teaching language arts, and four years experience in school library media services at the elementary school level. As a classroom

teacher, the writer facilitated remedial students, instructed gifted and on-level students, sponsored yearbook staffs, coached girls' basketball, and served as team chairperson for a middle-school concept team; at the elementary school level, the writer has served as chairperson for the resource teaching team, media committee, technology committee, and staff development committee. At the system level, the writer serves on the media/technology and public relations committees.

Dr. Melvin Bowie, instructional technology and library sciences instructor, served as mentor and advisor to the writer while earning a specialist's degree in Instructional Technology at the University of Georgia. Dr. Mary Ruth Miller, professor emeritus of North Georgia College, served as facilitator for the writer while participating in the Georgia Mountains Writing Project which was underwritten by the National Writing Project.

The writer has also conducted workshops for teachers and paraprofessionals in writing across the curriculum, computer word processing and database creation, keyboarding instruction for the elementary student, research process with the elementary school student, activities with books, and implementing technology into the curriculum areas.

CHAPTER II

STUDY OF THE PROBLEM

Problem Description

The writer's site is one of the most technologically advanced elementary schools in the state with one or more networked computers in each classroom and two networked computer labs located in the media center for whole class instruction. More than 1,000 software programs selected specifically to enhance instruction are available to students and teachers via the local area networks; however, teachers at this site have lacked the skills and the confidence necessary to implement instruction with computers into curriculum areas.

Computers in the classrooms and labs are expected to be in constant use at this facility. Lesson plans submitted to administrators are expected to include time scheduled for and instructional activities with these available technological tools. The number of worksheets previously required for student practice need to be drastically reduced and/or partially replaced with sessions doing the same type of activities using computers.

Past staff development programs for this faculty focused on traditional teaching methods and materials and failed to incorporate modern technologies as resources for instructional units. Since audio/visual or

computer-related technologies had not been included in these training sessions, teachers lacked a working knowledge of and confidence in the use these teaching tools. Thus, the problem was one of technologies being available yet going unused due to ignorance and fear.

The problem was that ample computers and software existed that could be used to enhance instruction at this site yet they were not being used for this purpose. By addressing this problem, students were highly motivated to learn in areas where they had deficiencies such as reading, spelling, and writing skills. Test scores in reading and other language areas needed to be improved. Teachers needed to feel more confident teaching with these tools and with incorporating them into their instructional plans.

Problem Documentation

School records indicated that teachers did not choose to use available technologies with daily instruction. The writer gathered information from computer network usage reports, copy room records, and lesson plans developed by the faculty members and submitted to administrators as evidence that this problem existed.

The most frequently used educational network at this site was the Apple IIe computer lab located in the media center. The network file server had the capability to track access by individual, group, or grade level. These reports could be printed whenever desired. One such report printed after one semester of use indicated that students accessed 70% of the time to play games rather than to work with curriculum related programs (see Table 1).

At this facility, two educational paraprofessionals had the duty of copying worksheets for instructional use in the classroom. Their records

Table 1

Results of One Semester's Student Access of Mastery Development Apple IIe Network

Software Program Categories & Names of Programs	Educational	Games	Percentage of Time Accessed
Writing Room	X		2%
Keyboarding Klass	X		7%
Math Facts Tracker	X		10%
Mastery Arithmetic	X		3%
Geo Quiz	X		1%
MECC Software:			
Language Arts	X		2%
Math	X		1%
Social Studies	X		3%
Early Learning	X		1%
Public Domain:			
Games 1 Player		X	55%
Games 2 Players		X	15%

provided information on the number of copies made, the person who requested the copying, and the type of information contained on these copies. These records were carefully analyzed. From these records from the first semester of the school year, teachers averaged requesting more than three worksheets per student per day (see Table 2). The majority of these worksheets contained the same type of practice activities available to students on the computer network.

During the school year, all certified teaching personnel at this site were required to submit to the assistant principal in charge of instruction complete sets of lesson plans. These plans are reviewed and used as a portion of the teachers' annual professional evaluation. From 57 weeks of these plans, the writer documented that less than 3% included computer assisted instruction (see Table 3). Of the lessons that included computer technology, the programs chosen employed isolated computer skills such as keyboarding rather than subject-related activities that enhanced the students' learning.

Causative Analysis

The writer was of the opinion that there were several causes for the lack of implementation of technology into classroom instruction at this site. Teachers not only lacked training with modern computer technologies, but also were encouraged by administrators to continue using traditional teaching methods. Rigidly mandated scheduling of computer labs added to the problem. All of these were factors which related to this problem.

