2002

Technology staff development

Paul A. Rabara
University of Northern Iowa

Technology staff development

Abstract

Traditional staff development does not suffice for emerging technologies and evolving pedagogy for teacher use of technology in instruction. Societal changes have produced new needs. Change causes a need to systematically look at progress and the attributes associated with the diffusion of innovations (Rogers, 1995). Roswell (1997) is only one of several schools who have dedicated considerable resources to developing a technology staff development plan with results in higher percentages of teachers using technology in the classroom. Technology staff development should have characteristics in models that coincide with the attributes of diffusion. Technology staff development can bridge the use and understanding of technology to students. Highlighted will be what must be done in order for schools to experience significant change in technology implementation.

Technology Staff Development

A Graduate Review

Submitted to the

Division of Educational Technology

Department of Curriculum and Instruction

In Partial Fulfillment

Of the Requirements of the Degree

Master of Arts in Education

UNIVERSITY OF NORTHERN IOWA

By

Paul A. Rabara

May, 2002

This Review by: Paul A. Rabara

Titled: Technology Staff Development

has been approved as meeting the research requirement for the

Degree of Master of Arts.

June 6, 2002
Date Approved

Mary C. Herring
Graduate Faculty Reader

June 6, 2002
Date Approved

Sharon E. Smaldino
Graduate Faculty Reader

June 7, 2002
Date Approved

Rick Traw
Head of Curriculum and Instruction

Abstract

Traditional staff development does not suffice for emerging technologies and evolving pedagogy for teacher use of technology in instruction. Societal changes have produced new needs. Change causes a need to systematically look at progress and the attributes associated with the diffusion of innovations (Rogers, 1995). Roswell (1997) is only one of several schools who have dedicated considerable resources to developing a technology staff development plan with results in higher percentages of teachers using technology in the classroom. Technology staff development should have characteristics in models that coincide with the attributes of diffusion. Technology staff development can bridge the use and understanding of technology to students. Highlighted will be what must be done in order for schools to experience significant change in technology implementation.

Introduction

The 21st Century Training Session

Progress

The odyssey of the American educational system, once again, finds itself amid a swirling stream of technological whitewater. As our educational system approaches and enters the Age of Information, so many quick fixes, or short-term changes for school improvement have filtered into materialization, but are only piecemeal approaches to creating systemic change—that is, the root of a deeper level change (Rogers, 1995). Disconnectedness and piecemeal approaches have done little, if any, for true changes in progressing American schools. Moreover, schools have been criticized for their fragmented approach to change (Sparks and Hirsh, 1997). A strategy is needed for educational change (Ellsworth, 2001).

A strategy is needed that targets and connects teachers in a technology-rich society to the possibilities in the classroom. The aim is staff development that will support emerging and advancing technologies. Advances in technology cannot be supported by the old constructs of a system that was established at an earlier time period (Cuban, 1986). Therefore, past traditional staff development focuses are insufficient in attempting to bridge technology presence and classroom application. Staff development has been considered one of the strongest links to school improvement (Bailey & Lumley, 1994; Blackhurst, 2001; Joyce & Showers, 1995; Sparks & Hirsh, 1997; Zepeda, 1999). What is needed is a specific type of staff development—technology staff development.

Technology staff development is a continuous process that is directed by appropriate and specific goals (Sparks & Hirsh, 1997). Traditional staff development has sometimes been too disconnected from goals and district plans. Now that technology has, and continues to be, embedded into schools, technology teacher training is a wise investment and rationale for reshaping staff development. A look at alternatives to traditional staff development and an examination of technology staff development for targeted change is the focus for this paper. Staff development is one of the pillars that President Clinton in 1996 articulated as part of his Technology Literacy Challenge. The importance of continuous teacher technology development cannot be overstressed (CEO Forum, 1998). A learning organization, such as a community of teachers, is one that continually redesigns itself to adapt to the changing work of which it is a part (Ellsworth, 2001). The goal should be to make the teacher organization of the public schools a community of continual professional growth.

For so long in our society, people have pointed to technology to enhance our way of life, our way of training for the workforce and our way of gaining new and important knowledge. The hopes of technology enhanced changes have blurred some to liken technology to a miracle pill. Only recently has technology progressed to the point where it can be highly effective in changing, or developing the mind to think, analyze and produce intricate work. Healy (1999) states, "an atmosphere of hysteria surrounds the rush to connect even preschoolers to electronic brains" (p. 20). Healy stresses that rather than mindlessly accepting change as important and necessary for our children, we should begin by pausing and reflecting on the long-range personal and cultural implication of our new technologies.

Analysis and Discussion

Technology staff development is needed for a teacher to be highly effective in the 21st century. Traditional staff development cannot support emerging technologies and evolving pedagogy (Sparks and Hirsh, 1997). Reviewing literature related to societal changes and trends, a clear pattern could be established to verify a rate of progress that is, by nature, very rapid. With rapid changes occurring in modern society, new needs and focuses are inevitable. Since the school system is situated within a larger system, societal changes influence educational changes. Once a perspective of change was established, a look at attributes of change was established to support the need for a systematic approach to systemic change.

Traditional staff development and traditional delivery of staff development was defined in order to provide a foundation for changing to technology staff development (Sparks and Hirsh, 1997). Effective technology staff development can increase the rate of technology implementation into instruction and productivity tools for teachers to assist students in becoming highly proficient with technology. Standards were considered so that technology staff development was systematic in approach and in a position to be evaluated. Standards can guide technology staff development's design which are related to Rogers (1995) attributes of the diffusion of an innovation. A look at Roswell technology staff development plan will provide information on increase use of technology for teachers in instruction and productivity when supported with many offerings of technology staff development.

Societal Changes

National education should maintain pace with technological innovations so that the effectiveness of education can be gauged in an evolving society. American society is steadily progressing into the technological future, and therefore schools should strive and succeed in maintaining pace with the advancements and innovations. Cuban (1986) suggests that organizational imperatives (the greater society) have influenced how people think. Moreover, Cuban concludes that since classrooms are often viewed as the fix-all drug of society, they should also be viewed as the foundation for excellence for societal progress. Currently, progress is dictated by emerging technologies.

The use of technology in the classroom has seemed to be a slow process during the 20th century. Reasons why teachers are not currently using computers and the reasons why teachers were hesitant to use modern technology (radio, film, and television) during the course of the century share parallels. For example, Cuban (1986) stated the three main reasons for teacher's lack of use for radio during the early decades of the 1930s as: (a) lack of skills, (b) cost of equipment and upkeep, and (c) inaccessibility of equipment when needed. "In today's new technology implementation, incorporation is slowed because of those same reasons" (p. 12). Therefore, technology staff development, if applied efficiently, should close the gap between the historically critical components of technology implementation into the classroom. Cuban's three main factors for the lack of use can be remedied through technology staff development because the cost of equipment and the access to it is becoming a non-issue by the mere volume of machines in schools today. Skills development seems to be the major hindrance for teachers, which can be addressed through ongoing technology staff development. The deciders of educational

technology implementation were non-educators. Cuban said, "Applications to classroom were conceived, planned, and adopted by non-teachers. Teachers were seldom consulted or involved in the early stages of introducing [technology]" (1986, p. 36). Teachers were described as frustrated, intransigent, reluctant, fearful, hostile, and indifferent when technology was beginning to emerge. They had a cautionary attitude toward change when discussing the implementation of technology in the classroom. Conclusions for teacher preparation were teachers have been trained amateurishly; mediocre was the standard, and that the clogged bureaucracies, top-down governance, slowed the rate and degree of implementation of computers in the classrooms throughout the history of computers in education (Cuban). As teachers enter the workforce, it is imperative that learning continues—technology staff development must be designed to address ongoing innovations for technology use.

