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Developing a teacher directed inservice plan for technology

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DEVELOPING A TEACHER DIRECTED INSERVICE PLAN FOR TECHNOLOGY

A Project
Presented to the
Faculty of
California State University,
San Bernardino

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts
in
Education: Secondary Option

by
Robert Norman Charpentier
September 1995
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PLAN FOR TECHNOLOGY

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ABSTRACT

Despite the vast numbers of computers in schools today there has been little integration of technology into teaching practices. The primary reason for this discrepancy is that teachers are not prepared by teacher preparation programs or traditional inservices to use technology effectively. A review of the related literature organizes the essential features of technology inservices into a set of guidelines. The guidelines include needs assessment, inclusion of teachers, focus on teaching practices, hands-on experiences, long term commitment, and incentives. Specifically, this project is a plan for developing teacher directed technology inservices following the guidelines. Also included as part of the inservice plan are teacher survey and evaluation forms as well as an interactive computer program that serves as part of the needs assessment.
Acknowledgments

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Chapter One: Introduction

Computers are prevalent throughout our society and touch our lives in a multitude of ways. At work, at home, and at play we can find technology making a difference in the way we function (Hannafin and Savenye, 1993; Merrow, 1995). So it would be reasonable to assume that technology is having the same impact in our schools. Such is not the case. While it is true that there are vast numbers of computers in our schools, little has been accomplished towards widespread integration of technology into teaching practices (Glenn and Carrier, 1986; Futrell, 1989; Hadley and Sheingold, 1993; Hannafin and Savenye, 1993). Most classrooms today are not much different technologically than they were before the arrival of computers (Merrow, 1995). Certainly, the technological revolution in education that so many have heralded has not yet happened.

How is it that technology can be so pervasive in every aspect of our society except in the classrooms of our schools? While there are many factors involved, this project will illustrate that the primary reason for the lack of technology use in the classroom is that teachers do not have the information, opportunity, or training needed to use technology effectively. Although preservice education programs are constantly improving, many teachers have had insufficient preparation for the integration of technology.
and teaching. This is probably more true for experienced teachers credentialed before technology preservice education improved. Likewise, school districts' attempts to inservice teachers on technology integration have also been insufficient (Boe, 1989; Barker, 1990; Browne and Ritchie, 1991, Siegel, 1995). Trainers often knew more about computers than about teaching, too much attention was paid to programming skills, and little attention was paid to the needs of the teachers who would be responsible for the technology in the classroom. On the whole, inservices have often focused on what the technology can do instead of focusing on what the teacher can do with the technology. Consequently, teachers have not received the kind of inservicing that would foster and nourish an interest in technology. Additionally, inservices are usually too short to be of any real value to teachers and long term training programs are almost non existent. Unfortunately, inservices on technology are ineffective and do not make any real changes in the way teachers use technology.

In addition to poor training as a cause for technology remaining outside teaching practices, teachers have personal barriers to technology. These barriers to technology result in a hesitancy to pursue opportunities to learn about technology. Most of the barriers teachers have towards technology stem from the tremendous amount of time and effort needed to integrate technology as well as from resistant
attitudes. Teachers who are resistant will not change their attitudes towards technology until they perceive a personal benefit from its use. Such personal benefits can come from the use of word processing or gradebook programs. Because of the immediate application of these programs to classroom tasks they are often the basis for an enthusiasm for technology.

Teachers' interest in technology alone, however, is insufficient in enabling them to integrate technology into their teaching practices. Current inservice programs, as stated previously, are not getting the job done. So where do teachers turn to learn about technology and how to bring it to their classrooms? One answer is to rework the inservice to meet the needs of teachers in terms of real classroom applications. Certainly there are prerequisite skills necessary to operate a computer; but beyond those basics, an inservice should focus on how technology can be used to enhance or make more efficient one's teaching practices. In addition to a proper focus, teachers should take the responsibility of planning and directing their own technology inservices. After all, who knows more about what teachers do and how they do it than teachers themselves?

What follows in this project is a review of the literature supporting the contentions of this introduction and a plan for a teacher directed inservice on technology including an evaluation.
The Prevalence of Computers

Although it is common knowledge that technology and computers in particular are widespread throughout our schools, it would be useful to lend some support from the literature. In 1984, Diem reminds us of the predictions made in the late 1970s that microcomputers would someday play a major role in education. He believed that most of these predictions had already come true in 1984. In support of his belief, he refers to a 1982 report by the Office of Technological Assessment (OTA) that at least 300,000 microcomputers were sold to elementary and secondary schools in the United States. By 1988, reports indicated that ninety-seven percent of all schools in the United States had at least one computer (McCarthy). A year later, Glenn and Carrier (1989) wrote of an unprecedented growth in the amount of technology in the schools and provided an estimate that 1.7 million computers were in use in public schools. In 1990, Barker states that "the desktop or personal computer is the most prevalent electronic tool used for instruction in American elementary and secondary schools, followed by the videocassette player and recorder (VCR)" (p. 31). Also in 1990, Main and Roberts participated in the California Technology Project, a statewide survey of educational technology in California public schools. They reported that
computers were by far the most common technology available in schools with an average of almost 40 computers per school surveyed. By 1994, Dyrli and Kinnaman indicate that the ratio of students to computers has dropped to about 15:1 and Merrow (1995) puts the number of computers in schools at four million. Clearly the belief that computers are prevalent in our schools is a well documented one.

Computer Technology Not Widely Used

Having established that computers are the most common form of technology available in schools, it would be a natural assumption that computers are widely used in the classrooms by teachers and students alike. Unfortunately it would be a false assumption. Glenn and Carrier (1986) indicated that a common criticism is that computer technology does not play an integral role in the instructional process. A criticism supported by an OTA report that computers remain a neglected resource in the schools and described the impact of technology on classroom instruction as negligible (Futrell, 1989). Even as late as 1993, Hadley and Sheingold reported that a wide range of surveys of the broad trends in schools across the United States showed a limited integration of computer technology. They also cite a 1988 OTA report concluding that computers are not integrated into classroom practices and are not part of the core learning activities of
students. Also in 1993, Hannafin and Savenye state that "the computer remains a tool fully exploited by relatively few" (p. 26). How is it that the most prevalent form of technology in our schools remains a largely neglected resource?

While this is indeed an important question, the focus of this project addresses the question of how to increase the use of technology by teachers. However, the following sections highlight a few of the factors contributing to the neglect of computers in the schools as a backdrop in support of this project. These factors are preservice training, teacher barriers to technology, and teacher inservice training.

Preservice Training in Technology

The heart of the problem with teacher preservice education in technology is the lack of training. Most teachers received their training before improvements were made to technology training and before there were any exemplary programs. This was quite evident a decade ago when teachers received very little training on the use of technology (Diem, 1984). In 1986, Glenn and Carrier reported that a typical preservice teacher received only 10 to 20 hours of computer instruction and that the most common computer course available to students was an introductory
course providing only the most minimal of skills. In addition to the lack of time spent on technology, Futrell (1989) states that "most new teachers have been taught to use computers; they have not been taught how to teach with computers" (p. 45). Such a minimal exposure to educational technology makes the expectation that technology is the future of education an unrealistic one. Great efforts must be made to prepare future teachers to use technology if that future is to be realized. Futrell writes, "if we are not to continue to merely read about the promise of computers as instructional tools, teacher preparation programs must be comprehensively and systematically restructured" (1989, p. 45). Bitter and Yohe (1989) also agree that "the integration of technology into the teacher preparation curriculum is the single most pervading issue in colleges of education today" (p. 22). Even during clinical experiences, preservice teachers did not receive additional training unless their master teacher happened to use technology in the classroom (Glenn and Carrier, 1989). According to a 1987 OTA report, Power On!, technology preparation received a flunking grade from the students surveyed and fewer than one-third felt prepared to teach with computers (Fulton, 1989). In the early nineties, preservice technology had improved but reports indicated that preservice teachers were usually limited to a single required computer course (Handler, 1993; Resta, 1993). Handler adds that "there is little
evidence that typical preservice education programs are permeated with opportunities to work with technology" (p. 147).

On the whole, many preservice education programs fall short of adequately preparing teachers to use technology in any meaningful way in the classroom. The lack of time appropriated to computer technology can be partly attributed to the many demands placed on the curriculum of preservice programs. Other reasons cited in the literature include computer courses taught by technology specialist who focus on the mechanics of computer use rather than curriculum design (Handler, 1993). Resta (1993) lists limited access to technology, limited opportunities and resources for faculty development, and lack of faculty incentives as additional barriers confronting colleges of education. Yet, the limited exposure current preservice teachers receive is greater than the preservice experiences of older teachers who received their credentials before the computer revolution. It is for the majority of teachers that the influence of computer technology is too recent to have been part of their preservice training (Fulton, 1988; Riordan, 1989; Kinnaman, 1990; Main and Roberts, 1990).
Teacher Barriers to Technology

Teachers are highly motivated individuals when it comes to what is best for their students. When a teacher finds something that works in the classroom, it becomes a part of their teaching style. On the other hand, when presented with an innovation, teachers can be very skeptical (McCarthy, 1988). Computer technology has been such an innovation. One could contend that any resistance to technology by teachers has not been without just cause. In the beginning of this computer revolution, many were under the false assumption that the computer was so magically powerful that it would implement itself into educational practices (McCarthy, 1988). Consequently, it may have been the case that educators were led to believe that an effort to integrate computers into teaching practices was unnecessary. Although it is doubtful that anyone still maintains this line of thinking, there are still many reasons why teachers are resistant to technology. In a survey of California public schools, Main and Roberts (1990) found that some teachers were described as resistant to technology in some way. Unfortunately the depth of their survey did not allow for a more detailed analysis of the ways in which teachers were resistant. However, the literature provided many other references to teacher's resistance to technology.
A frequently mentioned reason for teacher resistance to technology stems from the amount of time required to adopt innovative teaching practices. Bitter and Yohe (1989) argue that technology's role in education has not yet been totally defined or widely accepted by educators. They also argue that with any innovation, acceptance and understanding takes longer than the acquisition of skills. This argument is supported by the findings of a nationwide survey by Hadley and Sheingold (1993). In their survey of teachers experienced at integrating computers into teaching practices they found results that were "at once encouraging and surprising about what many teachers are achieving with technology and sobering about the effort, time, and support needed to realize these accomplishments" (p. 262). The teachers in this survey listed the lack of time to develop lessons utilizing computers as one of the highest rated barriers to the integration of computers into their teaching. Interestingly, this was a top rated barrier of the past when the teachers were just beginning to learn about computers as well as a current barrier. Time constraints are indeed a problem for all teachers and especially so for new innovations that are complicated and time consuming to learn. Many teachers have been reluctant to spend the time necessary developing computer skills because of the time and costs involved (Fontana and Ochoa, 1985). McCarthy (1988) argues
that the technology must become radically simpler for curriculum integration to occur.

Less frequently mentioned reasons for teacher resistance included teacher fears about their role after technology is implemented (Glenn and Carrier, 1986; Robinson, 1991; Hannafin and Savenye, 1993), initial negative attitudes towards innovation in general (Fontana and Ochoa, 1985; Hannafin and Savenye, 1993), and the perception that computers are not all that helpful (McCarthy, 1988; Hannafin and Savenye, 1993).