Casual discussions between the writer and faculty members at this site revealed that most teachers felt neither confident nor skillful enough to use computers and available software programs as a means of helping students to

Table 2

Results of Copy Room Records

Grade Level/Area	Total Copies Made
Grade 3	25,130
Grade 4	24,559
Grade 5	15,212
Special Education	9,589
Resource	3,092
Chapter I & Remediation	4,701
Other	34
Total Practice Worksheet Copies Produced	82,317
Average Copies per Student per Day	3

Table 3

Results of Review of Lesson Plans Filed with Administrators

Grade Level/Area Number of Plans	Number of Plans Using Computers	Number of Plans Without Computers	Total
Grade 3	4	172	176
Grade 4	3	114	117
Grade 5	4	84	88
Special Education	2	22	24
Resource	0	23	23
Chapter I & Remediation	0	14	14
Totals	13	429	442

learn content and concepts. Many educators admitted that they are intimidated by students who have access to computers in their homes and seem to know more about them than their teachers. To compensate for this lack of knowledge and skill, the teaching professional usually refrained from using the computer lab during instructional time or simply allowed students to freely choose a program to access and referred to it as a reward for producing good work presented under traditional teaching methods.

Education in the United States has historically been governed by local and state laws. Programs have guidelines that are mandated from leaders to administrators to teachers. More times than not these guidelines have focused on traditional methods that were used for educating students in past periods: agricultural, industrial, and space-age. Today, educators are given new tools to use, but little or no training on how to use them; then they are evaluated on how well they teach using out-dated methods.

Most educational evaluators have been trained to use past methods such as lecture, rote-memorization, and drill-and-practice with flash cards or repeated copying of facts. When these traditional methods are used to evaluate computer-assisted instructional approaches, administrators often understand less about this area than do teachers. These procedures seemed to reinforce the use of traditional tools and methods for instruction while at the same time did not address instruction that used new technologies. It prohibited rather than promoted using modern methods and tools to assess teacher performance.

Another misconception prevalent at this setting was the rigid scheduling of computer labs. The present administration and faculty believed that teachers needed specific equal time allowances to bring their classes for

computer use. Classes were scheduled for thirty-minute computer lab sessions two times per week; this scheduling promoted isolational skills access. It did not assure equal access; it did, however, limit those teachers who wished to plan units of study around software packages because it prevented them from acquiring ample time at the computers for their students to complete the units of study. On the other hand, some teachers who preferred using traditional teaching methods and resources and did not wish to use computers had difficulty seeing the value of giving their students access to computers. If it were not for the administrator's mandating and insisting that all teachers use their scheduled time slots, the computers would often go unused.

Relationship of the Problem to the Literature

The problem of helping teachers to use modern technologies to enhance student learning has been carefully studied by many professional educators. Through their examinations, numerous factors have been found to contribute to this problem. Factors such as time, accessibility, personal skills, comfort with the hardware and software, and the support of peers were among the most commonly listed (Ely, 1993).

According to a study conducted at the Bank Street College for Education in New York (Sheingold & Hadley, 1990), teachers most frequently listed the lack of enough time as the major factor that prevented them from using computers for instruction with their students. The classroom teacher's typical day usually begins by arriving at the classroom fifteen minutes prior to students. Often this period is spent with peers, preparing for the day's events, preparing work for students to begin upon entering the classroom, or with a

parent in conference. During the school day, the elementary teacher teaches six or more subjects, takes students to lunch, recess, restrooms, and physical education, and plans for the next day when the routine begins again. After school when teachers are off-duty, many remain to finish the daily chores that time did not permit them to complete during the day. They prepare for the next day or attend meetings with other faculty members. Given these numerous and varied duties, no time is built into the day for learning to better use technology, to work through software programs before students work with them, or to improve their own skills with administrative software. D'Amico's study (1990) of the integration of computer-assisted instruction also confirms the lack of time as the major factor in implementing this new technological way of teaching.

Inadequate training for teachers with new technologies is another factor which contributes to procrastination in implementing technology in instructional areas. 59% of United States teachers believe that they are inadequately trained to use computers in the classroom (Wirthlin Group, 1989). Most of these teachers consider themselves less computer literate than their students. This feeling of inadequacy is a contradiction to the teaching profession since many teachers believe it is their duty to impart information. This directly relates to the traditional beliefs held by society about education and educators; the belief that teachers are to lecture while students are to listen and learn. In order to change society's and the profession's way of thinking about education, teachers must overcome their fears of technology; this can be accomplished with careful guidance of administrators (Hancock, 1990).