The accessibility of software and hardware impacted the use of machines in the classroom. Poor equipment (i.e., obsolescence) was a contributing factor for failure of fully implementing the technology. Three main reasons for implementation difficulties for ITV (Instructional Television) are: (a) programming scheduling, (b) lack of advance notice of scheduling, and (c) lack of sufficient time to plan for programming (Cuban, 1986). Cuban has drawn connections to past mistakes for use of technology in the classroom, and he parallels some issues that face computer implementation at a higher scale. One main theme can be extracted from the above three points. First, teachers say in the production of materials via technology was minimal to none. Second, teachers had to adapt to what was being hurled at them, instead of designing the tools to cater to the curriculum. And, third, the rate at which new items get introduced is incredibly fast. The

question, then, was how can experts be created in programs and applications when new ones are continuously being designed?

Teachers are anchored to the classroom and are the student's gatekeepers. Therefore, educators who implemented technology at a greater rate than minimal users perceive a value on the effectiveness to improve the quality of instruction taking place in the classroom (Cuban, 1986). Educational technology can help ameliorate the process of teaching and learning. Teacher use of machine technology can test how applicable situationally constrained choice is as an explanation for teaching practice. The argument posed is this: The more effective and efficient the tool used by a teacher, the more the teacher will use the tool because of the functional benefits for improved instruction. Teachers ask very different questions of new classroom technologies than do administrators, school board members, state and federal policy makers, and scholars. Therefore, top-down mandates were less effective for implementing new technologies. Staff development empowers teachers to integrate technology into their curriculum (Cuban, 1986).

Organizational imperatives can influence what people think. Yet different ideas about children's development, how they learn and purposes for schooling beyond cultivating minds, permeate the larger culture and penetrate educators' thinking. Cuban points out an interesting fact. During the 19th century, large group instruction was the norm. Then, during the early part of the 20th century, small group instruction was thought to have been more effective. Yet, still today, much of the instructional methodologies are large group. Change in the schools is a slow process. However, once it becomes standard, it is "fixed" in the system as more of a foundation.

The research and data by Cuban (1986) can help to show that top-down management methods neglect the perspectives of the teachers. When this happens, the teachers cannot intuitively implement, alter, and change for better ways of doing things in the classroom. If the teachers can see the opportunities to be more effective in the classroom with their instruction, then they can be more willing to use the technology because they see the worth. Worth is an impression, and impressions reside within the realm of the subconscious. Technology staff development can be designed to target more than skills development for teachers; targets can be designed to assist teachers in creating an understanding for the applications of technology to form a newly expanded perception of how to use computers for instructional purposes.

Impact of Technology

In order to develop a view of the revolution that technology is creating in education, it is helpful to briefly consider how technology has revolutionized American culture, and how it has left educators rushing to catch up. Computers made it possible for vast amounts of information, from airline reservations to the contents of encyclopedias, to be made instantly available and modified with a keystroke. Children have grown up with remote controls, and often spend more time watching television and videotapes than reading (Strommen & Lincoln, 1992). "They [learners] are used to an environment where they control information flow and access, whether through a video game controller, remote control, mouse, or touch-tone phone" (p. 1). Hence, the summative experience of the growth and change in our society during the 20th century has pointed to a direction toward school reformation.

With the changing ideas regarding the best practices for educating our citizens, technology and the information on the Internet can be applied to learning like no other invention in the world. Becker (2000) describes transmission pedagogy—the dominate pedagogy of the 20th century—as a conventional theory of learning in which understanding arises from carefully planned direct instruction on a narrowly defined skill or content topic and guided practice on questions related to that topic. He offers that what is needed is a guiding philosophy that suggests principled changes in the curriculum, and effective uses of technology as part of these changes. Teachers must modify or alter pedagogy so that technology is a key component of every classroom. Technology should be thought of as "an integral component of the curriculum, a chameleon-like tool that can be used with almost any content" (Strommen & Lincoln, 1992 p. 3). Technology has effectively progressed American society with emerging technologies that have created new ways of doing things. Schools should maintain progress with the greater society in order for schools to remain an integral part of our experience. An unexpected by-product of this revolution has been the emergence of a generation of children weaned on multidimensional, interactive, media sources. A generation whose understanding and expectation of the world differ profoundly from that of the generations preceding them. Therefore, why teach with old paradigms and techniques? The purpose of education is not fixed on a set of curriculum, a set of basic skills, or a set of instructional strategies that cut across time and space.

Educators and researchers, to determine the most effective and efficient ways to incorporate technology into the learning that occurs in schools, are closely examining the changes and innovations in society. Most current and past uses of education technology

have typically supported traditional notions of teaching and learning. This result was partly due to the newness of technology during the early stages of technological advancement. However, a trend in computer access has shifted the focus from why to use technology to how to best use technology. With the increase of availability, instruction geared toward the technology can ameliorate learning and better facilitate the modern theories of learning and instruction.

The needs of tomorrow's school.

New curriculum, new approaches, and new theories are continuing to develop with the growing need for inclusion of emerging technologies (Rogers, 1996). Old curriculum is not for the Age of Information. In schools where the curriculum is a mass to be swallowed, where students are fed information meals all too similar to fast food, educators should not be asking how to employ technology in support of the curriculum. They should first change the curriculum to focus on the learning process. Schools should be much more about students making meaning rather than merely committing someone else's insights. When curriculum is written as a journey, such as in a WebQuest, student discovery, invention, and investigation are the prized results. Teachers need to be comfortable in the new learning environments that emerging technologies are providing.

Information Age schools will provide a balance between primary and secondary sources, challenging students to develop their own insights while critiquing and reviewing the best thinking of the society's experts. The importance of developing change in the school system is imperative for the schools to be effective in the 21st century and beyond, and that the learner-centered context of the classroom is mandatory

for students to actively learn (Joyce & Showers). Self-activity has long been the ultimate educational ideal (Dewey, 1939). Progress has come to the age where all of what is known to be highly effective and transformative is at one's fingertips. The future of curriculum, instruction, and schooling is changing; they can become highly efficient and effective for schooling. The posterity's future is unknown, for innovation and advancement begets more progress. The current school system will not adequately suffice the needs of a changing and evolving world.