**Teacher Inservice Training**

By far the most frequently cited barrier to teachers using computers is the availability and quality of inservice training. Boe (1989) states that while others have placed blame elsewhere, "educators know that the fault lies much more in the inadequate manner in which technology has been implemented in the schools" (p. 39). He further states that teacher training was often overlooked entirely or was taught by trainers who had no understanding of how teachers worked. A general agreement is that inservices have often inappropriately focused on the technical aspects of hardware and software applications with little attention paid to transferring these skills to classroom practices (Boe, 1989; Valdez, 1989; Barker, 1990; Browne and Ritchie, 1991). Glenn
and Carrier (1986, 1989) concur that the focus of inservice training has been misdirected and add that in most cases no follow up inservices were implemented. One explanation for the improper focus of many inservices is that a majority of the trainers knew more about computers than they did about education (Kinnaman, 1990).

Teachers understand the importance of connecting skills to application for their students, but little attention was paid to this concept when teaching teachers about computer technology. One insightful software vendor was quoted as saying, "the lesson is that if you bring into the school a technology that ignores the complex social and pedagogical environment that exists there ... that technology won't be able to live. Teachers will kill it by simply ignoring it" (McCarthy, 1988, p. 45). This statement would surely be appreciated by Boe (1989) who warned the computer and software industries that their future is dependent on staff development. Without the proper information and training it is inevitable that an innovation would be ignored. Given that inservicing has been a traditional method for keeping educators current on new teaching practices and that most teachers have had little or no formal training in the use of technology, inservice instruction should have been a top priority. Much attention should have been focused on how teachers could use technology in their classrooms as part of their current teaching practices. Instead, the focus was
often on programming or basic operations of the computer with little emphasis on integration (Diem, 1984). Consequently many teachers became skeptical about integrating technology (Fontana and Ochoa, 1985). A more recent national survey of technology staff development found that on average only eight percent of technology budgets go towards training, 66 percent of respondents gave workshops on software and hardware but did not focus on using the technology as a tool to enrich the curriculum, and inadequate hands-on practice and insufficient follow-ups were cited as weaknesses (Siegel, 1995). Merrow, (1995) reports that fewer than half of all schools provide basic computer classes for teachers. In summary of the literature cited here, inservices have neither inspired nor fostered an interest in technology. Too much attention has been given to the computer itself and not enough to what teachers could do with the computer. Moreover, inadequate long term follow-ups failed to nourish any interest teachers may have had in integrating technology.

Despite the barriers teachers may have to technology, they are motivated individuals who are always looking for ways to improve their skills as educators. The difficulty is in convincing teachers that an innovation is worthwhile. Computer technology has often been presented in a fashion that turned teachers off, not on. Hadley and Sheingold (1993) conducted a nationwide survey of teachers known to be using technology and found that the teachers were extremely
motivated and had made significant commitments in time and effort to integrate technology. Furthermore, they found that in general, these teachers were motivated by the opportunity to learn new skills. "Teachers, like other professionals, want to stay abreast of the latest developments in their field" (Fulton, 1988, p. 32). Fulton (1988) supported this statement by citing an OTA study that found most teachers want to use technology.

The Value of Inservicing

If technology inservices have been historically ineffective, then what direction should be taken to effectively train teachers about technology? To abandon the inservice format would be foolish. Inservices are practically an institution within the educational arena. Indeed, staff development is seen as a critical element (Durost, 1994; Lamson and Barnett, 1994). Meeks and Soeffing (1995) write that "without the training, staff members become indifferent to a tool's potential and will continue to do what they have always done, and get what they have always gotten" (p. 117). Given the need for inservicing, the challenge is to recreate the inservice to meet the needs of teachers and match the complex nature of technology. The review of related literature presents many factors that should be part of technology inservices. For a more orderly
presentation, these factors have been divided into five categories: focus, preparation, presentation, general concerns, and evaluation.

The Focus of Technology Inservices

Previously, the problem of most technology inservices giving too much attention to the technology was addressed. Where then should the focus of technology inservices lie? Perhaps a question posed by so many students will help: When am I ever going to use this? Ultimately, this question must be answered for teachers who are responsible for the learning environment, instructional strategies, and the use of technology (Glenn and Carrier, 1986). Technology inservices must show teachers when they will use technology. Yet it is not as simple as demonstrating the use of technology to achieve a particular teaching objective. Fisher (1989) believes that staff development is not about teaching people simply how to use computers and that the focus should be on helping teachers to teach with computers. Teachers teaching with computers should then be the focus of technology inservices. Boe (1989) wrote about the gradual process that most teachers must go through if technology is to be adopted. He stated that, "they [teachers] must be shown that new approaches to instruction fit the objectives in which they believe" (p. 42). Technology needs to be integrated with a
teacher's current methods of teaching and not the other way around. According to Hawkins (1994), teachers need see how technology can improve what they are already doing. Similarly, Siegel (1995) believes that teachers must learn how to integrate technology seamlessly into the curriculum. If new technology does not enhance their instructional methods, Durost (1994) warns that teachers will return to their old ways. With this focus, the integration of technology does not require a whole new way of teaching; instead it is a means to enhance the kinds of teaching practices that teachers already believe in. Fisher (1989) sums it up best when he writes:

We have progressed from a focus on technology (learning about bits, bytes, and BASIC), to a focus on the software, (with software evaluation and curriculum guides), to a focus on the curriculum (with lesson plans and more curriculum guides). I think we still have one step to go--to a focus on instruction. Focusing on the curriculum simply connects the software objectives with teaching objectives, but it does not help a teacher figure out what to do with the computer or how to connect the software to anything else he or she is doing in the classroom. (p.105)
Preparation for Technology Inservices

Conducting a needs assessment is one of the first steps in good instructional design (Wepner and Kramer, 1987; Fisher, 1989; Hagerty, 1990; Zeitz, 1995). Sturdivant (1989) advises that the needs assessment must be continuous to properly adjust a training program. As part of his steps to curriculum integration, McCarthy (1988) recommends asking teachers what they want and cautions against throwing technology at teachers. Not all teachers will require the same level of inservice or inservice on the same topics. A properly conducted needs assessment will allow inservices to be tailored to the level of expertise of specific groups of individuals (Fulton, 1988; Browne and Ritchie, 1991). For example, some teachers may require instruction on how to get an application up and running on a computer while others may be ready for advanced techniques of that very same application. The very nature of a needs assessment is to determine what the inservice should cover and at what level of instruction. Valdez (1989) believes that inservices targeted to the wrong level of the participants may be the most significant reason for poor evaluations of those inservices. Similarly, Hagerty (1990) suggests that inservices lacking teacher input are rarely successful. A poor inservice is one that does not provide something that teachers can walk away with and make use of.
The best method for conducting the needs assessment, is to include teachers in the planning of the inservice. Letting teachers plan the agenda for an inservice is an excellent way to meet their personal needs. Active participation by teachers is not only a critical component of planning but it will help insure their ownership of the inservice (Boe, 1989; Fisher, 1989; Valdez, 1989). Fisher (1989) writes that most staff development programs do not allow for staff involvement at any level and that a sense of involvement is a key element of successful change in schools. The issue of ownership or buy-in is an important one for any inservice and especially so for technology inservices.

Presentation of the Inservice

Giving teachers hands-on experiences in technology inservices is arguably the single most important element. If technology is to become part of the classroom experiences of students, it will be the teacher who is responsible for implementing and directing that technology. Experience in the use of such technology is naturally a prerequisite. Allowing teachers time to practice with the computer must be scheduled during the inservice (Moursund, 1986; Fisher, 1989; Glenn and Carrier, 1989; Eisele and Eisele, 1990; Kinnaman, 1990; Robinson, 1991; Lamson and Barnett, 1994; Siegel, 1995). Too often teachers have been presented with dazzling
demonstrations about the capabilities of computer technology (Boe, 1989; Fisher, 1989). The mistake here is that teachers do not need to be impressed with what computers can do; instead, teachers need to be impressed with what they can do with computers.

While demonstrations and lectures about technology are necessary components of inservice, there are outcomes that only hands-on experience can produce. For some teachers inexperienced with the use of computers, there is a real anxiety about how to approach technology. The task can appear so daunting that the easiest decision is not to try. The opportunity to practice with the computer can reduce these anxieties about technology (Barker, 1990; Hawkins, 1994). For the majority of teachers who are interested, but do not know how to integrate technology, a strong practice component of the inservice is a critical factor that influences whether or not technology is adopted (Fulton, 1988; Hagerty, 1990).

Adding to the call for hands-on experience, Eisele and Eisele (1990) suggest that inservices begin with an application that is easy to use and that teachers can immediately put to use in their classrooms. This project suggests that a word processor or gradebook program fits the bill perfectly. Although these type of applications may not affect instructional practices, they can be of great personal benefit to the teacher. The functions of word processing and
gradebook programs are parts of every teacher's job that can be simplified by the use of computer technology. Boe (1989) argues that teachers can be most positively affected by seeing the personal benefits of computers and this insight is necessary before they can begin to adopt technology for use in the classroom. Once a teacher is hooked by the personal benefits of technology, they will be open to technology in others areas of their teaching. Evidence for this is found in a nationwide survey of teachers experienced at using technology. For more than nine of 10 teachers surveyed, text-processing applications were the most frequently used (Hadley and Sheingold, 1993).

After insuring that teachers have ample opportunity for hands-on experience with technology, the next key component of the inservice is to insure that teachers have ample opportunity to collaborate with one another (Moursund, 1986; Robinson, 1991; Siegel, 1995; Zeitz, 1995). During the inservice, collaboration simply means that teachers will work with one another while exploring technology. Hawkins (1994) prefers to use the word "share" indicating that sharing is non-threatening for teachers and gives change a chance. Nothing more formal than the opportunity to share experiences needs to occur. Barker, (1990) feels that it is important for teachers to work together during the hands-on training since it is helpful in reducing anxieties about technology. In describing a staff development program for technology
based on the Concerns-Based Adoption Model (CBAM), a commonly used model for educational change planning, Boe (1989) writes, "the progression of activities and involvement by teachers in this program starts with experiences designed to meet personal needs then concentrates on instructional strategies, and finally develops into a collaborative effort of innovation" (p. 42). His description not only supports the need to make technology inservices collaborative in nature, but also supports the need to tailor inservices to the needs of individual teachers and to focus on instruction rather than on technology. Boe (1989) feels that collegial support is more important than formal learning and makes the difference between successful and unsuccessful programs.

General Concerns

As could be expected, there is a general call for school districts to support teachers in their efforts to integrate technology; and in general, any inservice sponsored by a school district is a form of support. However, conducting inservices alone is insufficient support. Throughout the literature reviewed, there were many incentives listed that should be offered to teachers for their participation in any kind of training program. Fisher (1989) suggests that teachers deserve recognition for professional growth and that a reward structure is a necessary component of effective
staff development. Similarly, (Zeitz, 1995) argues that time, money, and support needs to be invested in teachers in order to bring technology into the schools. Release time for teachers to attend workshops, collaborate with other teachers on integration, and attend planning sessions for inservices, were often listed as incentives (Fontana and Ochoa, 1985; Fulton, 1988; Hagerty, 1990; Kinnaman, 1990; Robinson, 1991; Zeitz, 1995). If school districts are behind the movement to integrate computers then release time should be provided. Teaching is a full time job that takes all of a teacher's energy. If technology inservices were part of the teacher's regular day, then attending an inservice would not be an added burden. One solution is to hold technology inservices in place of the regularly scheduled meetings that teachers are already required to attend. It is reasonable to assume that teachers would enjoy a break from the typical monthly faculty meetings.