Considering that for centuries it has been accepted that teachers are

highly educated individuals who dedicate their lives to students and the promotion of knowledge, it is not surprising that these professionals are uncomfortable with the emerging roles technology creates for students and teachers and their relationships. According to a study conducted by the Office of Technology and Assessment (1988), only about one-third of all elementary and secondary teachers have had more than ten hours of computer training. Many veteran educators had been teaching for years before seeing a computer. They went to traditional schools, learned by traditional methods, and were taught to teach using basal textbooks, chalk, and #2 pencils. They are trying to teach children using these same tools, but today's children use video games, televisions, computers, and other silicon-chip machines on a regular basis and have difficulty with traditional tools since their native environment is fast-paced with immediate feedback.

Computer anxiety frequently affects the way educators approach implementing technology into curriculum areas (Loyd & Gressard, 1984). Motivation and a person's ability to master computer skills can also be affected by computer anxiety (Wood & Barnes, 1991), which can be defined as intimidation by the effects of computer experiences on computer attitudes. Considering that most educators have had minimal training and contact with computers, computer anxiety could certainly be a contributing factor to why teachers are not using this technology to enhance student learning outcomes.

When individuals are aware that they can easily be monitored for productivity by individuals or machines, their anxiety level rises. According to a study conducted by W. R. Jordan at Southeastern Regional Vision for Education (1993), teachers like the idea of using computers as productivity tools but do not like the idea that computers can also be used to monitor their

work habits. They like being able to monitor their students' progress and have the convenience of information on hand for parents but are hesitant to allow day to day monitoring of their productivity. This conflict is also a contributing factor in the argument of computer technology implementation. Veteran teachers who have been isolated in their classrooms for years may feel threatened when faced with this dilemma (Ely, 1993).

Previous studies suggest that computers have been purchased by and used in the schools for more than a decade; 95% of these machines are used primarily for word processing (Ely, 1993; Gramza, 1993)). This has been the situation at this writer's work setting also. However, the Information Age is here, and these technologies are capable of much more than serving as typewriters with memories (Thormann, 1991).. These new learning environments require teachers to apply their knowledge of teaching with how to best use these tools to improve their teaching and student learning (Stakenas et al, 1990).

Integrated programs of today allow teachers to expand upon all concepts with databases, spreadsheets, communication capabilities, graphics, and desktop publishing abilities (Jordan, 1993). This means that teachers are being forced to make changes in how they approach teaching with computers. To continue in the teaching profession, educators are faced with the necessity of keeping up or dropping out or retirement. Gerald Bracey (1992) suggests that some teachers are just better at adapting to technology than others based on personal experiences in their backgrounds, attitudes toward change, and/or their general approach to problems. Some teachers have a knack with technology while others must have repeated hands-on practice to develop skills necessary to use computers (Cuban, 1986).

When considering the problem of persuading teachers to learn to use technology for themselves and as a teaching tool, the teacher's professional knowledge and experience need to be upgraded regularly (Office of Technology Assessment, 1988). Educators are accustomed to the status of professional students and are truly lifelong learners. The problem with computers and technology is that science is moving much faster than education and its ability to provide adequate training (Dyrli, 1994). One approach to this problem is for teachers to use technology for daily administrative tasks before asking them to use it with their students (Jones, 1991; Ely, 1990).

In most schools today, there are too few computers for the number of students who wish to use them (Ravitch, 1993). This leads to problems with scheduling ample computer time for student use which in turn deters teachers from attempting to incorporate computers into their daily plans (Dockterman, 1991). To address this problem, teachers are faced with the predicament of finding time to consider how others have approached this obstacle. One method is by reviewing literature in journals and other periodicals related to their particular teaching area. Even though more than 15 journals are published which are devoted exclusively to computers in education, most teachers have difficulty finding time to read the research data available to them (Ely, 1993).

CHAPTER III

ANTICIPATED OUTCOMES AND EVALUATION INSTRUMENTS

Goals and Expectations

The following goals and outcomes were projected for this practicum. The writer planned to improve the language arts skills of the third, fourth, and fifth grade students involved by using specific software and related activities to establish change. The writer would work closely with students and teachers to support them in their endeavors to approach and accomplish specific objectives to reach the goals of using technology to enhance student learning outcomes and to raise teachers' comfort levels and skills with computers.

Expected Outcomes

The writer expected that by the end of implementation five measurable outcomes would occur. These results were expected to show that:

1. At the end of the implementation period, ten of forty teachers at this site will request that computer labs at this site operate flexibly four hours of the seven-hour school day.
2. Having observed and/or participated in this practicum experience, teachers at this site who wish to incorporate

computers into the instructional process will schedule at least one hour per month for instructional planning time with the writer.