In the past, knowledge, even in the midst of Progressive thought, was seen as standardized testing performance results. True, current, accountability is still a key issue in education, however, accountability has extended into technological proficiency skills for educators and administrators. Knowledge was gained through transmission from teachers to students. Technology played a minor role in the educational process. Students were considered sponges who would absorb the data. Administrators were nonchalant with gathering information with regards to technology. For example, Cuban (1986) mentioned that an affiliate of the National Education Association received slightly over 7 percent of the replies to a survey for technology usage in 1933. Action research could have been stronger for the classroom teachers, and the administrators could have developed better tools for assessing the new integration of technology but the process did not occur. To target the historical hindrances of technology in education is of great consideration, or else the same pitfalls that have been will continue to be.

The same contributors to the past efficient implementation of technology are still the same contributors for current day debates. Contemplation is needed to seriously look at what has been done, or learn what the experts, such as Cuban, have gathered and apply

what direction those results suggest, to continue to progress with the growing information available to study. The data can be used to systematically plan to future paths. Therefore, a plan can be designed that has its roots in consideration of what occurred previously with branches pointing toward the future.

Reaching students through teachers

The society at large thought of the technology machines (radio, television, movies, and computers, etc) as miracle teachers and insisted upon administrators to purchase and place in the classrooms. However, the major resistance to converting classrooms into technical enterprises has come from the organizational realities of school and classroom life and the teacher's holistic perspective on what is important to young people (Healy, 1999). If student learning is to be impacted, teachers must first receive training for technological needs. Technology staff development can adhere to the changing wants of a society by its nature of ongoing development.

During the middle part of the 20th century, the educational system was receiving some criticisms for slow progress in integrating technology effectively, almost similar to the criticisms today. The use of instructional television was seen as a way for students to be infiltrated with information. However, the use of television was not as widely accepted as it could have been. In 1981, 13% of elementary teachers indicated that they used no instructional television in their classroom (Cuban, 1986). Teachers failed to see the importance of technology supported instruction.

The current educational system continues to lag behind in technology integration supporting staff development. "Well-trained teachers are the keys to successful classroom technology integration. To ensure a return on ever increasing investments in technology

schools must make a commitment to staff development" (CEO Forum, 1999, p. 56). In, 1996-1997, schools spent $4.18 per student on computer training for teachers, which was five percent of the technology budget. In the following year $5.23, per student was spent on teacher training—again five percent of the budget. Finally, in 1998-1999 schools spent $5.65 per student on technology training for teachers, which was still only five percent of the school technology budget (Technology Purchasing Forecast, 1998). As the data demonstrates, the rise in technology budgets for schools have not consistently coincided with an increase in spending on technology training for teachers. A return on hardware investments must be supported through technology staff development.

The organizational realities of the classroom, training teachers, and developing good uses for the technology already in the classrooms must be addressed continually in order for true results to manifest (Rogers, 1995). Technology staff development can reach students via teacher training and professional development. Considering the possibilities for teachers to utilized technology into instruction, students can be the beneficiaries for an increase of technology in instructional settings.

Procedural Change

With changes so rapidly penetrating our modern lifestyles, researchers must be looking at change systematically. Arbitrarily implementing innovations as they arose was a simpler process in the past, when innovation was at a root level. However, vast changes and depths of changes in innovations has given rise to a look at change from a very systematic approach. Procedural change can place some consistency in developing methods to incorporate new with old.

Procedural change is a systemic look at how innovations alter, or modify the way in which life is lived. Procedural change assists with diffusion of innovations. Rogers (1995) describes diffusion as a kind of social change, defined as the process by which alteration occurs in the structure and function of a social system. So, taken in context, the diffusion of innovation is the rate at which innovations become diffused in society. Rogers discusses the attributes of innovation and how the attributes must be considered for a more rapid acceptance of innovation. The attributes that act as catalysts for change are:

1. Relative Advantage: What are the advantages of changing?
2. Complexity: What is the perceived difficulty? Is the innovation hard to understand?
3. Trialability: What is the degree of experimentation? Can a person try out the innovation easily?
4. Compatibility: Is there a need for change?
5. Observability: To what degree could the results or uses of the innovation be seen by others? (p. 34)

The stronger the attributes are in the change process, the more chance there is for the adoption of the innovation such as technology. Think about the innovations that have changed the world and consider the attributes of change. If the attributes for efficient innovation are considered, the results may provide a society more willing to contemplate new innovations, which may decrease the skepticism that many individuals hold tightly. Moreover, if technology staff development can model traditional staff development, teachers can find solace in familiarity. Technology staff development can relate the

familiar with the new and have prior beliefs, knowledge, and issues deep in the psyche connect to newly acquired constructs of instructional technology. Therefore, the attributes can be applied to any innovation to ensure a timely diffusion of usage.

Technology staff developers should heed Rogers' (1995) attributes and base new models of staff development with them in mind. Rogers' example is the cellular phone. The relative advantage is its mobility. A cell phone is based on a regular phone, so skill development was minimal (complexity). A person could easily borrow a friend's phone to see how he/she likes it (trialability). Next, a cell phone takes business, education, and general communication to a higher level—it is very mobile and convenient (compatibility). Finally, as the population of cell phone users increased, so did the social prestige or social norm of carrying and using a cell phone (observability). As more people begin to use cell phones, policy change will occur as problems arise (i.e., restricted use on planes, ringers set on off during movies, etc.) (Rogers, 1995). In fact, New York is the first state to ban driving and cell phone use with 38 countries considering the same. Fullan (1982) has pointed out so carefully that an innovation is not sustained unless there is a shared understanding of its purpose, rationale and processes.

A look at Rogers (1995) attributes shows that change is a deeper issue than most realize. An example of the type of change that technology may be assisting can be seen in a Piaget conducted study. It showed that the type of change that is, in a sense, at the root of a species (Fosnot, 1995). He took pond snails from three varying environments. Habitat A was tranquil, habitat B was semi-turbulent, and habitat C was very turbulent. He studied the snail's shell and concluded that the snail from habitat A had an elongated shell, which was influenced by the habitat itself. Both snail types from habitat B and C

had more globular shells, which helped with suction in the turbulent environments. Piaget took an offspring from habitat B and found that the offspring took the shape of a snail from habitat A. He named the change as a phenotype, or a temporal change. He then took an offspring from a snail in habitat C and put it in the habitat A environment. Unlike the offspring from habitat B, the offspring from habitat C continued to have globular shells. It was a change at the gene level, which he named as a genotype modification. Technology innovation may be at the same level of change, embedded in one's personal hardwiring. It should be nurtured as a procedural approach to help detect shifts in perspective. In fact, Healy (1999) suggests that experts look at what technological implementation is doing to the hardwiring of children. Depending on the usage and age of a person, technology is a factor so deeply rooted that unforeseen changes are inevitable and should be contemplated. Consider the generation currently in college. Students born after 1980 know a world of CDs, color television, portable phones and a host of other innovations that previous generations developed, or rarely used. The human offspring may be experiencing a deeper level change with the progress of technology.