When scheduling a time for technology inservices, a key factor is to see that staff members are not attending on their own time (Eisele and Eisele, 1990; Siegel, 1995). Providing release time to attend an inservice is the only way to conduct an inservice during the regular teaching day. Teachers who are motivated about technology will likely show up at any time, even if it is personal time. For the majority of teachers who are not as enthusiastic about
technology, requiring the sacrifice of personal time will surely guarantee minimal attendance.

In addition to release time, some sort of monetary reward is high on the lists of incentives. Remuneration for conference and workshop fees, stipends for attendance to technology inservices, professional days to attend conferences or visit other schools using technology, master teacher pay for those with extensive technology experience, summer employment for planning and development, and movement on the pay scale were all suggested as incentives (Fontana and Ochoa, 1985; Wepner and Kramer, 1987; Fulton, 1988; Villa, 1989; Kinnaman, 1990). Kinnaman (1990) also suggested that there are intrinsic incentives that can motivate teachers to participate in training programs. At the top of his list of intrinsic incentives is the opportunity for professional growth. As a final note to incentives, Kinnaman (1990) points out that having incentives is essential for teachers just starting out with technology.

Computers are the number one form of electronic technology in classrooms today, but is their number sufficient to allow widespread use by teachers? Many have written that schools do not have sufficient numbers of computers to make them an integral component of the instructional process (McCarthy, 1988; Glenn and Carrier, 1989; Szabo and Hotch, 1993). Yet, access to computers is critical to staff development (Fisher, 1989; Kinnaman, 1990;
Robertson, 1991; Lamson and Barnett, 1994; Siegel, 1995). Obviously limited access means limited opportunity to practice; but Robertson (1991) feels that without adequate access, teachers may not be able to overcome other barriers to technology. Similarly, Barker (1990) argues that teachers will master technology skills only if they have continued access to computers and that teachers will gain confidence through practice. Regular practice requires constant access to computers and school districts should provide for this kind of access. Computers should be placed in the teacher's lounge, on the teacher's desk, and should be available for teachers to check out for weekends and summers (Fulton, 1988; Boe, 1989; Robinson, 1991; Lamson and Barnett, 1994). Additionally, school districts should help teachers obtain a computer for home use under favorable conditions such as special purchase programs or financial aid (Boe, 1989; Sturdivant, 1989; Moonen, 1989; Kinnaman, 1990). McCarthy (1988) interviewed a software designer who feels that giving computers to kids first was a mistake made in the beginning and that computers should have been given to the teachers first.

Regular and ongoing training is another of the key factors of staff development (Fulton, 1989; Eisele and Eisele, 1990; Kinnaman, 1990; Lamson and Barnett, 1994). The technology may be simple and teaching practices well established, but the integration of technology into teaching
practices is a demanding endeavor. Bitter and Yohe (1989) conclude that "traditional inservice programs have not been effective because of the lack of time and commitment involved with the proper integration of technology" (p. 25). Even an inservice designed around the best thinking today can be ineffective if the training is limited to one or a few scattered sessions. Both Kinnaman (1990) and Robinson (1991) warn against the one-time inservice approach. Boe (1989) describes a 1988 OTA report that indicates a need for long term commitments to staff development programs and Wepner and Kramer (1987) went one step further by stating that staff development should be a continuous process for teachers.

Teacher-Directed Inservices

A natural progression after having teachers involved in the planning of an inservice is to have the teachers run the inservice. Riordan (1989) sees a return to the idea of teachers teaching teachers as a solution to providing training to language teachers who are unable to attend conferences. In support of this idea, she refers to research indicating that teachers rely more on the expertise of colleagues than on that of supervisors or administrators. Indeed there are those who also feel that teachers need to be involved in the implementation of inservices and indicate that teachers as trainers is an essential component of
technology inservices (Moursund, 1986; Fulton, 1988; Hagerty, 1990). Kinnaman (1990) argues that despite the problems of the past, we still must invest in staff development to train teachers in the use of technology. He believes that the best way to meet the staff development needs of teachers is to build in-house expertise. This kind of expertise is supported by Riordan (1989) who contends that the success of any change effort is dependent on the effort of a core group of teachers. She states that "these core teachers need to be energized and empowered to be professional leaders in their own area. They need to become trainers of their colleagues" (Riordan, 1989, p. 186). The training of teachers to give inservices is also supported by Hagerty (1990). The use of in-house experts is an effort to provide more meaningful training in technology for teachers. This strategy, however, should not exclude the use of outside experts; the intent is to make better use of the expertise available on site. As a challenge to using computers in education, Moonen (1989) states that inservice training should be organized within each school and that the school should determine the structure and content of the training.

In addition to being an effective method of inservicing, there are other benefits to using teachers as trainers of teachers. Dunaway, Mechenbier, Parsons, and Wright (1987) indicate that the use of in-house trainers is a cost effective way to circumvent budgetary restrictions. They
also list encouraged interdepartmental interaction and renewed enthusiasm for teachers combating burnout and stress as additional benefits. Kinnaman (1990) also cites cost effectiveness as a benefit to using teachers as trainers. To that list of benefits, he adds increased ownership by all teachers involved and greater opportunities for collegiality.
This technology inservice plan is designed for the teachers of the Mathematics Department of Upland High School located in Upland, California. Upland High School is the sole high school in the Upland Unified School District. Its enrollment is approximately 3,100 students in grades nine through twelve. The teaching staff consists of approximately 125 full-time teachers. In the Mathematics Department there are 18 teachers responsible for mathematics courses ranging from Basic Math to Calculus.

The current state of technology use in the Upland High School Mathematics Department is like that of most schools. There are a growing number of computers available for teachers to use, but not enough for even one computer per math classroom. As of 1995, the Math Department has only one Macintosh computer to share among 18 teachers. This computer is stored on a cart and may be rolled from classroom to classroom. Four additional Macintosh computers are located in the school library and are available for all faculty members. These four computers are not available for classroom use. The Apple Macintosh has become the de facto choice of computers for the Math Department as well as the school. There are IBM platform computers on campus, but the Macintosh is clearly the computer of choice. Other departments, most notably the Science and Business
departments, possess greater numbers of computers. Overall, it is safe to say that the Math Department is lagging behind in technology growth. This is especially true in terms of the ratio of computers to students. Despite the small number of computers available, the Mathematics Department has several software applications. Most of these applications are teacher utility programs. Unfortunately, an informal survey showed that very few teachers within the department know how to use these applications and even fewer are using them in the classroom. The problem then is to introduce teachers to the available technology through teacher-directed inservices.

Upland High School has a technology committee consisting of an administrator and at least one teacher from every department. The function of this committee is to oversee the technological needs of the school by evaluating software for potential site licensing, reviewing new technologies and updating the faculty with reports, and aiding departments in the writing of technology grants. Training teachers in the use of technologies is the responsibility of individual departments. Therefore, the scope of this project will not overlap the boundaries of that committee. However, the technology committee may be interested in receiving reports on the progress of the Mathematics Department inservices. These reports could be useful to other departments conducting their own technology inservices. On the other hand, the
technology committee represents a bank of experiences that may prove useful in the inservices of the Math Department.

From the District's point of view, teacher-directed inservices are an excellent way to continue a meaningful program of staff development without putting a further strain on the already stretched budgets. Dunaway, Mechenbier, Parsons, and Wright (1987) agree that in-house training is cost effective and suggest that it is also good for teacher morale. Furthermore, these inservices are consistent with the District's policy of staff development. Their policy requires teachers to set goals in the area of professional growth and to work on those goals throughout the year. Inservicing ourselves on technology is exactly the sort professional growth encouraged by the District. Working with the Technology Committee would simply be one more reason why the District will support my plan. Teacher participation in school committees is something the District expects and encourages. There are no apparent reasons why the District would not wholeheartedly support the efforts of this project. Fisher (1989) provides a favorable argument when he writes, "thinking about staff development as a way of promoting the growth of each individual teacher also helps us remember that staff development is not a thing unto itself, but a service and a resource for teachers and the district" (p. 108).
Guidelines

The following is a plan for teacher-directed inservices on technology for the Mathematics Department at Upland High School. There is ample evidence in the literature supporting the belief that teachers acting as the trainers is essential to any technology inservice (Moursund, 1986; Fulton, 1988; Riordan, 1989; Hagerty, 1990; Lamson and Barnett, 1994; Meeks and Soeffing, 1995). This plan is based on the following six guidelines derived from the review of related literature as well as personal experiences with computer technology: conduct a needs assessment, include teachers in every phase, focus on teaching practices, provide hands-on experiences, make a long term commitment, and provide incentives. Each of these guidelines is addressed following an overview of the inservice plan.

Overview of the Inservice Plan

The first step in implementing this inservice plan is to conduct a needs assessment. Two tools, a needs assessment survey (Appendix H) and an interactive computer program (disks included as part of this project), will be used to conduct the needs assessment. For simplicity, the computer program will be referred to as TINA (Technology Inservice Needs Assessment). Although each of these assessment tools
is discussed in great detail in the next section, a brief
description is provided here.

TINA is a menu-driven sampler of the seven inservice
topics offered in this plan. By using TINA, teachers can
briefly explore any or all of the topics. Those seven
choices include five inservices on computer applications, one
inservice on the Texas Instruments TI-85 graphing calculator,
and one inservice on how to buy a personal computer. The
five computer applications are Microsoft Word (word
processing), LXR•Test (test banking and creation), Gradebook
Plus (electronic gradebook), Exam in a Can (test generator),
and Geometer's Sketchpad (a graphical exploration of
geometry). A list of these software applications is included
in Appendix I.

The needs assessment survey investigates each teacher's
level of computer skills and interest in the seven offered
topics. Based on the responses to this survey, teachers will
be divided into smaller groups with similar skill levels and
interests. Each group will be inserviced on their chosen
topic with an expert peer leading that inservice. A typical
inservice group will consist of one teacher acting as an
expert presenter for up to six teachers. For inservices on
the five computer applications, each teacher will have their
own computer to use. For the inservice on the graphing
calculator, each teacher will be given a calculator and
manual. The remaining inservice on buying a personal
computer will not necessarily require one computer per teacher; one or two computers used as examples should be sufficient.

At the end of each inservice session, teachers will receive an evaluation form (Appendix H). The evaluation process is addressed in detail in Chapter Four of this project. Since there are seven different topics and each inservice session is tailored to the needs of its participants, it is not possible to give a detailed outline of what each session will cover. However, there is a basic format that all inservice sessions will follow. The introduction and practice of required computer skills, if any, should start each session. An overview of the topic and its relevance to teaching will follow required skills practice. Hands-on practice of new skills emphasizing application to current teaching practices should be next. Finally, an evaluation of the session should close each inservice.

In order to illustrate the kind of work involved in the various inservice sessions, a variety of handouts and sample work are included in Appendices A to F. Handouts for the five computer applications are either samples of finished products showing how a teacher could use that applications or lists of information useful in learning about the application. The Microsoft Word handouts include sample work.
such as a class rules handout for students and a handout illustrating the possible combinations of fonts and font formats (Appendix A). All of the handouts in Appendix B are samples of tests, test questions, answer sheets, and solutions that are created with LXR•Test. Handouts in Appendix C are sample grade reports from a fictitious class of Algebra II students. Appendix D contains sample tests, answer sheets, and solution keys created with Exam in a Can. The Geometer's Sketchpad handouts are example constructions of a regular polygon, the centroid of a scalene triangle, and a simple fractal (Appendix E). Finally, Appendix F contains information useful to a teacher interested in buying a personal computer. Since the school is committed to Macintosh computers, most of the information in this appendix is specific to Apple Macintosh computers.