3. Upon completion of the practicum experience, computer network usage reports will indicate that 70% of the students at this site would access academic software 80% of the times they logon to the network.
4. The number of worksheets used for student practice by teachers who were involved in this experience will be reduced from three per student per day to one per student per day.
5. 20% of lesson plans developed by teachers and submitted to the administrator in charge of instruction will include computer software and hardware as instructional resources to support lesson content as an end result of this practicum experience.

Measurement of Outcomes

Since the expected outcomes varied immensely in their context, several instruments were used to measure them.

To measure the amount of time computer labs operated on a flexible schedule, sign up sheets were kept daily and tallies were recorded by the writer at the end of implementation. These sheets included teacher's name, number of students involved, subject area or activity, and amount of time needed. Since flexible scheduling had not been used in previous years, the success of this outcome was measured against real time available during the school day

The writer kept a daily log that reflected media activities and lessons

which were monitored by administrators on a quarterly basis. This log was kept on a computer database. From these records, tallies of requests made by teachers for assistance with instruction incorporating computer technology could be made. A ratio of the number of teachers on staff to the number of teachers who sought assistance were used to determine to what extent this outcome had been met.

Prior to and immediately after the implementation period, a computer network usage report was printed. This report showed what percentage of the time students and teachers accessed academic software or games software.

Paraprofessionals whose responsibilities include making copies kept tallies and data on the number of copies requested for practice activities in the language arts curriculum areas. Those which could have been more efficiently and effectively accomplished by using computer software were tallied at the end of the implementation period; the results of these tallies were used to determine if the number of worksheets copied to be used by students could have been reduced and still have met the same instructional objectives. It was projected that the number of worksheets per student would be reduced from three per day to one per day.

Lesson plans developed by teachers and submitted to administrators were examined, and the number of times software programs were used to support instruction was recorded. This number was compared to the tally that evidenced that a problem existed and was used to determine to what extent teachers were using available technologies to enhance learning outcomes for students. Since the implementation period did not involve a full semester, pro-rating of time was used for accuracy. It was expected that teachers would raise their use of technology from less than 3% incorporation

to at least 20% incorporation into their instructional plans.

CHAPTER IV

SOLUTION STRATEGY

The problem was that ample computers and software existed that could be used to enhance student learning outcomes at the writer's setting, however these tools were not being used effectively for educational purposes.

Discussion and Evaluation of Solutions

Many educational professionals have studied this problem and have presented solutions that were used at other academic settings. In the search for meaningful solutions the writer reviewed many excellent resources with insightful views as to why this problem existed and how it could be addressed and/or resolved.

Many educators possess what Vicki Hancock referred to as "technophobia" (1990). This fear of technology, especially computers, seemed to be prevalent among veteran elementary teachers and is due in part to the availability of the equipment at this level. Another factor that contributes to technophobia seems to be the lack of training elementary teachers receive in education programs at the college level (Shermis, 1990). To overcome this stigma, one strategy is the identification of a core group of teachers who show an interest in using technology and who will work diligently in a train-the-trainer approach situation (Jones, 1993). This method seemed a practical one

to implement since the writer's setting is isolated and resources are limited; colleagial training (i.e., school library media specialists train teachers on new information technologies) was a distinct possibility since the writer is considered to be knowledgeable about technology. The train-the-trainer approach also allowed for practice and adjustments to be made while working to resolve problems before they mushroomed.

Providing time for teachers to learn new technologies is a resolving strategy suggested by a teacher poll conducted in 1990 (Sheingold & Hadley). However, time is a set factor and can create a problem for schools that wish to consider outside resources for training their teachers in settings such as workshops, conferences, or classes. Time, however, if looked at from a flexible scheduling perspective or the possibility of heavier participant involvement had to be given consideration as a feasible educational strategy. Time was an extremely important factor at this site since travel to facilities that could provide technology training was not available other than when teachers themselves were working with students in the classroom.

Training and time were the key factors to consider when this problem was approached, but they were not the only ones. Other factors such as administrative support for and good leadership within the school had to be considered. Gerald Bracey (1992), an educational research psychologist based in Washington, D. C., identified leader support as being one of the most influential factors in teachers experiencing success with using computers for instruction. John Gould, Assistant Superintendent of Curriculum in Norristown, Pennsylvania, adds support to Bracey's ideas in his statement that success occurs when entire professional staffs participate in like training (1992). In other words, it is the responsibility of leaders to not only support

technology training but also to become technologically literate by attending training sessions with their faculty and staff members. None of the factors (i.e., time, training, or support) could be given individual consideration as a solution; jointly, they offered powerful solution possibilities.

Training teachers to use administrative or management software and giving them tools they could successfully use to lessen their paperwork load was another means of interesting educators in using computers with their students (Cuban, 1988). By using this approach, teachers could be helped to see the value of these tools, and it gave them the confidence and skills they needed to work with students who were equally or more computer literate than the teachers were.