In dealing with change, Piaget matched and developed three modes of accommodation, or three ways the mind will accept new information once it was assimilated. First, a person will deject, or deny new information, or concepts and remain with their already existing beliefs. Second, the person will hold a detached construct and will apply it to specific cases—all dependent on the case itself. And, thirdly, the person will bridge the new information with pre-existing information and will have a more encompassing view. Change that relates to habitat C is critical for deep-seeded beliefs to

be modified and revamped. Piaget's work should be considered when developing the goals of technology staff development.

Procedural change and Rogers (1995) attributes for diffusion of innovation can be considered for technology staff development to assist in bridging emerging technologies with already established frameworks of thought. Teachers must handle a creativity that will incorporate technology, instead of relying on traditional notions of instruction where technology is not as easily considered for implementation. In other words, teachers must automatically, or easily see ways to use technology that is unhindered by lack of perspective. Therefore, procedural change and connection between the current and emerging systems must include similar, or familiar characteristics so that a comfortable connection is made. Technology staff development based in Rogers attributes and Piaget's attributes will effectively bridge the changing pedagogy that will support technology in the instruction of teachers.

Integration

Jane Healy (1999) delves into issues about empowering youngsters to construct knowledge rather than having adults decide when and how to funnel it into their brains, which has long been an objective of many future-oriented educators. Healy brings up the fact that the brain itself may be changing in the sense of the hard drive makeup of the actual brain functioning power. Mental skills and even the brain organization of people using technology is altering, or adapting new habits. However, Healy (1999) suggests that schools bursting with digital bells and whistles can impress even a skeptical visitor, but only time will demonstrate whether such changes improve learning—or if we are

simply pandering to our media-crazed young. Direction can be integrated through systematic approaches to integrating technology.

Why integrate? The quality of public education in this country increasingly depends upon our collective ability to close the gap between technology presence and its effective use in the pursuit of school improvement. For 1999, the number of computers in American schools has increased 13% to create an installed base of six million computers (CEO forum, 1999). The CEO forum *Year 2* Highlights (1999), a report on technology and readiness assessment, recommends that every state develop standards for effective continuing education on integrating technology into the curriculum. Schools should have long-term technology plan and proficiency standards for all teachers and administrators. Resources for technology-related staff development should be increased, and every staff development program should integrate technology as a part of training components (CEO Forum, 1999).

Only 20% of teachers report feeling very well prepared to integrate education technology into classroom instruction (CEO forum). From the fall of 1994 to the fall of 1997, the percentage of U.S. public schools with Internet access increased from 35% to 78% (U.S. Department of Education, 1998). The number of classrooms that have more than five computers connected to the Internet increased from 25% to 43% (Technology Purchasing Forecast, 1998). These are commendable signs of progress. However, the evolution of classroom technology from hardware, software, and connections into tools for teaching and learning depends on the knowledgeable and enthusiastic teachers who are motivated and prepared to put technology to work on behalf of their students.

What is technology integration?

The point of technology integration goes deeper than just teaching computer skills. Technology integration is using computers effectively and efficiently in the general content areas to allow students to learn how to apply computer skills in meaningful ways (CEO Forum, 1999). It is organizing goals of curriculum and technology into a coordinated, harmonious whole. To integrate technology effectively is the vision for the educational system. Therefore, we should have a firm understanding of what that entails, so to properly include technology in our schools.

Dockstader (1999) listed some important reasons for integrating:

- correctly designed, more depth into the content-area curriculum is possible,
- in the information age there is an intrinsic need to learn technology,
- students are motivated by technology, thus increasing academic engagement time,
- while working in more depth with the content, students are able to move beyond knowledge and comprehension to application and analysis of information
- Students learn where to find information in an information rich world.
- Computer skills should not be taught in isolation and
- Students develop computer literacy by applying various computer skills as part of the learning process. (p. 59)

The reasons listed to integrate technology are valid, yet many teachers cannot assist their students unless they themselves can integrate technology. Our current educational system is at a crossroad with progress. As computer use continues to increase in society, educators must also prepare for the use of computers within the classroom (McCannon & Crews, 2000). Without teacher integration of computers into the classroom, deep-rooted

change is superfluously scattered and is more in a state of ebb and flow—not true progress. In a recent study, the U.S. Department of Labor identifies 54 jobs with the highest growth potential between now and the year 2005 and only eight do not require technological fluency (Thornburg, 1998). Fast paced thinking, abundant information and new paradigms are quickly changing the way we view the job of teaching. People sense the possibilities of educating individuals in today's info-rich culture. However, many of us also know that the system can be improved to even greater efficiency and effectiveness. Moursund (2000) suggests that, "The roots of our current formal educational system go back approximately 5,000 years, to the time of the invention of reading, writing, and arithmetic" (p 4). He states that the lack of change is embedded in societal norms that are deep and infused into automated views and perspectives. McCannon and Crews (2000) share that one of the most important factors which determines computer integration in elementary schools is the amount of computer knowledge the teacher possesses. If teachers are going to implement technology at the rate that progress dictates, it is vital for the teacher training programs and continued professional growth through staff development focus on technological implementation. Table one shows that many of the transition elements are, in fact, based in pedagogy. A teacher currently in the educational system was most likely trained in instruction that was based in teacher-centered approaches. A teacher may be unknowing of research in multi-sensory, multi-path progression, multimedia capabilities, collaborative work, information exchange, and exploration environments.

Table 1

Moving from Traditional to New Learning Environments

Traditional	New
Teacher-centered instruction	Student-centered learning
Single sense stimulation	Multisensory stimulation
Single path progression	Multipath progression
Single media	Multimedia
Isolated work	Collaborative work
Information delivery	Information exchange
Passive learning	Active/exploratory/inquiry-based learning

From the International Society of Technology Educators, 1998.

To be fair to experienced teachers, many of the concepts should be unfamiliar to veteran teachers because of the newness of the studies. However, this does not make them excusable from developing information. It only shows the need for technology staff development that will support and expand teacher understanding of technology innovations and theory to support technology integration.

Educational Change and Staff Development.

The educational system is a system within a system. Educational change comes from societal change, and societal change creates a need for educational change. Twenty-first century students will be requiring new skills and information (Uchida, 1996). Sparks and Hirsh (1997) have identified three powerful ideas that are currently altering the shape

of schools in the United States and the models of staff development that occurs with them. These ideas are results-driven education, systems thinking, and constructivism. Technology staff development is critical for teachers already in the classroom who may have been trained before the vast amount of emerging technologies were manifested. These three ideas are more than skills development. They are connected to pedagogy, which should be continually expanded or refined.

Results-driven education. Results-driven education evaluates the success of schooling not by the courses students take or the grades they receive but what they actually know and can do as a result of their time in school. Staff development is needed because results-driven education requires that administrators and teachers acquire new instructional beliefs and technological skills and alter their existing attitudes. In results-driven education teachers should have the opportunities to discuss, think about, try out, and hone new practices. Some of the roles that can be utilized are teacher-researcher, problem-solving groups, creating standards, creating a culture of inquiry (Sparks and Hirsh, 1997). True understanding cannot be developed only through traditional teacher training strategies. In essence, staff development should help teachers to weave new knowledge and beliefs about content, teaching style, and twenty-first century students.