Beyond these basics, it would be difficult to describe a detailed inservice plan since each session will cover different topics at various levels of expertise. In order to illustrate how these inservices will work, a description of an inservice on the Gradebook Plus program for teachers with limited computer experience is given below.

The first portion of the Gradebook Plus inservice will involve directed instruction on the use of the computer. For the novice user, instruction could include turning the computer on, starting the gradebook application, mouse skills, using a disk, and file management. Keeping in mind
that hands-on practice is one of the guidelines, all basic instruction should be guided; that is, teachers should be working on the computer rather than watching it done on the computer. Teachers will move into a guided tour of the gradebook application as soon as the most basic computer skills are covered. With the gradebook program running, teachers will first create a file for one of their classes and input the names of their students. Using this file for practice, teachers could input a grading scale and fictional scores for tests, quizzes, and homework assignments. During this time, the expert teacher will observe the others and act as a coach when needed. As scores are entered, the teachers can observe how the program organizes grades for students in much the same fashion as any ordinary gradebook (see Gradebook Plus examples in Appendix C).

The next level of inservice for this group of teachers would include the more advanced features of the gradebook program such as weighting grades and printing score reports. A more advanced group of teachers could conceivably cover all the feature of this application in a single session. At any rate, teachers should receive enough instruction and practice to immediately begin using the technology.

Target dates for the implementation of this inservice plan would be during one of two district inservice days scheduled at the beginning of the 1995-96 school year. Given that this will be an accreditation year and that the school's
agenda will be occupied by that process, it is anticipated that only the needs assessment will be conducted during these two days of inservice. In all likelihood, the actual inservice sessions will have to be scheduled for a later date. Perhaps future departmental meetings can be used for the inservices; otherwise, mutually acceptable time slots will have to be found. Unfortunately, the accreditation process will use up much of the department's discretionary time during department meetings throughout the school year. Therefore, the guideline to schedule inservices during school hours will be difficult to meet. Every attempt should be made to satisfy each of the guidelines, but this will not always be possible.

The preceding paragraphs outlined a sample plan for teacher-directed inservices. For a more in-depth description of the inservice plan, each of the guidelines will be addressed in the following sections. Since much of the description of this plan is specific to a particular school and department, the specific steps for planning and implementing the technology inservices may not translate exactly to other situations. A description organized around the guidelines presented earlier should prove more useful for others using this plan as a guide to technology inservices in their school.
Needs Assessment

As discovered in the literature review, a needs assessment is the first step in a well designed inservice (Wepner and Kramer, 1987; Fisher, 1989; Hagerty, 1990; Zeitz, 1995). As previously mentioned, a survey and an interactive computer program (TINA) will be used to conduct the needs assessment in this project.

TINA was authored using HyperStudio by Roger Wagner Publishing. HyperStudio is an authoring application used to create multimedia interactive programs. Each program in HyperStudio is called a stack and consists of individual cards linked by buttons that control movement from card to card. Cards can contain graphics, text windows, and sound effects. TINA has a total of nine stacks saved on two 3.5 inch disks. The included disks are Macintosh formatted and contain all the stacks along with a HyperStudio Player application. A text document with instructions for hard disk installation is also included on the disks and can be viewed by most word processing applications. A copy of these instructions also appears in Appendix G. HyperStudio was used to create a menu of the technology applications available to the Mathematics Department at Upland High School. The menu stack is called the Home Stack in HyperStudio. Included in the menu are the seven inservice topics previously mentioned. Appendix G contains a printout
of the menu screen from the Home Stack showing the seven inservice topics plus an eighth item which gives credit to HyperStudio as the authoring program for all the stacks. Appendix G also includes printouts of the 15 cards from the Microsoft Word stack.

When using TINA, users are first presented with a title card, followed by the menu screen from the Home Stack (Appendix G). From this menu, the user may choose to explore any or all of the seven inservice topics. Clicking on a button next to a particular menu item will bring up a stack of cards about that topic. Since all of the stacks are presented in a similar fashion, only the cards on the Microsoft Word stack will be presented as a sample.

The Microsoft Word stack consists of 15 cards. All but three of the 15 cards use a PICT file (a type of graphics), taken from the application, as a background. Card 1 contains a text window describing Microsoft Word as a word processing application and how it would be useful to a teacher. Also on this card are two buttons. One is an exit button taking the user back to the menu and the other prompts the user to "go on". Clicking on the "go on" button takes the user to Card 2 which illustrates Microsoft Word's working environment. A text window instructs the user to click on four buttons from the Microsoft Word application to investigate their function. Each of these buttons will bring up a new card describing the function and usefulness of the spell check, text formatting,
justification, and spacing features (Cards 3, 4, 5 and 6). From these cards, a "go back" button automatically returns to Card 2 where the user can select another button. The "go on" button on Card 2 links to card 7, which contains six examples of the many fonts available with Microsoft Word. The next card (8) explains how to save documents on disks and indicates that disks are available in the Math Department office. Cards 9, 10, and 11 show portions of teacher created documents. Included are portions of an inservice instruction document, a letter of recommendation, and a classroom handout. Card 11 shows the same document screen and buttons from Microsoft Word as found in most other cards. The text on this card describes the availability of spell checkers, grammar checks, and a thesaurus. A number of mathematical symbols that can be typed directly from the keyboard, such as the greater than and square root symbols, are also included in the text. The next two cards (13 and 14) illustrate several examples of font styles and the more complex mathematical equations that can be created with Microsoft Word and Equation Editor. The last card (15) provides a few final notes regarding Microsoft Word's compatibility with other word processing programs, the Macintosh's compatibility with files from IBM compatible machines, and the graphic capabilities of the program. Also on the last card is another exit button to bring the user back to the main menu. Users are presented with exit buttons on the first and last
card of each stack. These exit buttons allow the user to browse through the many topics provided in the Home Stack.

Reasons for using HyperStudio to conduct part of the needs assessment are two-fold. First, the computer-assisted needs assessment (TINA) is useful in meeting the recommendation to ask teachers what they want in their technology inservice (McCarthy, 1988; Meeks and Soeffing, 1995); and second, it begins the active participation of teachers that is critical to the planning of the inservice (Boe, 1989; Fisher, 1989; Valdez, 1989; Orwig, 1994).

The needs assessment survey (Appendix H) has six sections that investigate each teacher's overall experience with technology. Section I has the teacher rate their level of expertise with Macintosh computers, printers, keyboarding skills, and the six computer applications seen in the HyperStudio stacks. The rating scale goes from 1 to 4 with a 1 indicating no experience and a 4 indicating an advanced user. Since all the inservices will utilize Macintosh computers only, the survey does not contain questions about other types of computers. Section II asks about technology courses and workshops the teacher has attended. Section III inquires about home computers, printers, and software that the teacher uses at home. Section IV asks about any technology currently used in the classroom. Section V address any anxieties a teacher might have about technology. All together, these five sections are expected to provide a
clear picture of each teacher's level of experience and proficiency with technology. This information will be useful in grouping teachers according to level of experience, tailoring the inservices to meet the needs of teachers, addressing barriers to technology, and finding new experts to facilitate future inservices. Assessing a teacher's skill level is essential in order to tailor the inservices to the participant (Valdez, 1989; Fulton, 1988; Browne and Ritchie, 1991). Section VI asks teachers to indicate which of the seven inservices they wish to attend and the order of their preference. It is the responses to this section that will determine which inservices will be offered. There will be ample time to organize teachers into inservice groups based on interest and skill level assuming that the inservices will have to be scheduled on a later date.

Inclusion of Teachers

A sense of involvement is critical to successful change in schools (Fisher, 1989). From planning to evaluation, teachers should be included in every phase of the inservice. In the needs assessment, teacher involvement is initiated by allowing them to choose which topics to be inserviced on and at what level of experience. In this manner they will be designing the outline of the rest of the inservice. Which topics are offered and the targeted skill level of the
inservice sessions will be determined solely by the teachers' responses on the needs assessment survey.

Another level of involvement within the inservice sessions will be the use of teachers experienced with the use of technology. From the Mathematics Department staff, five other teachers will be available to act as presenters on various topics. Additionally, there are a number of teachers outside the department, as well as secretaries, that could be called upon for their expertise.

Overall, this plan is designed as a teacher-directed inservice and as such will involve teachers in every aspect. More specifically, teachers will be involved in the planning, presentation, and evaluation of the inservice. During the inservice, teachers will be involved through hands-on practice and use of their own work. More detailed examples of this broad inclusion of teachers can be found throughout this chapter.

While the inclusion of teachers is essential to any inservice, it is secondary to teacher buy-in. The opportunity to participate is meaningless to a teacher who does not wish to participate. What reasons then do the teachers of the Math Department have for buying-in to these inservices? The design of these inservices can provide many reasons for teacher buy-in. Scheduling the inservices during regular department meetings, providing plenty of hands-on practice, and employing the technology to accomplish teaching
related tasks are all strong incentives for participation. These and other incentives are discussed at length later in this project.

Focus on Teaching Practices

Teachers need to see how technology can be used without the need to change their established teaching practices (Boe, 1989; Fisher, 1989; Hannafin and Savenye, 1993; Durost, 1994; Hawkins, 1994). For example, every teacher must keep and maintain a gradebook as well as assign grades several times each year. An electronic gradebook can be more efficient and accurate than paper and pen methods. Teachers already have an established practice of keeping grades and technology merely offers an attractive alternate method. Therefore, each inservice offered will focus on how math teachers can use technology to accomplish or enhance their established teaching practices.

Since there has been virtually no integration of computer technology into the math courses at Upland High School, this plan will follow the advice of Eisele and Eisele (1990) and include in the inservices applications that are easy to use and can be immediately put to use in the classroom. This advice supports an initial premise of this project that teachers must first experience the utility of technology in a personal way before integrating technology
into their curriculum. Consequently, most of the applications from the HyperStudio menu are teacher utility programs. Additionally, each inservice offered will invite teachers to bring some personal work such as roll sheets for starting the gradebook program. In this fashion, teachers will experience first hand the utility of that technology. Applying the technology to teaching tasks can increase efficiency and lead to motivated learning. One suggestion made by a fellow teacher is to use the test generator programs to write the departmental finals during an inservice. Writing these finals is a task all members of the department must undertake since new textbooks will be adopted in the coming year. Creating these exams would normally require teachers to work on their own time.

Hands-on Experiences

If teachers are going to be responsible for using technology in the classroom, then it is essential to let them use technology during inservices (Moursund, 1986; Fisher, 1989; Glenn and Carrier, 1989; Eisele and Eisele, 1990; Kinnaman, 1990; Robinson 1991; Lamson and Barnett, 1994). The importance of hands-on practice should not be underestimated. Both Fulton (1988) and Hagerty (1990) believe it to be a critical factor in the adoption of technology.
This inservice plan will insure hands-on experience by having teachers bring their own work to the inservice. Making use of teachers' personal work will assure hands-on experience with the technology as well as demonstrate the utility of the technology. Naturally, there will be some lecture and demonstration, but that will be kept to a minimum to provide more hands-on time. Time devoted to hands-on practice will also be maximized by the grouping of teachers with similar skill levels. In other words, more advanced users will not have to suffer through demonstrations of basic computer skills and novice users will not be left behind to flounder on their own. Grouping by skill level should also insure small group sizes which in turn should afford more time for hands-on practice. Should a large group of teachers have similar skill levels and interests, they will simply be divide into several smaller groups and offered multiple sessions of the same inservice.