A key factor in assisting teachers to use computer technology to enhance student learning outcomes for students was having a knowledgeable person on staff who could help them plan and use the existing technology with their students (Jones, 1991). This strategy has proven to be very successful for public schools that neither have nor can provide a budget for extensive staff development training in this area.

Description of Selected Solution

After reviewing possible solutions proposed by other professionals who studied the problem of encouraging teachers to use technology as an instructional tool to enhance students learning outcomes, the writer believed that a combination of strategies would best address the problem at this setting. By serving as the site's resource person for technology, the writer worked with three teachers, one representative from each grade level housed at the site, who were interested in incorporating computers and available software

into the language arts and/or social studies and science curriculum areas. These teachers' classes were involved in units of study that used computers and software instead of or as a supplement to worksheets to reinforce skills. Time at the computers was flexibly scheduled as needed to complete the instructional units.

The writer chose to use software programs that existed at the site. By developing a list of the software by curriculum area and/or grade level, the writer provided the participants with the freedom to choose resources that best fitted their needs and time frame for each instructional area.

The writer assisted the participants with making decisions regarding scheduling computer lab time for all students to actively engage in the same activity. Participants developed their own schedules for students to use the networked classroom computer.

The writer assisted the participants with learning the software prior to having their students actively interact with the programs. This activity was a necessary part of the experience since none of the teachers involved considered themselves computer literate or regular users of technology. They had limited knowledge of the programs they chose to use in conjunction with their units of study and needed instruction on how to best help their students with trouble spots they might encounter such as vocabulary, commands, and saving a session so that they could later reenter the program without beginning from scratch.

The writer believed that the above strategies were of major importance to the success of this project. By supporting teachers and their efforts to use technology, stress and intimidation levels were reduced, and attitudes were changed.

Report of Action Taken

The writer established through copy room records, lesson plans, computer networks usage reports, and computer lab and media center schedules of lessons and activities that there was a definite need for assisting teachers with the incorporation of computer software into language arts and other curriculum areas. The writer gained permission from school administrators to enlist three classes, their teachers, and the assistant principal in charge of instruction in a concentrated plan to address this need.

The writer met with teachers who desired for their classes to participate in computer-related activities and the administrator in charge of instruction to discuss instructional units which could best be integrated with computer technologies and to select software resources for required study units that were generally taught using traditional methods.

After instructional units were chosen, the writer assisted the participating teachers with the selection of software programs that addressed the instructional objectives for the chosen units and that which could easily be integrated into the instructional process (see Table 4). The writer also made suggestions as to the amount of computer time needed in order for students to complete their work. Time was scheduled in advance based on need; allowances were made for computer down-time and/or absenteeism among students and/or teachers. Other resources such as books, video tapes, and filmstrips that would support instruction were identified, located, and reserved for use upon teacher request.

During the second week of implementation, this site was chosen to participate in a pilot study of a computer program being written for

Table 4

Selected Software for integration into Content Areas

Teacher	Curriculum Area	Instructional Unit	Software Used
Grade 5	Reading	Mysteries	Mystery House
			Story Machine
	Writing	Composition	The Writing Room
	Science	Energy	Tell Me Why, Vol. 1 & 2
	Social Studies	Colonial Period	Lewis and Clark Stayed Home
Grade 4	Reading	Science Fiction	Discovery Lab
			Marooned in Space
	Writing	Composition	The Writing Room
	Science	Space	Moonplotter
			Skylab
			Planets
			Marooned in Space
	Social Studies	Map Skills	Jenny's Journey
Grade 3	Reading	Historical Fiction	Lewis and Clark Stayed Home
	Writing	Poetry	Haiku
			Cinquain
			The Writing Room
	Science	Volcanoes	Tell Me Why, Vol. 1 & 2
	Social Studies	Map Skills	Jenny's Journey

elementary school students to monitor satellite weather broadcasts. This project added a new dimension to the practicum plan. All teachers and classes at the site were invited to participate; however, only one class that was not already involved with the practicum project showed an interest. The writer served as assistant to and liaison person for the pilot study group. Since the pilot study on the weather program was to run for five weeks, it fitted nicely into the scheme of the practicum. Children were then involved in instructional units that covered all parts of the language curriculum areas (spelling, reading, writing, and grammar) and science.

The writer met with each participating teacher individually to discuss lesson plans within instructional units. Any trouble spots were identified and adjustments were made in scheduling, resource availability, and computer software. Teachers were also encouraged to make brief notes and observations about their concerns during this experience. These notations were expected to be helpful in identifying trouble areas for them as teachers and in available software and hardware.