As part of Results-driven education, Uchida (1996) suggest certain educational changes can make schools better:

1. Ensure the use of emerging technologies (may be defined as evolving and sophisticated communication devices which capture, create, transfer, and use words, music, sound, graphics, and video—Bailey and Lumley, 1994).
2. Promote active learning, instead of passive learning.

3. Commit more time and effort for staff development for teachers and administrators.
4. Develop standards, redefine the basics, and clarify what is expected of students.
5. Students and teachers work on real world problems.
6. Increase parental involvement.
7. Empower the teachers and schools with authority and control.
8. Create and strengthen new systems to support innovations.
9. Reflect international perspective in curriculum. (p. 27)

As the list describes, many of the educational changes consist of pedagogical aspects. Pedagogy is in the realm of thought and beliefs. Therefore, it is ever-changing and expanding. Technology staff development can be geared toward training teachers with the latest research and studies to assist in expanding ongoing data and discoveries.

Systems thinkers. When teachers are more knowledgeable, stress decreases. With decreased stress, or anxiety, creativity may flourish. Systems thinking has been described as a discipline for seeing wholes. It is a framework for seeing interrelationships rather than things, for seeing patterns of change rather than static snapshots (Sparks & Hirsh, 1997). Systems thinking is essential because the complexity of evolvement is ever increasing, and systems thinking offers a language that can restructure how we think about various types of relationships and about how organizations change.

Rather than seeing events, systems thinkers see the interconnectedness of all things and understand evolvement is circular—not linear. Seeing things as in a state of ebb and flow, instead of linear and non-related is a strength of systems thinking.

According to Sparks & Hirsh (1997), there are two important implications for staff development. First, staff development must help to install systems thinking at all levels within the organization so that school board members, superintendents and other central office administrators, principals, teachers and students understand the nature and power of systems to shape events. Second, educational leaders must understand the limitations of staff development that is separated from a systems perspective.

Constructivism. The final idea that Sparks and Hirsh discuss is a theory of instruction, constructivism, which suggests learners create their own knowledge structures, rather than merely receive them from others. As a philosophy of learning, constructivism can be traced at least to the eighteenth century and the work of the Neapolitan philosopher Giambattista Vico, who held that humans can only clearly understand what they have themselves constructed. The constructivist teacher sets up problems and monitors student exploration, guides the direction of student inquiry and promotes new patterns of thinking (Brooks & Brooks, 1999). Becker (2000) found that a constructivist philosophy raises the chance that an academic subject-matter teacher will use many types of software frequently with students. It is imperative for constructivist staff development models and the staff developers during a workshop, or presentation model constructivist experiences.

In schools, educators are faced with changing times and sweeping innovations of a modern society. With those changes come the need for evolution in the currently operating educational system. One such modification is the implementation of technology into the educational system. The theory of constructivism can guide instruction so that the use of technology is being wed with the best approaches for learning—and the old paradigm from the 20th century is not compatible with new. If the goal is to develop

technologically competent citizens in a growing technological society, then results must instill the skills and attitudes to form technological literacy at an early age to last a lifetime by teachers who are proficient in technology. John Dewey (1939) suggests that the activities of the young will affect the country when they are adults:

> In directing the activities of the young, society determines its own future in determining that of the young. Since the young at a given time will at some later date compose the society of that period, the latter's nature will largely turn upon the direction children's activities were given at an earlier period. This cumulative movement of action toward a later result is what is meant by growth. (p. 205)

Technology needs a supportive theory for implementation, and the 20th century theory of transmission will not suffice emerging possibilities for instructional achievement. The implications of constructivism for staff development are thus profound and quite direct: constructivist classrooms cannot be created through transmittal forms of staff development (Sparks & Hirsh, 1997). Staff development must model constructivist practices for teachers if those teachers are expected to accept the validity and to understand them thoroughly to make them integrate as part of their pedagogy.

As the traditional classroom is changing into new learning environments, the need for teachers to assimilate and modify pre-existing pedagogy, beliefs, and attitudes is imperative for technology to assist with change in education. Technology staff development can assure that teachers are informed with the latest information and technologies available for implementation.

Staff development: a Target for Change

Ellsworth (2001) describes change as in the air for the educational system because of the rapid innovations of emerging technology. Changes in the schools are happening, and none is a better target than the teachers themselves are. Staff development is a powerful vehicle for implementing innovation (Killion, 1999). Change requires many things: skills, new knowledge, attitudes and beliefs. Therefore, staff development based on old principles or constructs will not suffice for technological implementation into schools because the change lies deeper than skill development. Staff development for educators increases knowledge, reinvigorates teaching, and in many cases, inspires change in teaching practices (CEO Forum, 1999).

Rogers (1995) argues that technology is shaped by social factors and is a product of society, and is influenced by the norms and values of the social system. Therefore teachers, future as well as current, must come to determine technology as a highly useful and imperative tool for use in the educational system. Staff development, and more importantly, new technological staff development must be aligned with standards such as, the National Staff development Standards (NSDC), or the National Educational Technology Standards (NETS) and must contain practice and instruction based on newer, more efficient theories (Sparks & Hirsh, 1997).

America is a technology-rich nation. The public school system has a responsibility to provide students with the skills and knowledge employers demand (CEO Forum, 1999). Technology staff development is critical throughout a teacher's career. Teachers, like all professionals, need and deserve ongoing exposure to technology so it

becomes a seamless component of instruction that leads to real results for students (CEO Forum, 1999).

A New Staff Development: Technology Staff Development

Staff development is an innovation. If change processes are to be successful, Roger's (1995) attributes should be presented so that teachers and administrators recognize and accept the components and thus will be willing to implement it more rapidly. Staff development is the key to this process. Currently, staff development has a traditional context to it. By traditional, the delivery mode and content are based in transmission theory and is detached from authentic projects based in the classroom. Bailey and Lumley (1997) define staff development as a process designed to foster personal and professional growth for individuals within a respectful, supportive, positive, organizational climate. Moreover, staff development is designed to have as its ultimate aim better learning for students and continuous, responsible self-renewal for educators and schools. Staff development can also be described as any activity or process intended to improve skills, attitudes, understandings, or performance in present or future roles (Bailey and Lumley). Staff development is not an end in and of itself. Rather, staff development becomes a means to an end, which is connected, to desired outcomes of practice (Sparks & Hirsh, 1997). Staff development has been the "sit-and-get" format, which does not support emerging technological implementation. The findings from the Year 2 CEO Forum (1999) define needed staff development for teachers as an ongoing, long-term commitment that begins with the decision to pursue a career in education and continues, through a combination of formal and informal learning opportunities, for the duration of a career.

Technology staff development can best be defined as the integration of emerging technologies into education through the use of planned, ongoing, and comprehensive approach involving leaders (both administrators and teachers), who facilitate other stakeholders that are actively engaged in acquiring, upgrading, or abandoning knowledge, attitudes, and skills related to technology-based learning environments (Bailey and Lumley, 1997). Technology staff development can incorporate a variety of district goals, including modifications in teacher pedagogy to assist in accepting technology for its value as a teaching tool.