Long Term Commitment

The acquisition of technology skills and the integration of technology into teaching practices are long term endeavors and as such require regular and on going training (Fulton, 1989; Eisele and Eisele, 1990; Kinnaman, 1990; Lamson and Barnett, 1994). Unfortunately, whether or not a long term commitment is made towards technology inservices is an area
beyond the scope of this project. While it is true that the
district supports this plan to provide technology training
for the Mathematics Department, there are no guarantees that
such support will continue. For the present, however,
permission has been granted to conduct this inservice plan
starting with the next school year. During the two days of
preservice for the teachers, each department is given the
opportunity to plan its own agenda for one of those days.
The commitment given by the administrative head of the Math
Department is to use a portion of that day. The next school
year is an accreditation year for Upland High School and most
of the faculty's preservice days will be occupied with the
tasks associated with that process. However, there should be
enough time to conduct the needs assessment portion of the
inservice plan. After the start of classes, each department
has monthly meetings and is responsible for setting its own
agenda. If the members of the department wish to devote time
from these monthly meetings to technology, then the
commitment could extend to the entire school year.

Outside regularly scheduled department meetings, there
are no other opportunities that offer teachers time to
schedule their own inservices. However, I believe that this
inservice plan provides a means by which teachers can conduct
their own inservices independent of scheduled faculty
meetings. After all, this inservice plan is teacher-directed
and requires no resources beyond the control of teachers.
Furthermore, it is another example of teacher inclusion through ownership of the inservice process. This sort of control also helps to avoid the one-time inservice approach warned against by Kinnaman (1990) and Robinson (1991) and offers the potential for a more continuous process of staff development suggested by Wepner and Kramer (1987). If technology inservices assess the needs of teachers, involve teachers at all levels, focus on integrating technology into existing teaching practices, and provide ample time for hands-on experiences, then the commitment to technology is likely to follow. Consequently, logistical problems like when to meet can be resolved by those committed to learning more about technology.

Incentives

When possible, an effective technology inservice plane will schedule sessions during school hours, offer incentives for participation, and guarantee access to computers. All of these incentives are suggested throughout the literature (Fontana and Ochoa, 1985; Wepner and Kramer, 1987; Fulton, 1988; Villa, 1989; Hagerty, 1990; Kinnaman, 1990; Robinson, 1991; Zeitz, 1995). The design of this project offers many incentives to teachers for their participation.

Allowing teachers to use their own work during inservices is intended to be an incentive. Knowing that most
teachers consider inservice days an interruption to the time they should be spending in preparation for classes, the opportunity to do work in preparation for their classes should be a strong incentive. Many teachers of the Math Department have supported this feeling and have indicated that they usually spend time at home after the inservice preparing for their classes.

The plan for these technology inservices will initially use faculty and department meetings as a way to insure that teachers are not required to sacrifice their own time to attend. This plan is not quite the same as the district providing substitutes for teachers, but it is a reasonable alternative. For the future, it will be necessary to lobby the administration for time and financial support.

Fortunately, the district has, on one occasion this past year, provided period substitutes for teachers attending a technology inservice. In this one instance the district did demonstrate a willingness to support technology inservices.

Another incentive offered by this project is that of professional growth. The opportunity to learn new skills that can be applied to their profession is the sort of intrinsic incentive suggested by Kinnaman (1990). Fisher (1989) argues that teachers deserve recognition for professional growth. Teachers at Upland High School do receive such recognition. As part of the yearly teacher evaluation process, teachers receive commendations for
professional growth such as participation in inservices. These commendations become part of a teacher's permanent record and give both incentive and recognition to teachers.

Access to computers is not only an incentive but an essential component necessary to acquire technology skills (Fisher, 1989; Barker, 1990; Kinnaman, 1990; Robinson, 1991; Lamson and Barnett, 1994; Orwig, 1994; Siegel, 1995). With the small number of computers available to the teachers of the Math Department, creativity was needed to insure teachers access to computers. As mentioned before, the Science Department has a large number of computers. Most science teachers have a Macintosh in their classroom and the department acquired 13 Macintosh computers through a grant. Although these computers are in use by students throughout the day, they sit idle after school hours. After a bit of investigation, there appears to be no reason why other teachers could not use these computers after school. Consequently, the math teachers will have access to not one department computer, but 14 computers. This access of nearly one computer per teacher is a frequent suggestion throughout the literature (Fulton, 1988; Boe, 1989; Robinson, 1991; Lamson and Barnett, 1994). One computer placed in every teacher's classroom would naturally be more desirable, but access to computers at a time when many teachers typically do their preparation for teaching is better than no access at all.
While this project offers its own incentives, other incentives such as payment for expenses from conferences or college courses, credit towards pay scale advancement, and financial aid in obtaining personal computers will be more difficult to obtain. Again, teachers must make the effort to persuade school districts that their efforts are worth the financial costs. To cause a change in the district's spending priorities is understandably a difficult task in light of the current financial constraints on school district budgets.

For my part at Upland High school, I am committed to acquiring more financial support for the Mathematics Department. Along with several other teachers, I am lobbying to make it a departmental goal to place a computer in every math teacher's classroom. As for district support in obtaining personal computers, I did investigate the possibility of teachers purchasing computers through the school district. Given the buying power of a school district and the special prices available for educational institution, buying computers through the district was thought to be a way for teachers to obtain technology at a lower price. Unfortunately, school districts may not resale merchandise to teachers. Even my inquiries with Apple Computer returned the same response. Through further investigative efforts, however, I did learn about a special purchasing program available to teachers through Apple Computer and that local
retail computer stores are willing to offer groups of ten or more teachers a bid for more competitive prices. I also learned that many popular software applications come in educator's versions at substantially reduced prices. These investigative efforts led to the discovery that there are already financial incentives for teachers to purchase computers and software. These financial incentives will be part of the inservice session on how to buy a computer.

Other incentives already available for the teachers at Upland High School are a number of software applications for which the school has a site license. For the Gradebook Plus and LXR•Test Generator, the school's site license allows for the installation of the application on any computer on campus. Other licenses offer additional installations for a low fee per computer. HyperStudio actually offers a free home version of their program to teachers of a school with a site license.
Chapter Four: Evaluation

The evaluation of the inservice plan will be based on the same guidelines used to develop the plan. Results obtained from an evaluation questionnaire will be used to refine the planning and implementation of future inservices for the department. Appendix H contains the evaluation form that will be used at the end of the technology inservices. The form contains three open response questions and seven statements. For the statements, teachers will circle a number on a scale of one to five to indicate the degree to which they agree or disagree. Each item is constructed to generate evaluative information regarding the six guidelines used to plan the technology inservices.

Needs Assessment

Each teacher's level of expertise with Macintosh computers and their interest in inservice sessions are surveyed by the needs assessment. The results should allow the placement of teachers into inservice sessions of their choice with an appropriate level of instruction. An evaluation of this needs assessment should result in establishing the effectiveness of the instruments used to determine teacher placement. Any discrepancies will indicate the need for a more reliable needs assessment; that is, a survey that more accurately assesses technology skills.
Reassessing will be necessary to determine which inservices to offer in the future and at what skill level. Questions 2 and 8 from the evaluation form seek teachers' responses to the appropriateness of the skill level grouping of the inservice and about meeting their specific needs. Question 1 asks if the teachers were able to attend their first choice in inservices. Responses to these questions will be used to evaluate the needs assessment itself and to serve as a needs assessment for future inservices.

To summarize, an evaluation of the needs assessment should determine if specific needs have been identified. Evaluation should also be a continuous process much like the needs assessment. An ongoing needs assessment can be considered a method of evaluation. By asking teachers about their needs from technology inservices, it is possible to continually refine the inservice process.

**Inclusion of Teachers**

The purpose of the evaluation of this guideline should determine the extent and nature of teacher involvement in the inservices. Involvement of teachers includes participation in the planning, presentation, and evaluation of the inservice. Quantifying the numbers of teachers involved in these capacities will be an easy task. Other types of involvement such as peer coaching and hands-on experience
with technology will not be as easy to quantify but will be evaluated through qualitative data. Questions 4 and 6 ask about the adequacy of hands-on practice and level of involvement in the inservice. Qualitative responses to these questions will be used to evaluate the level of teacher inclusion.

Focus on Teaching Practices

Evaluating this guideline should be straightforward. Did the inservice focus on how technology can be used with current teaching practices? If the inservice receives overall low marks on this criterion, then the problem may be a lack of teacher inclusion. Questions 3, 4, and 6 relate to teacher inclusion by addressing the use of personal work, hands-on practice, and involvement in the planning and implementation of the inservice. Another possible reason for low marks might be the design of the inservice. In this case, responses to questions 2, 5, 8, and 10 will provide evaluative feedback. These questions concern appropriate skill level, adequate instruction, inservice deficiencies, and suggestions for improvement.

Hands-on Experiences

The evaluation of this guideline will determine teachers' satisfaction with the amount of hands-on practice
provided during the inservice. If the amount of hands-on time was not optimal, future inservices will be adjusted accordingly. Question 4 inquires about the amount of hands-on practice. Just as important as the quantity of hands-on practice is the quality of hands-on practice. Question 5 asks about the amount of instruction provided. Responses can give insight as to the quality of the hands-on practice. A balance between instruction and hands-on practice is necessary to avoid unproductive use of time.

**Long Term Commitment**

This evaluation will focus on teachers' satisfaction with the frequency and duration of inservices. Question 6 asks if the teacher would like to attend additional inservices similar to the one attended. The response to this question may indicate at least a growing commitment to technology. However, a burgeoning commitment will not grow without support. Consequently, a system where quality inservices can be developed and implemented according to the needs of the teachers is arguably more important than the number of inservices provided.

**Incentives**

An evaluation of this guideline will determine which incentives are most important to teachers. If released time
is more important than reimbursement for expenses, for example, then scheduling becomes more important than providing low cost inservices. If access to computers is important to teachers, then access needs to be insured. In other words, find out what incentives work best and provide those incentives. Question 9 asks teachers about the kinds of incentives most important to them. Responses to this question will indicate which incentives are worth offering and which are not. Question 10 asks for suggestions for improvement. Suggestions offered could prove useful in evaluating any of the six guidelines.

Project Summary

This project has shown in a review of related literature that computer technology is indeed prevalent in our schools, but that their use is less than their numbers would suggest. Much of the reason for the neglect can be attributed to inadequate training in both preservice education programs and inservice staff training. The latter often consists of infrequent training that focus on the technology rather than on teaching. In addition to pointing out the errors of past technology inservices, the literature does indicate the essential factors for a successful inservice. From these factors, a set of six guidelines for technology inservices is presented. These guidelines are: conduct a needs assessment,
include teachers in every phase, focus on teaching practices, provide hands-on experiences, make a long term commitment, and provide incentives. Additionally, an argument in favor of teacher-directed inservices is made. Based on the six guidelines and the teacher-directed argument, a technology plan for Upland High School's Math Department is developed. The plan is presented and evaluated with respect to the guidelines previously mentioned.