After the third week of the practicum implementation, the teachers involved introduced the planned units to their students. The writer was present for the introductory classes to encourage both teachers and students. The students needed no encouragement; they were very enthusiastic about additional time interacting with the computers. Teachers were asked to continue to keep notes which reflected their feelings about computer activities, their students' reactions, problems encountered, and any other information they perceived as useful to them as educators. The writer reviewed these periodically with the involved teachers and used them to assist with necessary adjustments to instructional strategies.

At the end of the fourth week of full implementation the teachers involved submitted a brief summary which reflected on this week's work using technology. They were asked to note any changes in software programs or in the ways they presented information about computer technology that differed from the procedures they would use if they were using traditional teaching methods and materials.

During the fifth week of implementation the writer scheduled observation time in classes where students were using the computer as a means of enhancing a specific aspect of instruction. A continued effort was made to assist, support, and encourage teachers to develop more lessons and units which incorporated technology as a support resource. Students began to make requests of their teachers to try software they had experimented with during open computer lab time which occurs before and after regular school hours. Surprisingly, their teachers began to evolve into facilitators rather than imparters of knowledge. This was seen as a positive change by both students and teachers.

By the end of the fifth week of practicum implementation, teachers were fully working with their students in various curriculum areas. All classes were participating in the satellite weather station program but on varying levels. The independent class that chose to use the weather program used it more heavily than the three who were using computers for language arts, social studies, and other science programs. The writer assisted teachers with students who needed individual guidance while working with computers in the classroom and/or the computer labs or when software/hardware obstacles occurred. Dependent upon the unit of study and the class involved, the writer frequently observed students and teachers

at work with computers in the computer lab or as a small group at one computer. The writer recorded her observations in a journal and carefully reviewed them in order to prevent or address problems that arose. At this stage, most of the teachers were proficient enough with the hardware and software to address student needs without asking for the writer's assistance.

Since some units of instruction were ending and new ones were beginning, the writer helped teachers to evaluate the progress they were experiencing by comparing the quality of their students' work before the incorporation of computers into the curriculum areas with previous work they had completed using worksheets. This was a time for teachers to reflect not only on the quality of the work students were doing but also the enthusiasm their students had for getting their work done.

At the end of the fifth week of implementation, computer usage reports were printed and reviewed to give insight into the choices students were making when they had free access to network software. The writer carefully examined these reports and made notations for comparison to the reports that would be printed at the end of the practicum implementation period.

Copy room records were monitored at this time to enable the writer to determine if the teachers involved in the practicum were making changes in the number and types of worksheets they required for instructional purposes.

The writer, the administrator, and the teachers involved met as a group to share experiences that had occurred during the lessons taught during the first weeks of this practicum and to discuss progress made. The involved teachers submitted their observations and notations to the writer for review. Work samples completed by students using computers were shared. These

were part of the formative evaluation process. The writer continued to observe students using computers and teachers facilitating them while diligently keeping a journal of practicum experience.

During the sixth week of the implementation period, the writer continued to assist teachers with other instructional units they wished to develop that would incorporate technology as a tool to enhance student learning outcomes. New units included writing personal narratives, realistic fiction, writing personal letters, magnets, electricity, and regions of the United States.

The writer continued to observe students and teachers interacting with technology. These observations were noted in the writer's journal.

During the eighth week of implementation all faculty members submitted complete lesson plans to the administrator in charge of instruction for her approval. The writer reviewed these plans and gathered data from them to determine the extent of the usage of technology as an instructional tool. The data gathered included the number of times teachers planned to take their students to the computer lab, the software programs to be used, and if the software used was educational or non-related game-type programs.

The ninth week of the practicum experience marked a giant leap for teachers using technology in conjunction with traditional teaching resources to improve instruction and to enhance student learning outcomes. This was the first week without the pilot study for the satellite weather program. Students had become accustomed to using the weather stations at will and at first they seemed shocked when it was no longer available to them. To compensate for this, they were asked to produce writing samples using the word processor to describe their experiences with instruction that involved

technology to predict the weather and/or any other experiences they had encountered since being so densely immersed with computers and software programs. From these responses, the writer and teachers involved were able to draw conclusions and write future lesson plans incorporating technology.

The writer evaluated the practicum experience by gathering computer network usage reports and comparing them with past reports. Data was collected, examined, and tallied to determine the average number of worksheets used by students throughout the school. The writer also gathered information about number of copies requested by teachers who used the traditional instructional methods and compared their totals to those of teachers whose classrooms were involved in the practicum experience to determine if change had taken place. Lesson plans that had been submitted to administrators were reviewed to determine if there was an increase in the number of plans that included computer technologies when compared to the previous school semester.