Staff development is a key to school reform (Bailey & Lumley 1997; Killion, 2000; Joyce & Showers 1995; Sparks & Hirsh 1997; Richardson 1994). Staff development is at the center of most reform strategies—without it, such strategies are ideas without an avenue for expression. Therefore, staff development is clearly needed to assist educators in continual growth, which guides school improvement. To be truly professional means to be consistent with an ongoing effort that is never truly completed. Teachers, who feel professionally competent, are empowered to make change. A survey showed that only 20 percent of teachers felt sufficient in their skills with technology (CEO, 1998). Zepeda (1999) describes staff development as what must be done. What is done must be grounded in a carefully conceived and clearly stated sense of purpose and be embedded in core beliefs that are under constant scrutiny by the members of the learning community. Staff development is at the heart of teacher change. Although many educators and policy analyst consider educational technology a vehicle for transforming education only a small percentage of teachers feel they are proficient in teaching with technology (Department of Education, 1998). The goal for implementing technology staff

development throughout a teacher's career is to reach established educational objectives such as enabling teachers to teach better, students to learn better and communities across the nation to improve their public schools.

In a study by Tipton (2001) results demonstrate a relationship between technology proficiency and its impact in the Roswell Independent School District for (1) providing more occurrences of workshops and other training and (2) the teachers are participating in more staff development on technology. The Roswell School District implemented inservice time for teachers and administrators. In total, there were 206 sessions/workshops and/or conferences, 1924 participants, and over 10,000 educator-hours. There was also an increase from 6.1% to 27.7% of teachers used a computer more than 10 hours per week for instructional tool and student tool. An increase in student use of computers was also gauge as a result of teacher proficiency. Therefore, teachers who have technology staff development and have the support to integrate technology into the classroom are far more likely to do so (Sparks and Hirsh, 1997). Overall evaluation of staff development activities by the Roswell School District showed that the most effective staff development effort was the technology support team. The team assisted educators in dealing with project problems and assisted teachers in increasing technology usage in their classrooms. The results of more technological staff development have been (1) an increase in technology use by teachers and their students, (2) an increase in the awareness of technology planning, (3) a belief that the resources necessary for improved proficiency with technology are available, and (4) self-reported proficiency levels have surpassed the goal of the board-adopted technology plan (Tipton, 2001).

Table 2

Steady growth

Year	1992-1993	1993-1994	1994-1995
# of workshops, training sessions, and supported conferences	10	35	195
# of teachers participating in the available session	195	370	1679
Resulting # of staff development hours educators spent learning technology	1993	4415	6826

Table 2 shows that the number of offerings for technology staff development (Tipton, 2001).

Effective Technology for Staff development

According to Sparks and Hirsh (1997), staff development departments have typically reported the number of hours of workshops or courses attended by employees and their satisfaction with those activities rather than noting any changes in on-the-job behavior or effects on students or the organization. Staff development connotes ongoing systematic processing. Fullan (1982) indicates that staff development is " . . . ongoing, interactive, cumulative learning necessary to develop new conceptions, skills, and behaviors" (p. 66). Staff development is concerned with building the climate for growth and success (Zepeda, 1999). Staff development is concerned with personal/process oriented goals. Technology staff development must be of the process orientation as

shown by the diffusion of innovation catalyst. To be effective, staff development programs need to accommodate the program goals of an institution, the target results for students, the level of sophistication of teachers who participate, and the technology available (CEO Forum, 1999). The goal for many institutions is technological implementation; the desires include technological proficiency for student success. Finally, technology must be presented to teachers in a clear and precise way.

Collaboration: Constructing a learning community for teacher's continual development is essential for any school plan. Fullan (1982) suggests that schools with a collaborative work culture manage change better, and that collaborative culture is developed in part through becoming a learning community. Teachers need opportunities to work with colleagues. Teachers need to be part of a larger learning community.

The National Staff Development Council (NSDC) agrees within its recommendation:

- Embed opportunities for professional learning and collaborating with colleagues in the daily schedule of teachers. (25% of teachers' time be devoted to their own learning)
- Recognize the importance of skillful leaders in schools and at the district level who have a deep understanding of instructor, curriculum, assessment, and the organizational factors that affect student learning. (p. 2)

Technology staff development can utilize both of the suggestions by creating learning hubs, or learning centers where teachers can share and discuss new ideas—while developing technology skills and knowledge related to implementing new tools into the classroom.

Reflection. Another component that can increase internalization of information and learning is reflection. In a class of graduate students at Ohio University (The Link, 2000), two groups of students were assigned to journal what they had been learning. The control group was given more direction and strategies for writing. Researchers found that the journal entries of the experimental group demonstrated a higher level of internalization and more practical ideas for ways to use what had been learned. Reflection is a key to constructivism and can be highly effective if used in a setting of staff development.

Planning. Planning is a critical component that can be implemented into staff development models and planning. Making time to collaborate and reflect with colleagues are strategies that should be included. The National Board for Professional Teaching Standards (as sited in The Link, 2000) has five propositions of Accomplished Teaching. First, teachers are committed to students and their teaching. Second, teachers know the subjects they teach and how to teach those subjects to students. Third, teachers are responsible for managing and monitoring student learning. Fourth, teachers think systematically about their practice and learn from experience. Finally, teachers are members of learning communities. The propositions can all be supported by emerging technologies, so technology staff development should embrace and utilize the prepositions for successful technology integration.

Skill Development. One component that has been identified as a major hurdle was the skill element (Tipton, 2001). Teachers lacking the technology skills will be far more nervous and apprehensive for using technology as a tool in instruction. The Roswell School district developed a Technology Resource Team that was structured to provide technical support and resources for teachers. Teachers must perceive the

importance of seeking more skills development and must realize the district's resources as vital and extremely useful. Skill development should be a major focus for technology staff development, since lack of skill is fruition from the pace of emerging technologies. Table three outlines effective staff development characteristics and what Roswell included in their staff development. The connection between what is considered effective and what Roswell included demonstrates one specific plan that was designed. Technology staff development designed in effective characteristics as defined by Zepeda (1999) can be paralleled by the Roswell School District approach. The results were that more teachers used technology in their instruction and delivery because of the increased support, experience, and training that were part of the model developed by Roswell. Vital components, such as, technology resource and support center create a confidence with teachers, and the results are more technology use in instruction and delivery. School wide efforts and district wide plans increase the knowledge that teachers have of technology implementation. If teachers are more knowledgeable about what is expected from them, then teachers can actively collaborate with their colleagues.

A district could combine models depending on the goals and desired results. Models can also be targeted for teacher preferences. From the traditional models, technology-directed goals can be included as part of the staff development. The models can be modified or custom designed to develop technological literacy. What will make a difference is not so much the model, but the standards for technology staff development. The models are only the vehicle to implement change. The standards are what will drive the success.