One expectation of this plan is that it will introduce teachers to the power of technology as a teacher utility through inservicing on word processors, gradebook programs, and test generators. Another expectation is that a teacher with an enthusiasm for technology will be more likely to pursue the integration of technology into their teaching practices. This expectation is supported by Boe (1989) who feels that teachers must first see the personal benefits of computers before they can begin to adopt technology in the classroom. Lastly, this inservice plan can provide teachers with ongoing training in technology designed around their interests, needs, and schedules.
Appendix A: Microsoft Word Handouts

Sample Documents

May 18, 1994

To Whom it concerns,

Please accept this letter of recommendation for James Jones. James has been my student teacher for one period of college prep Algebra II during the second semester of the 1993-4 school year. For the first four weeks, we slowly worked James into the role of teacher starting with class observations, conducting homework reviews, followed by the presentation of a few single lessons, and finally taking on the class full time. As of this date, James has full responsibility for the class. Taking roll, lesson plans, lectures, testing and grading are under James' control. It is his intent to finish out the school year with this class so that he may experience the final examinations and final grading of students.

It is my pleasure to give James my highest recommendation for any teaching position he chooses to apply for. In these past several weeks I have observed James to be student teacher with many excellent attributes. In terms of his knowledge about the subject matter, he is flawless. His command of the subject allows him to organize and present his lessons in a fashion that should have taken a year or two to develop. As a student of the teaching profession, he has been very flexible given his busy schedule, multiple subjects assignment and two different master teachers. When ever I have made a suggestion to James in regards to teaching techniques, he has been able to incorporate these suggestions quickly and very effectively. As a person, James has the sort of personality that I believe is one of his greatest strengths. He is well liked by the students because of his competence, caring, sense of humor, and willingness to help out when ever asked. Organizational skills are another of James' attributes. He is always right on top of things in and out of the classroom. I've found James to be a great help in creating review assignments and solution keys and in developing chapter tests.

To sort of sum up my recommendation of James: I would hire him for a teaching position if it were up to me. Please feel free to contact me in regards to James Jones or any of my comments. My Name, address and phone number are listed below.

Sincerely,

Robert N. Charpentier
BASIC MATH
UPLAND HIGH SCHOOL

I. REQUIREMENTS
1. Bring paper, pencil and your book every day.
2. Take notes, do all the assigned work and turn it in on time.
3. Take all quizzes and tests.

II. GRADES
1. Grades are divided as follows:

<table>
<thead>
<tr>
<th></th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tests</td>
<td>60%</td>
</tr>
<tr>
<td>Homework</td>
<td>30%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>10%</td>
</tr>
</tbody>
</table>

2. The grade scale:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percent Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>100 - 90%</td>
</tr>
<tr>
<td>B</td>
<td>89 - 80%</td>
</tr>
<tr>
<td>C</td>
<td>79 - 70%</td>
</tr>
<tr>
<td>D</td>
<td>69 - 60%</td>
</tr>
<tr>
<td>F</td>
<td>59 - 0%</td>
</tr>
</tbody>
</table>

III. CLASS RULES
1. Stay in your seat.
2. No talking when the teacher is speaking.
3. Clean up after yourself.
4. No childish games.
5. Cheating will be punished.

IV. ASSIGNMENT POLICY
1. Assigned work is due at the end of the period.
2. Late assignments will be accepted for half credit.
SITE GOVERNANCE COUNCIL
MINUTES
JUNE 6, 1994

Members Present: Bob Charpentier, Rose Lane, Margene Ridder, Maggie Hanson, Debbie Field, Ruth Hammond, Alan Case, Bert Rawl, Sally Cook.

9th GRADE CORE:

A 6 period core will not be possible due to the number of freshman signed up and the current restrictions of the core program. Therefore, the total number of students will be smaller than originally planned.

A 4 period core is the current design. 250 students will now be involved in the core. Core classes will consist of English, Social Studies, Math and P.E. All other classes will be taken outside of the core.

Students selected will mirror the whole freshman population in gender, ethnic background, and ability level (a heterogeneous group).

Current design will require 8-9 teachers. Approximately 14-17 teachers have already express a serious interest in the program. Teachers interested in the program should file a letter of interest with Wilma Mitchell by 3pm, Thursday, June 9.

Core classrooms will be grouped together, but no specifics have been planned.

The I.C. for the core will either be Harriet Vaughn or the new I.C. yet to be hired. No decision has yet been made.

Counseling department requested that current alpha groups be maintained and that the counselors be involved in any summer planning.

Site Governance gave final approval for the 9th grade core.
Fonts and Font Styles

Sample fonts

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<th>Size</th>
<th>Font Style</th>
<th>Size</th>
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Special Features

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<tr>
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<tr>
<td>Courier Plain</td>
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<td><strong>Bold, italic, underlined</strong></td>
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Point Samples - Courier plain

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Appendix B: LXR•Test Handouts

Sample Test

Name: ___________________________ Period: ______

Match description on left with software solution on the right:

1. 'Top-of-the-line' edition — complete with scoring and survey capabilities.
   A. LXR•TEST Personal Edition
   B. LXR•TEST Professional Edition
   C. LXR•TEST Scoring Edition
   D. Interactive eXtension
   E. Spelling Checker
   F. Mac-to-Windows Bank Converter

2. Entry-level 'edition' that has more power than any test generator in its class.

3. Feature that allows spelling verification of entire question bank.

4. Module that adds on-line exam capabilities with support for QuickTime™ movies.

5. What kind of question types does LXR•TEST support?
   A. multiple choice
   B. true/false
   C. matching
   D. short answer (fill-in)
   E. open-ended (essay)
   F. numeric
   G. all of the above

6. Which of the following best describes LXR•TEST handling of text?
   A. Questions can have super and subscript text styles.
   B. Questions can have plain, italics, bold, outline and strikethru styles.
   C. Questions can have left, right, center and decimal tabs.
   D. Questions can have multiple rulers each with different paragraph formatting.
   E. All of the above.
7. If wheel A is turned 1 revolution, how many revolutions will wheel B turn?
A. 1  
B. 2  
C. 3.14  
D. 6.28  
E. None of the above.

8. If wheel B is turned 1 revolution, how many feet will point on the circumference of wheel A travel?
A. 1 ft  
B. 1.57 ft  
C. 3.14 ft  
D. 6.28 ft  
E. None of the above.

9. What is the degree of the polynomial \( x^6 - 5x^4 + 3x^2 \)?
A. 2  
B. 4  
C. 6  
D. 12

10. State any excluded values in the following expression:
\[
\frac{x^2 + 3x - 4}{x^2 - 2x - 15}
\]
A. 4 and -1  
B. -4 and 1  
C. 5 and -3  
D. -5 and 3

11. What is the axis of symmetry of \( xy = 4 \)?
A. \( y = x \), \( y = -x \)  
B. \( x = 4 \)  
C. \( y = 4 \)  
D. \( y = x - 4 \)

12. Graph the following system and indicate the number of intersections:
\[
x^2 + y^2 = 25 \quad \text{and} \quad xy = 8
\]
A. 1  
B. 2  
C. 3  
D. 4
Test Features

Name: ___________________________  Period: ________

1. ABCDEFG
2. ABCDEFG
3. ABCDEFG
4. ABCDEFG
5. ABCDEFG
6. ABCDE
7. ABCDE
8. ABCDE
9. ABCD
10. ABCD
11. ABCD
12.

Number of intersections: ______

---

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### Answer Key

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<td>4 C A E D</td>
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<td>003 MC-SR</td>
<td>1 G G G G G G G G G</td>
<td></td>
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<td>005 MC-SR</td>
<td>1 E E E E E E E E E</td>
<td></td>
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<td></td>
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<td>1 B A D B D B C C C A</td>
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<td>1 C D A B C D A B C D</td>
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<tr>
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Alegbra II
Final - 2
Form B

Sample Cover Page
Geometry
Chapter 6 Test

Name: ___________________________ Period: ____________

Sample custom header
# Upland High School

Mr. Charpentier's Algebra II

Gradebook as of Tue Jul 4, 1995

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<td>35</td>
<td>86</td>
<td>75</td>
<td>50</td>
<td>150</td>
<td>534</td>
<td>82.2</td>
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</table>

**Average:** 81.5  79.9  42.4  74  81.1  43.5  125.1  527.5  81.2  
**Possible:** 100  100  50  100  100  50  150  650

**Key:**
1) Test Chapter 1 4) Test Chapter 3 7) Test Final-1
2) Test Chapter 2 5) Test Chapter 4
3) HW 1-25 6) HW 26-50

**Grading Scale:**
- 97+ = A+
- 90+ = A
- 87+ = B+
- 83+ = B
- 77+ = C+
- 73+ = C
- 70+ = C
- 67+ = D+
- 60+ = D
- Below 60 = F
Score Reports

Test Final-1
14 out of 14 students have scores
Mean: 125.14
Median: 129
Standard Deviation: 18.91
Points Possible: 150

Upland High School
Mr. Charpentier's Algebra II
Statistics as of Tue Jul 4, 1995

2 A+'s
14.3% 150- KW
148- ST

2 A's
14.3% 143- KK
140- JB

1 A-'s
7.1% 139- SM

1 B+'s
7.1% 134- WH

2 B's
14.3% 130- CC
128- LC

1 B-'s
7.1% 120- CC

1 C+'s
7.1% 118- DD

0 C's
0%

1 C-'s
7.1% 108- RG

1 D+'s
7.1% 104- JR

1 D's
7.1% 99- CS

1 D-'s
7.1% 91- SR

69
Name: Deporto, Diana

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<td>3) HW 1-25:</td>
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<td>5) Test Chapter 4:</td>
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<tr>
<td>6) HW 26-50:</td>
<td>50/50</td>
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<tr>
<td>7) Test Final-1:</td>
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Total Possible Points: 503/650 = 77.4%
Grade: C+
Data Entry Sheet for Mr. Charpentier's Algebra II

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</tr>
<tr>
<td>Tardy, Steve</td>
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<tr>
<td>Wymes, Kim</td>
</tr>
</tbody>
</table>
1. Find the area and perimeter.