The writer met with the teachers who were involved in the practicum experience and the administrator in charge of instruction to discuss the practicum experience and write a short summary of their experiences which reflected their personal feelings, instructional practices, and observations of using computers to enhance student learning outcomes.

During the final week of the practicum implementation period, the writer interpreted all of the data collected which pertained to the practicum plan and objectively evaluated the findings.

CHAPTER V

RESULTS, DISCUSSION, AND RECOMMENDATIONS

Results

The problem was that ample computer hardware and software existed at the writer's site but it was not being used effectively to enhance student learning outcomes. According to data gathered from 442 lesson plans submitted from teachers at this site, only 13 involved the use of computers. Computer network usage reports showed that students were accessing games 70% of the times logged on to the file server. Teachers at this school used more than 3 copied worksheets with their students each day to provide practice that could have been done using computers. Standardized test scores were below national and statewide levels in the language arts areas.

The writer received positive results from the twelve week implementation period. Teachers gained expertise and confidence with using computers. Students independently chose to access academic software programs when given free choice, and the number of lesson plans that included computer software as an instructional resource rose from less than 3% to more than 24%.

Expected Outcome One for this practicum was as follows: At the end of the implementation period, ten out of forty teachers at this site will request

that computer labs at this site operate flexibly four hours of the seven-hour school day. Prior to implementation, the teachers at this self-governed site had requested a semi-flexible schedule for computer lab operation for this school year. They reasoned that they functioned at various levels of computer literacy and needed some scheduled time to relieve the technostress they were feeling about the amount and type of technology that was rapidly becoming available at the site, but they also wished to have the ability to schedule extra time if needed to work on special activities. The entire faculty and staff closely observed the teachers that were involved in the practicum experience and how their teaching styles had evolved over the implementation period. In informal notes sent to the media specialist the consensus of the faculty has changed to one that is more secure in its technology capabilities. Faculty members are mutually agreeing to exchange scheduled lab time in order to accommodate one another's units of study. Over the implementation period, more than 17 of the 27 homeroom teacher faculty members scheduled additional time for their students to use the labs or made tradeoffs with other faculty members in order to accommodate the learning of the student rather than rigid traditional practices. Additional time had not been requested in prior weeks of the labs operation nor had teachers worked closely together to facilitate instruction.

Expected Outcome Two for this practicum was as follows: Having observed and/or participated in this practicum experience, teachers at this site who wished to incorporate computers into the instructional process would schedule at least one hour per month for instructional planning time with the writer. During the implementation period, the writer met with 17 of the 27 homeroom teacher faculty members scheduled one or more hours of

planning time with the writer to assist them in incorporating technology into their lesson plans. Of these 17, 13 homeroom teachers requested that the writer actively work alongside them with their students when in the computer labs or while working with small groups in the classroom.

Expected Outcome Three was as follows: Upon completion of the practicum experience, computer network usage reports would indicate that 70% of the students at this site would access academic software 80% of the times they logon to the network. Network usage reports showed that prior to practicum implementation that students, when given freedom to choose, would prefer to play games rather than interact with programs related to academic areas 70% of the times they logged on to the file server. During the practicum implementation period, this percentage was reduced to 30% for games (see Table 5). This is a dramatic increase in the percentage of logons in order to access academic software when given a choice. This evolution of choice demonstrated that, with teacher guidance, students are more willing to make responsible choices when given choices for their free time activity.

Expected Outcome Four was as follows: The number of worksheets used for student practice by teachers who were involved in this experience will be reduced from three per student per day to one per student per day. Data gathered from copy room records show that during the implementation period for this practicum, the number of practice worksheets requested by teachers for student use dropped from 3 per day prior to implementation to 1.3 per day during the implementation period. This is a dramatic change with which the writer is very pleased (see Table 6). This change alone indicates that teachers at this site are making positive changes to facilitate learning through technological means rather than traditional paper-pencil methods.

Table 5

Results of Student Access of Mastery Development Apple IIe Network During Practicum Implementation Period

Software Program Categories & Names of Programs	Educational Programs	Games	Percentage of Time Accessed
Writing Room	X		17%
Keyboarding Klass	X		6%
Math Facts Tracker	X		10%
Mastery Arithmetic	X		3%
Geo Quiz	X		1%
MECC Software:			
Language Arts	X		10%
Math	X		1%
Social Studies	X		13%
Public Domain:			
Games 1 Player		X	19%
Games 2 Players		X	11%
Science	X		9%

Table 6

Results of Copy Room Records Data Review During Practicum Implementation Period

Grade Level/Area	Total Copies Made
Grade 3 Practicum Teacher	1,392
Grade 4 Practicum Teacher	1,052
Grade 5 Practicum Teacher	1,300
Total Copies Produced by Practicum Teachers	3,744
Student Population Involved in Practicum Experience	72
Average Copies per Student per Day	1.3