Table three

Characteristics of effective staff development	Roswell staff development structure
Programs are focused on an individual school-site and linked to school-wide efforts	Technology Resource Team site planning process
Teachers are actively and collaboratively involved, with a focus on a sharing of knowledge among educators and on building teachers-communities of practice	Technology Resource Team site planning process Instituting a regularly scheduled early-release day for technology assistance
The emphasis is on self-instruction, with differentiated learning opportunities	Teachnology Support Center Conference Support Developing and offering a credit course on classroom management for small-group instruction
Methods employed include demonstration (modeling), supervised trials (coaching), and feedback (collective problem-solving), which provide concrete, sustained, and ongoing training over time	Technology Support Center Workshops and Courses Technology Resource Team Instituting additional means of sharing information about technology, such as a technology newsletter, a library of videotaped lessons utilizing technology, and encouraging classroom observations

Ongoing assistance and support is available	through the talent bank process Technology Resources Team Technology Support Center

As shown in Table 3 (Tipton, 2001)

Standards for Technology Staff Development

Standards provide a systematic way of developing and assessing products. Standards are in every aspect of evaluation and should be the guiding factor for designing technology staff development. Standards are what will direct the development of models and structures of technology staff development. The National Staff Development Council (NSDC, 1998) standards are divided into three areas: context standards, process standards, and content standards.

Context standards: The NSDC suggest the following:

- requires and fosters a norm of continuous improvement
- requires strong leadership in order to obtain continuing support and to motivate all staff, school board members, parents and the community to be advocates for continuous improvement
- is aligned with the school's and district's strategic plan and is funded by a line item in the budget
- provides adequate time during the work day for staff members to learn and work together to accomplish the school's mission and goals
- is an innovation in itself that requires study of the change process

Process standards: The NSDC goes on to suggest:

- provides knowledge, skills, and attitudes regarding organization development and systems thinking
- is based on knowledge about human learning and development
- provides for three phases of the change process: initiation, implementation, and institutionalization
- bases priorities on a careful analysis of disaggregated student data regarding goals for student learning
- uses content that has proven value in increasing student learning and development
- provides a framework for integrating innovations and relating those innovations to the mission of the organization
- requires an evaluation process that is ongoing, includes multiple sources of information, and focus on all levels of the organization
- uses a variety of staff development approaches to accomplish the goals of improving instruction and student success
- provides the follow up necessary to ensure improvement
- requires staff members to learn and apply collaborative skills to conduct meetings, make shared decisions, solve problems and work collegiality
- requires knowledge and use of the stages of group development to build effective, productive, collegial teams. (p. 1).

Content Standards. The NSDC concludes with:

- increases administrators' and teachers' understanding of how to provide school environments and instruction are responsive to the developmental needs of students
- facilitates the development and implementation of school and classroom-based management which maximize student learning
- addresses diversity by providing awareness and training related to the knowledge, skills, and behaviors needed to ensure that an equitable and quality education is provided to all students
- enables educators to provide challenging, developmentally-appropriate curricula that engage students in integrative ways of thinking and learning
- prepares teachers to use research-based teaching strategies appropriate to their instructional objectives and their students
- prepares educators to demonstrate high expectations for student learning
- facilitates staff collaboration with and support of families for improving student performance
- prepares teachers to use various types of performance assessment in their classrooms (p.2)

The context standards supply the direction for continuous improvement and can be addressed through technology staff development, which should be ongoing and continuous throughout a teacher's career. The process standards reflect the importance of skills, knowledge, and attitudes that teachers use to foster instruction. Moreover, technology staff development provides a framework for integrating innovations and

relating those innovations to the mission of the school and the vision of the district. Finally, the content standards can guide technology staff development in developing teacher's utilization of emerging technologies to support instruction and to assist in training their students in these technologies.

Characteristics and Rogers Attributes of Innovation

The attributes associated with the diffusion of innovation can increase the rate of diffusion of innovation (Rogers, 1995). The increased rate is a result of availability of relative advantage, complexity, trialability, compatibility, and observability. If the attributes for effective diffusion of innovations are applied to technology staff development, models and characteristics of traditional staff development may be utilized.

Relative Advantage. What are the advantages of changing? Characteristics of technology staff development should clearly demonstrate teacher efficiency, improved instruction, and higher enthusiasm for implementing technology. For example, in the RPTIM Model (readiness, planning, training, implementation, and maintenance), the basic premise is that the local school site is the primary unit of change. Therefore, technology staff development can demonstrate the relative advantage for teachers using technology at a greater rate than non-proficient users. Wilson (2001) shares an example characteristic for a work model that states the learning environments should simulate real-life environments. With technology staff development, teachers and administrators will assess the advantages with increased ease of transfer of knowledge and increase practice into classrooms if the learning environment is similar to real-life context.

Complexity. What is the perceived difficulty? Is the innovation hard to understand? Technology staff development must be conducted in a way that is

supportive, caring, and understanding to the fears and frustrations of teachers. Problem-based learning models can be effective (Zepeda, 1999). The problem-based learning model is ideal for technology staff development. In this model, the adults develop clearly stated objectives, develop their own format for solving the problem, and given time to conduct a solution to the problem. If the context of a technology staff development session is learner-centered with an authentic problem to encounter, then the tools can be developed to assist the teacher in achieving the goals. Of high interest is the fact that in a technology staff development environment, support is provided for the teacher. Another model that can utilize Rogers' (1995) complexity principle is similar to problem-based learning models. The individually guided model (Zepeda) is one that engages teachers in a process of setting learning goals with assistance in developing a plan. During technology staff developments, teachers can hone a systematic approach to problem solving issues that are specific to case scenarios. Moreover, a technology staff developer can connect teachers to others who are working on similar learning ventures. If the support is periodically provided throughout the year, teachers can tackle specific problems and will thus find less complexity in discovering how technology can assist in solutions to various problems.

Trialability. What is the degree of experimentation? Can a person try out the innovation easily? A model that provides a conduit for teachers to become lifelong learners and, to a certain degree, to become action researchers can help teachers share knowledge with other teachers while finding solutions (Zepeda, 1999). The model is a study group/cluster model which provide an opportunity for teachers to focus on a topic that they choose for themselves, study groups help establish relevance for the individual,

and serve to promote peer interaction by providing ore frequent opportunities for that sharing of ideas (Zepeda).

Trialability supports action research. Action research is one type of applied research. Zepeda (1999) provides some benefits for using action research for technology staff development. When teachers collaborate with one another, they can support and provide emotional support—thus, allowing readily accepted change more rapidly because the perceived complexity is diminished due to self-directive perspectives. Action research can also be utilized once teachers develop skills to systematically conduct action research. One cannot overstress the importance of tracking data amidst emerging technologies.

Compatibility. Is there a need for change? Does the existing conditions show a consistency with the innovations? This principle relates to the individual's life situation (Rogers, 1995). The mentoring model can be a highly effective model for technology staff development because technology staff developers can specify case by case teachers and administrators current pedagogy, beliefs, and values. As a result, teachers and administrators can focus on specific steps to incorporate and accept new pedagogical, beliefs, and values and accommodate into pre-existing schemas. Another approach for acceptance of change can be reflection journals and group dialogue. Teachers and administrators can implement reflectivity and self-examine personal beliefs to estimate the most proper beginning of assimilation and accommodation for implementation of technology in education.