2. Find the area.

3. Find the lateral area and surface area of a right regular hexagonal prism with base edge 7 and height 8.

4. Find the volume of a right cylinder with radius 3 and height 4 in terms of $\pi$.

5. Find the area of the shaded region.

[2] 306

[3] Lateral area: 336, Surface area: 336 + 147\sqrt{3}

[4] 36\pi

[5] \frac{64\pi}{9} = 22.34
Sample Test

Exam in a Can

Sample Test
Algebra II - Roots, radicals and complex numbers

Name: __________________________ Period: _______
07-05-1995 Form A-A Page 1

Show all work - Use extra sheets if necessary

1. Evaluate: \( (8)^{2/3} \)

2. Evaluate: \( (125)^{-4/3} \)

3. Simplify: \( \sqrt[11]{15} \)

4. Simplify: \( \sqrt[17]{y^{14}} \)

5. Simplify: \( -5\sqrt{5} - 2\sqrt{44} + 7\sqrt{54} \)

6. Simplify: \( -3\sqrt{7} - 3\sqrt{25} - 3\sqrt{63} \)

7. Simplify: \( 6a^{1/3} - 7(7\sqrt{7} - 1) \)

8. Simplify: \( 625^{1/4} - 4(7\sqrt{5} + 8) \)

9. Rationalize the denominator: \( \frac{9}{2\sqrt{x} + 3\sqrt{y}} \)

10. Rationalize the denominator: \( \frac{2}{\sqrt{x} + \sqrt{y}} \)

11. Express \( \sqrt{-2} \) in the form \( bi \) where \( b \) is a real number.

12. Express \( \sqrt{-57} \) in the form \( bi \) where \( b \) is a real number.

13. Write the expression in the form \( a + bi \): \( (9 + 7i) + (3 + 5i) \)

14. Write the expression in the form \( a + bi \): \( (-6 - 5i) + (-4 + 9i) \)

15. Write the expression in the form \( a + bi \): \( (-4 - i)(8 - 7i) \)

16. Write the expression in the form \( a + bi \): \( (-2 - 5i)(6 + 5i) \)
Sample Algebra Test

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76
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<td>3</td>
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<td>4</td>
<td>( \frac{x^3 y^2}{\sqrt[5]{x^2 y^4}} )</td>
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<td>5</td>
<td>( 16\sqrt{6} - 16 )</td>
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<td>6</td>
<td>( -12\sqrt{7} - 15 )</td>
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<td>7</td>
<td>( 11 - 49\sqrt{7} )</td>
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<td>8</td>
<td>( -27 - 28\sqrt{6} )</td>
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<tr>
<td>9</td>
<td>( \frac{18\sqrt{x}}{4x - 9y} )</td>
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<td>10</td>
<td>( \frac{2\sqrt{x} - 2\sqrt{y}}{x - y} )</td>
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<td>12</td>
<td>( \sqrt{57i} )</td>
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<td>13</td>
<td>( 6 + 12i )</td>
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<td>14</td>
<td>( -10 + 4i )</td>
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<td>15</td>
<td>( -39 + 20i )</td>
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</tr>
</tbody>
</table>
6/Hexagon (Inscribed)

Given:
1. Point Center
2. Point Radius

Steps:
1. Let \([1]\) = Circle with center at Point Center passing through Point Radius.
2. Let \([j]\) = Ray between Point Center and Point Radius.
3. Let \([A]\) = Intersection of Circle \([1]\) and Ray \([j]\).
4. Let \([2]\) = Circle with center at Point Center passing through Point \([A]\).
5. Let \([3]\) = Circle with center at Point \([A]\) passing through Point Center.
6. Let \([k]\) = Segment between Point \([A]\) and Point Center.
7. Let \([B]\) = Intersection of Circle \([2]\) and Circle \([3]\).
8. Let \([m]\) = Segment between Point \([B]\) and Point \([A]\).
9. Let \([n]\) = Segment between Point Center and Point \([B]\).
10. Let \([4]\) = Circle with center at Point Radius passing through Point Center.
11. Let \([p]\) = Segment between Point Radius and Point Center.
12. Let \([C]\) = Intersection of Circle \([1]\) and Circle \([4]\).
13. Let \([q]\) = Segment between Point \([C]\) and Point Radius.
14. Let \([t]\) = Segment between Point Center and Point \([C]\).
15. Let \([5]\) = Circle with center at Point Center passing through Point \([C]\).
16. Let \([6]\) = Circle with center at Point \([C]\) passing through Point Center.
17. Let \([D]\) = Intersection of Circle \([5]\) and Circle \([6]\).
18. Let \([s]\) = Segment between Point \([D]\) and Point \([C]\).
19. Let \([u]\) = Segment between Point Center and Point \([D]\).
20. Let \([7]\) = Circle with center at Point Center passing through Point \([B]\).
21. Let \([8]\) = Circle with center at Point \([B]\) passing through Point Center.
22. Let \([E]\) = Intersection of Circle \([7]\) and Circle \([8]\).
23. Let \([u]\) = Segment between Point \([E]\) and Point \([B]\).
24. Let \([v]\) = Segment between Point Center and Point \([E]\).
25. Let \([w]\) = Segment between Point \([E]\) and Point Radius.
26. Let \([x]\) = Segment between Point \([A]\) and Point \([D]\).
27. Select Radius, \([B]\), \([A]\), \([C]\), \([D]\) and \([E]\).
Centroid
Given:
1. Point Vertex1
2. Point Vertex2
3. Point Vertex3

Steps:
1. Let \([j]\) = Segment between Point Vertex2 and Point Vertex1.
2. Let \([k]\) = Segment between Point Vertex3 and Point Vertex2.
3. Let \([m]\) = Segment between Point Vertex1 and Point Vertex3.
4. Let \([D]\) = Midpoint of Segment \([m]\).
5. Let \([E]\) = Midpoint of Segment \([k]\).
6. Let \([F]\) = Midpoint of Segment \([j]\).
7. Let \([n]\) = Segment between Midpoint \([E]\) and Point Vertex1.
8. Let \([p]\) = Segment between Midpoint \([D]\) and Point Vertex2.
9. Let \([q]\) = Segment between Midpoint \([F]\) and Point Vertex3.
10. Let Centroid = Intersection of Segment \([q]\) and Segment \([n]\).
11. Select Centroid.
Centroid of a Triangle
Koch Starburst

Given:
1. Point [A]
2. Point [B]
3. Point [F]

Steps:
1. Let \([j]\) - Segment between Point [B] and Point [A].
2. Let \([C]\) - Image of Point [A] dilated by 33.3\% about center Point [B].
3. Let \([D]\) - Image of Point [A] dilated by 66.7\% about center Point [B].
4. Let \([E]\) - Image of Point [C] rotated 60 degrees about center Point [D].
5. Let \([k]\) - Segment between Point [D] and Point [A].
6. Let \([m]\) - Segment between Point [E] and Point [D].
7. Let \([n]\) - Segment between Point [C] and Point [E].
8. Let \([p]\) - Segment between Point [B] and Point [C].
9. Let \([q]\) - Segment between Point [F] and Point [B].
10. Let \([G]\) - Image of Point [B] dilated by 33.3\% about center Point [F].
11. Let \([H]\) - Image of Point [B] dilated by 66.7\% about center Point [F].
12. Let \([J]\) - Image of Point [G] rotated 60 degrees about center Point [H].
13. Let \([r]\) - Segment between Point [H] and Point [B].
14. Let \([s]\) - Segment between Point [J] and Point [H].
15. Let \([t]\) - Segment between Point [G] and Point [J].
16. Let \([u]\) - Segment between Point [F] and Point [G].
17. Let \([v]\) - Segment between Point [A] and Point [F].
18. Let \([K]\) - Image of Point [F] dilated by 33.3\% about center Point [A].
19. Let \([L]\) - Image of Point [F] dilated by 66.7\% about center Point [A].
20. Let \([M]\) - Image of Point [K] rotated 60 degrees about center Point [L].
21. Let \([w]\) - Segment between Point [L] and Point [F].
22. Let \([x]\) - Segment between Point [M] and Point [L].
23. Let \([y]\) - Segment between Point [K] and Point [M].
24. Let \([z]\) - Segment between Point [A] and Point [K].
25. Recurse on \([D]\), \([A]\) and \([K]\).
26. Recurse on \([C]\), \([E]\) and \([D]\).
27. Recurse on \([H]\), \([B]\) and \([C]\).
28. Recurse on \([G]\), \([J]\) and \([H]\).
29. Recurse on \([L]\), \([F]\) and \([G]\).
30. Recurse on \([K]\), \([F]\) and \([G]\).
Koch Starburst Fractal
APPLE EDUCATION RESOURCE CD

News & Info: Doing Business With Apple:
Apple Education Toll-free Numbers

Description

Apple Education Information 1-800-800-2775
(For education products, programs, pricing, service, support, and order information)

Educator Advantage Program 1-800-959-2775
(For special discounts on individual purchases for home use)

Apple User Groups 1-800-538-9696, extension 500
(For referral to the nearest user group)

Worldwide Disability Solutions 1-800-776-2333
(For solutions information)

Apple Classrooms of Tomorrow 1-800-825-2145
(For ACOT research reports)

Macintosh & Curriculum Handbooks 1-800-722-6782
(For staff development tools in several curriculum areas)

Apple Education Videos 1-800-825-2145
(For education technology integration case histories on videotape)

Apple Customer Assistance Center 1-800-776-2333
(For help with problems not resolved elsewhere)
APPLE EDUCATION RESOURCE CD

News & Info: Doing Business With Apple:
Educator Advantage - Home Computer Purchase Program

Description

Our best-selling home computers, the Macintosh Performa family, are available to you through Educator Advantage. Each Performa comes with software chosen exclusively for educators at home, with extras like ClarisWorks 2, Quicken 4, American Heritage Dictionary, and more. And each Performa system comes complete with a modem and an on-line communications program. Selected systems come with the Educator Advantage CD-ROM Collection, available exclusively through the Educator Advantage program.

To make sure the Macintosh you want is within reach, Apple offers the Apple Educator Advantage Loan. With your loan, you can buy an apple Macintosh Performa for as little as $28 a month.** It's easy to apply for the Apple Educator Advantage Loan. The five-year, low interest loan can be pre-approved simply by calling us at 1-800-959-2775. There are no application fees, and the origination fee is quite reasonable. Call now for our terms and conditions.

To order through the Educator Advantage program, you must currently work a minimum of 19 hours per week for a non-profit, public or private, K-12 education institution within the U.S.A. School board members and PTA and PTO Executive Officers must be currently serving the minimum of a one-year term. Members of the American Federation of Teachers (AFT) and the National Association for the Education of Young Children (NAEYC) must be currently active. Purchases are limited to one computer system, one PowerBook, and one printer per customer per academic year.

You may order by calling our toll-free telephone number 24 hours a day, 7 days a week. Your new Apple products will be delivered directly to you in a matter of days, pending product availability. There's toll-free telephone support; Apple technicians are at your service at 1-800-SOS-APPL. Now it's easier than ever to buy a home computer from Apple!

Call 1-800-959-2775, ext. 548 - 24 hours a day, 7 days a week.

** Call for full loan details. All sales are final.
APPLE EDUCATION RESOURCE CD

What hardware comes with the Macintosh LC 575 Teacher Solution Bundle?
With the all-in-one Macintosh LC 575 workstation, everything you need is built into one convenient case: a 68LC040 processor with 5 MB of RAM, 160 MB hard disk drive, 14 in. Sony Trinitron color display, AppleCD 300i Plus CD-ROM drive, stereo speakers, microphone, Apple Keyboard II, and mouse. The Macintosh LC 575 has 2 expansion ports and is ready for a PowerPC upgrade.

What hardware comes with the Power Macintosh 6100/60 AV Teacher Solution Bundle?
The 6100/60AV has video input and output, PowerPC the newest high-performance processor - 8 MB of RAM, 250 MB hard disk drive, and internal AppleCD 300i Plus CD-ROM drive. In addition, it offers built-in Ethernet connection and a full set of multimedia and communications tools. The bundle also includes a 14 in. Apple AudioVision color display with built-in stereo speakers and microphone, and an Apple keyboard II and mouse.

Why is software part of the bundle?
By offering a Macintosh workstation with software selected to meet most teachers' productivity needs, Apple provides a solution teachers can use as soon as they open the box.