Expected Outcome Five was as follows: 20% of lesson plans developed by teachers and submitted to the administrator in charge of instruction will include computer software and hardware as instructional resources to support lesson content as an end result of this practicum experience. From the 442 lesson plans submitted prior to implementation of this practicum only 13 included computer software as an instructional resource. Of the 593 lesson plans reviewed during the implementation of this practicum, 147 of them included computer software as an instructional resource This data indicates that before this practicum experience less than 3% of the lesson plans submitted to the administrator in charge of instruction for review contained plans for using the technology that was available at this site. During the implementation period this figure rose to more than 24% (see Table 7). This rise in the incorporation of computer technology into curriculum areas indicates that teachers at this site grew in their own abilities and confidence in using new tools for enhancing student learning outcomes. The writer believes this is a giant step for education and that providing teachers with the support and encouragement they require, positive changes have been made.

Discussion

All five expected outcomes met or exceeded the writer's hopes for this practicum. The writer believes that the following factors contributed to the success of the practicum: a desire by teachers to grow in their own comfort and ability levels with the use of technology as a tool for instruction, a sense of trust in the ability of the writer to support and facilitate the teachers' efforts to provide quality resources for their students, and hope for the future of

Table 7

Results of Review of Lesson Plans Filed with Administrators During the Practicum Implementation Period

Grade Level/Area Number of Plans	Number of Plans Using Computers	Number of Plans Without Computers	Total
Grade 3	47	194	241
Grade 4	41	88	129
Grade 5	53	84	137
Special Education	6	29	35
Resource	0	31	31
Chapter I & Remediation	0	20	14
Totals	147	446	593

education as a profession and for young minds that will ensure the success of the future. The writer worked alongside students and teachers to provide support and encouragement to all participants. Students were highly enthusiastic; teachers took took on the role of facilitator rather than knowledge inparter. They shared discoveries with students and willingly learned from students who had experience with software programs.

For these instructional units, teachers used lessons they had taught in years past. All lessons correlated to the state core curriculum areas; the difference this time was that worksheets were replaced by sessions using computer software.

Customarily, teachers brought their students to class and gave students instructions about which software to access from the file server. This portion of the instructional process was familiar to both teacher and student. Depending on the software program accessed, the students were either on their own to interact with the program or were given further instructions by the teacher about topics for writing assignments or commands to be used to manipulate various aspects of the software.

Since most of the computer sessions were scheduled for 30 minutes, students were given assistance suring their work time if they needed it. In a setting such as this, the students frequently became the tutors for other students, thus resolving problems intuitively rather than requiring the teacher's intervention. Few discipline problems were encountered since the computers served as a high motivational device for accomplishing the tasks assigned.

Teachers discovered that students learned more efficiently and effectively with computers than with worksheets and that their frustration

levels were lowered since there were fewer papers to score. The software programs either presented the teachers with percentage scores they could use for evaluations or displayed remarks along the process to tell teachers how well or poorly their students had performed on a particular task. The computers gave immediate feedback to students when they correctly or incorrectly responded. Most programs gave several chances for the student to feel successful before recording a score.

From students' comments derived from their writings, the consensus from students was that computers were more fun than regular classroom work, but they would like more time to use the computers. Most students said they made better grades using the computer than they did when they completed worksheets. All comments were independently given. No questionnaires were used to elicit these remarks.

Recommendations

The results from this practicum experience indicate that computers are an effective and efficient instructional tool for teachers to use to enhance student learning outcomes. The practicum outcomes suggest that students and teachers enjoy using computers as a part of the instructional process. The results of this practicum experience imply that teachers need assistance when learning to use new teaching methods and that students prefer a hands on approach which actively involves them in the learning process..

Dissemination

There is a great need for today's teachers to use modern technological tools when instructing today's children; this is evidenced by this practicum.

the writer plans to share these findings by publishing them in the school's weekly bulletin, finding by finding with elaboration on and praise for the participants. The results of this practicum will also be published in a monthly newsletter which is sent home with each student at this site.

A quarterly local area newsletter published by the local school system will also carry a brief summary of the practicum results.

The writer also plans to present this paper at a statewide technology conference and a statewide self-governed schools consortium meeting in hopes that other professionals in the field of education and/or technology will benefit from these findings.

As we move into the 21st century, there is a great need for laying aside the antiquated tools of the past and to provide our children with the best educational tools available to help them to become a positive, successful society for the future. This writer believes that computer technology is one tool that can help to fulfill that need.

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