Observability: To what degree could the results or uses of the innovation be seen by others? This is probably the most crucial principle of the group. Observability can be

the deciding factor as to how well emerging technologies will continue to become a part of the classroom. Technology staff developers, regardless of model and approach, should have examples and publicity for programs and activities that are successful. Displaying teacher innovations, distributing products with teacher and administrator recognition, and presenting at conferences and various educational organization meetings can bring needed recognition for outstanding innovations for technology use by teachers for students. Technology staff developers can bridge a desire with real, genuine products so that teachers can become inspired and enthusiastic for learning and adopting new ideas for technology implementation.

The main issue for Rogers' (1995) five attributes for diffusion of innovation is simple. Innovations that include the principles have a greater degree for acceptance in a timely manner. Technology staff development, if designed with the principles in mind, can come to be of the utmost value for continued teacher use of technology. The principles can plant the seeds of motivation, interest, and acceptance from the population of gatekeepers to our classrooms.

Conclusion

Technology staff development is needed if teacher's are going to create learning environments that will provide students the skills to survive in the technological world. The concern for traditional staff development is that it cannot support emerging technologies training for effective use in the classroom. Furthermore, traditional staff develop was typically a passive experience for the teacher with an evaluation system being a frivolous approach. Traditional staff development was adequate for transmission theory. However, with the development of emerging technologies, a shift in pedagogy is

essential. Teachers must stay abreast of the rapid changes and research studies that continually shed new light on the profession of teaching. By continuing to expand and develop, teachers can continue to provide to their students what is essential or critical for success in a changing world. Therefore, technology staff development is of great importance for improvement in schools.

Research has clearly defined a path for technology staff development to follow. A path for school districts to follow that will connect current teachers, who were trained in a variety of settings and eras, with emerging information and technical training. The old framework for staff development and the use of technology will not support the sweeping changes that are inundating life in a modern era. A strategic approach to systemic change can increase the inevitable—the inclusion of technology into the classroom as a root, or foundation for learning in the twenty-first century. Traditional staff development, transmission pedagogy, and old constructs of an educational system architected during the early 1900s cannot suffice evolving theories, expanding pedagogues, and emerging technologies. With the endeavors of navigating technology into learning, educators are urged to consider the possibilities. Technology staff development can create learning communities for teachers and administrators to share, collaborate, and discuss approaches and ideas for the inclusion of technology as instructional tools for the classroom centers of the new American century.

Technology staff development to be effective must be designed with more than skills development in mind. What is needed for successful technology staff development is an approach that is deeper than skills development, for skills is only part of the package that teachers must develop. Technology staff development must hit at the root of

pedagogy and should allow teachers to systematically detach from old frames of thought and to be able to incorporate new beliefs, values, and knowledge about the essence of teaching. Piaget's has provides us with vocabulary and direction for the type of change that teachers must encounter. The purpose of schooling must be addressed within technology staff development because technology has the implications to expand the current educational system with the improvements in hardware and the capabilities of connectivity to the Internet.

If heeding Healy's concerns and insights about human development, constructivist research by Becker (2000), and learn from the past as Cuban (1986) implores us to do, a teacher community can develop that is proficient in computer skills, can be knowledgeable of evolving pedagogy, and accommodating of technology beliefs and values. It is then that the American community will continue to strive and thrive on greatness of innovation. The use of technology will be at a degree unknown in quantity today. Technology staff development can provide that avenue for continuing technological innovations by the family of humans for the benefits of advanced living.

References

Bailey G.D. & Lumley D. (1994). Technology staff development programs. New York: Scholastic Inc.

Becker, H.J. (2000). Findings from the teaching, learning, and computing surveys: Is Larry Cuban Right? Unpublished manuscript.

Blackhurst, E. A. (2001). Designing technology professional development programs. In

Brooks, J.G., & Brooks, M.G. (1999). The case for constructivist classrooms. Alexandria, VA: Association for Supervision and Curriculum.

CEO Forum. (1999, February). Professional development: A link to better learning. (Year Two Report). Washington, DC: Author. [online] Available: http://www.ceoforum.org/reports.cfm?RID=2

Crews, T. B. & McCannon, M. (Spring 2000). Assessing the technology training needs of elementary school teachers. Journal of Technology and Teacher Education, 8 (2), 111-121.

Cuban, L. (1986).Teachers and machine: The Classroom use of technology since 1920. New York: Teachers College Press.

Dockstader, J. (1999). Teachers of the 21st century know the what, why, and how of technology integration. T.H.E. Journal, 26(6), 73.

Dewey, J. (1939). Intelligence in the modern world: John Dewey's philosophy John Dewey. New York, Teacher College Press:

Ellsworth, J. B. (2001). Surviving change: A survey of educational change models. Syracuse, NY: Information Resources Publications.

Fosnot, C. (1992). Constructing constructivism in T.M. Duffy & D. H Jonassen, (Eds.) Constructivism and the technology of instruction. Hillsdale, NJ: Lawrence Erlbaum Associates.

Fullan, M. (1982). Meaning of educational change. New York: Teachers College, Columbia University.

Healy, J. (1999). Failure to connect. New York: Touchstone.

Joyce, B & Showers, B. (1995). Systemic change in professionalism for educators. White Plains, NY: Longman Publishers.

Killion, J. (1999). Design staff development with student needs in mind. (April, 1999). NSDC [on-line]. Available: http://www.nsdc.org/library/resuls/res4-99killion.html

Moursund, D. (2000). Roles of IT in improving our educational system. Learning & Leading with Technology, 28, 4.

Ratner, Joseph. Title: Intelligence in the modern world: John Dewey's Philosophy. New York: The Modern Library,1939.

Richardson, V. (1994). Teacher change and the staff development process. New York: Teachers College Press.

Sparks, D & Hirsh, S. (1997). A new Vision for staff development. Alexandria, VA: ASCD.

Strommen, E. F., & Lincoln, B. (1992). Constructivism, technology and the future of classroom learning [on-line]. Available: http://www.ilt.columbia.eduk12/livetext-nf/docs/construct.html

Technology Purchasing Forecast report, Quality Education Data [on-line]. 1998-1999. Available: http://www.ceoforum.org/reports

Thorburg, D. (1998, June). Reading the future. Electronic School, 12, p.21.

U.S. Department of Education, National Center for Education Statistics. (1998, March). Internet Access in Public Schools, March 1998.

Rogers, E. M. (1995). Diffusion of innovations (4th ed.). New York: The Free Press.

Tipton, P. (1997). Evaluation of staff development efforts to impact acceptance and use of technology in Roswell ISD. Technology Staff Development [on-line]. Available: http://www.roswell-usa.com/risd/techeval.html

Uchida, D. (1996). Preparing students for the 21st century. Arlington, VA: American Association of School Administrators.

Zepeda, S. J. (1999). Staff development. Larchmont, NY: Eye on Education, Inc.