Which software is included?
Both bundles include the Apple Teacher Productivity CD, featuring software products specially selected to enhance teachers' educational computing experience. These are programs to help you write memos, create schedules, communicate with parents, take attendance, assign grades, plan lesson, and develop tests. In addition, you get ClarisWorks from Claris - an integrated package that combines word processing, database, spreadsheet, graphics, and presentation software, and ClarisWorks for Teachers - a convenient collection of commonly used templates. To meet your reference needs, the bundle includes interactive CDs such as a multimedia encyclopedia, and electronic almanac, and a dictionary.
Computer Definitions

CD-ROM - Compact Disc - Read Only Memory. Just like music CD's but contain computer software. 2X refers to the speed at which it accesses information. 4X is a real speed demon and will make for smoother running animation.

Disks - A portable storage device. Standard disks hold 700 kilobytes or 0.7 megabytes of information. High Density disks hold about 1.4 megabytes.

Disk Cache - A kind of side memory that enhances the performance of your computer.

Hard Drive - Device located inside the computer used to store information. Size is measured in megabytes. An 80 megabyte drive is small and .500 is quite large. A storage capacity of 1000 megabytes is known as a gigabyte - it's huge!

Megabytes - The standard unit of measurement for the memory of a computer. It's not important to know exactly how large a megabyte is.

Modem - A device that connect your computer to a standard phone line. Needed to use services like America On Line or Compuserve. You may send and receive faxes by modem. Speed is measured in bps. 14,400 bps is becoming the standard, but 28,800 bps modems are the fastest you can buy.

Monitor - Basically the TV on top of the computer. It's an output device you look at.

Mouse - input device used to move the cursor on the monitor. The mouse is an extension of the keyboard and actually looks like one.

Multimedia - Refers to a mixture of media modes. Can include sound, movies, graphics, etc.

On line services - There are several such services that connect you by modem to a world of electronic information such as sports, encyclopedias, Business and finance, and shopping. America On Line and Compuserve are probably the best known of these services.
Computer Definitions

Operating System - Refers to the built in software that computers use to perform all its functions. The most current system for the Macintosh is System 7.5. For the IBM compatible machines, the newest system is called Windows '95. Newer operating systems are usually compatible with older software, but not necessarily so the other way around.

Power Mac - A line of Macintosh computers built with faster microprocessors. Some non power Mac models can be upgraded to power Macs, some cannot.

RAM - Random Access Memory used to run software. Four megabytes of RAM is pretty much the minimum for any serious computer, eight is very respectable, and anything larger is awesome.

MHz - Refers to how many calculations per second. The faster the computer, the more powerful. 33MHz is minimal and considered slow by computer standards. 60MHz is rather fast; 90 and 100MHz computers are about the fastest. The faster the speed, the more expensive the computer.

Preloaded software - Most computer systems are packaged with software applications preloaded on the hard drive. Systems with preloaded software are more expensive than systems without it, but the price increase in only a fraction of what it would cost to buy all the software on your own.

Printers - Laser printers are the highest quality and the most expensive. Ink jet printers come close in quality, but are far more reasonably priced. Both types of printers have models that can print in color. Of course, color printers are more expensive than black and white.

Super drive - A 3.5 in disk drive capable of using High Density disks.

VRAM - A special sort of memory that enhances the visual display of graphics, animation, and video.
Appendix G: Media Project

Menu Card

Card 1: Home Stack

Card 1: Microsoft Word Cards

Card 1: Microsoft Word

As you are aware from your frequent travels aboard Blue Sky Airlines, we produce a quarterly magazine for our passengers to read while in flight. As editor of Blue Sky’s publications, I am inviting you to be our Spring Spotlight Traveler.
Dear Jean Tanner,

As I'm sure you are aware from your frequent travels aboard Blue Sky Airlines, we produce a quarterly magazine for our passengers to read while in flight. As editor of Blue Sky's publications, I am inviting you to be our Spring Spotlight Traveler.

Card 2: Microsoft Word

Dear Jean Tanner,

As I'm sure you are aware from your frequent travels aboard Blue Sky Airlines, we produce a quarterly magazine for our passengers to read while in flight. As editor of Blue Sky's publications, I am inviting you to be our Spring Spotlight Traveler.

Card 3: Microsoft Word
Dear Jean Tanner,

As I'm sure you are aware from your frequent travels aboard Blue Sky Airlines, we produce a quarterly magazine for our passengers to read while in flight. As editor of Blue Sky's publications, I am inviting you to be our Spring Spotlight Traveler.

Card 4: Microsoft Word

Dear Jean Tanner,

As I'm sure you are aware from your frequent travels aboard Blue Sky Airlines, we produce a quarterly magazine for our passengers to read while in flight. As editor of Blue Sky's publications, I am inviting you to be our Spring Spotlight Traveler.

Card 5: Microsoft Word
Dear Jean Tanner:

As I'm sure you are aware from your frequent travels aboard Blue Sky Airlines, we produce a quarterly magazine for our passengers to read while in flight. As editor of Blue Sky's publications, I am inviting you to be our Spring SpotlightTraveler.

Card 6: Microsoft Word

Here are some examples of the different fonts available.

- New York
- Benguiat Frisky
- Geneva
- Poster Bodoni
- Graphite Light
- Torino Outline

A color printer is necessary for the colored print.

Card 7: Microsoft Word
Dear [Name],

As I read your letter, I am intrigued by your interest in joining our team at Microsoft Word Cards. Our company is always looking for new talent, and I believe you would be a great fit.

Our focus is on creating innovative and user-friendly software solutions. We offer a competitive salary and benefits package, as well as opportunities for professional development and career growth. If you are interested in interviewing and posing for some photos preferably aboard the Blue Sky, please let me know.

Our booking agents tell us that you fly Blue Sky in the company of Vincent, the orangutan from the popular television show. Would you be willing to be interviewed and to pose for some photos, preferably with Vincent? We'd love to publish this story in our fifth anniversary special issue of the magazine.

If you agree to be a Spotlight Traveler, you will receive two complimentary, round-trip tickets to anywhere Blue Sky flies as well.

Card 8: Microsoft Word

Card 9: Microsoft Word
February 16, 1993

To whom it concerns,

Please accept the following as a letter of recommendation for LaShawna Lako. It is on the basis of twelve years of teaching math and science, two years as math instructor in Algebra and Geometry for LaShawna and four years of acquaintance that I make this recommendation.

In her first two years at Upland High School, I was LaShawna's teacher for Algebra I and Geometry (both are college prep classes). From these two years, I came to know LaShawna as one of the most hardworking and talented students I've ever had in class. Her A grades in these courses indicated only her mastery of the subject matter. The grades do not reflect her daily effort, consistently accurate assignments, and two courses recommendation.

Card 10: Microsoft Word

Card 11: Microsoft Word

I. REQUIREMENTS

1. Bring paper, pencil and your book every day.
2. Take notes, do all the assigned work and turn it in on time.
3. Take all quizzes and tests.

II. GRADES

1. Grades are weighted as follows

Handouts like this are saved for future use.
Card 12: Microsoft Word

This is what it looks like when you are typing a document in Microsoft Word. Making a mistake is no problem—just hit the delete key and correct your mistakes. If you don’t catch your mistakes, then the spell checker will do it for you. If your grammar is not perfect, the grammar check will look it over and make suggestions. Stuck for just the right word? There’s a thesaurus to help out. For us math teachers, there are a number of math symbols available within each type of font you choose. Here’s a few: \( \sum \), \( \int \), \( \infty \).

Card 13: Microsoft Word

Change the print size.

Use a fancy font, or a plain font.
Choose bold, italic, underline, or all three.
There’s outline, and shadow too.

Examples of what you can do with text.
Card 14: Microsoft Word

Card 15: Microsoft Word

Notes on Microsoft Word

1. There are approximately 20 fonts available with Word.
2. Files can be exchanged between different word processors—such as Claris Works.
3. We do have the software to read files from later compatibles too.
4. Microsoft Word also has a graphics component where you can make your own art work and import it on to your word processing document.
HOW TO INSTALL ON YOUR HARD DISK

SYSTEM REQUIREMENTS:

HyperStudio Player requires at least two megabytes of RAM under system 6.0 and four megabytes under 7.0. All of the stacks, including HyperStudio Player, will use approximately 2.3 megabytes of memory on your hard disk.

INSTALLATION PROCEDURE:

Create a new folder on your hard disk and copy all files (ten in all) from these two disks on to that folder. The HyperStudio Player must be in the same folder as the file named "Home Stack". The remaining files may be placed in any other folder on your hard disk; although the program will run more smoothly if you place all files in the same folder.

OPERATION:

The file named Home Stack is a sort of hub around which all the other files are organized. Double click on the Home stack file to start the program. To quit HyperStudio, press the command and Q keys simultaneously.
Appendix H: Inservice Forms

Technology Inservice Needs Assessment

Name: ____________________________

I. TECHNOLOGY SKILLS

Please rate your level of expertise with the following technologies. 1 = no experience, 2 = novice with minimal skills, 3 = experienced with room for growth, 4 = advanced.

<table>
<thead>
<tr>
<th>Technology</th>
<th>Level of expertise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macintosh computers</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>Apple compatible printers</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>Keyboarding skills</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>TI-85 graphing calculator</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>Microsoft Word</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>LXR•Test 5.1</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>Gradebook Plus</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>Exam in a Can</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>Geometer's Sketchpad</td>
<td>1 2 3 4</td>
</tr>
</tbody>
</table>

II. TECHNOLOGY EDUCATION

Please list technology courses/workshops you have attended: ______________________________________________________

____________________________________________________

____________________________________________________

III. HOME COMPUTER USE

Do you own your own home computer?  ○ YES  ○ NO

If you answered Yes, please list which computer, printer and software applications you use at home.

____________________________________________________

____________________________________________________

____________________________________________________

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IV. CLASSROOM USE OF TECHNOLOGY

Are you currently using technology as part of your teaching and if so, how are you using that technology?

_________________________________________________________

V. TECHNOLOGY ANXIETIES

Please list any hesitancies you have, if any, about technology and its use in the classroom.

_________________________________________________________

VI. INSERVICE CHOICES

Choose as many as you would like to attend. Indicate your preferences by numbering your choices in the boxes provided.

- Microsoft Word. Bring what you need to create a handout for your classes.
- LXR•Test 5.1. Bring a test you already use in class and start your own test bank.
- Gradebook Plus. Bring your class lists and start your gradebook today.
- Exam in a Can. Make your next test or review sheet for Algebra or Geometry.
- TI-85 graphing calculator. Calculators are provided.
- Buying a computer. Bring all of your questions.
Technology Inservice Evaluation

1. I attended my first choice of inservices.
   
   5 4 3 2 1
   agree disagree

2. The inservice was appropriate to my skill level.

   5 4 3 2 1
   agree disagree

3. I finished school work I would have had to do on my own time.

   5 4 3 2 1
   agree disagree

4. There was adequate hands-on practice.

   5 4 3 2 1
   agree disagree

5. The instruction was adequate for the inservice.

   5 4 3 2 1
   agree disagree

6. I was involved in the planning and implementation of this inservice.

   5 4 3 2 1
   agree disagree
Technology Inservice Evaluation

7. I would like to attend inservices similar to today's on a more regular basis.

5 4 3 2 1
agree disagree

8. For you personally, were there any deficiencies in today's inservice? If so, please explain.

________________________________________________________________________
________________________________________________________________________

9. What sorts of incentives to attend inservices on technology are of value to you?

________________________________________________________________________
________________________________________________________________________

10. Suggestions for improvements:

________________________________________________________________________
________________________________________________________________________
APPENDIX I: Software


REFERENCES


