Chapter 2

REVIEW OF RELEVANT LITERATURE

Schools and school districts are often seen not as dependent upon one another, but rather interconnected in a web of supportive relationships with the district office, other schools and the community. This web closely resembles the ecological qualities of interdependence, network patterns, cooperation, partnerships, flexibility and feedback loops; qualities that are elements of constructivist learning for both teachers and students (Lambert, Walker, Zimmerman, Cooper, Gardner & Slack, 1995). These elements will be the cornerstones for a resource book for SUSD teachers in grades four through six. The purpose of this resource book will be to assist teachers to integrate technology using computer-assisted writing, including word processing, as they teach the district's adopted Language Arts curriculum. The resource book will also serve as an essential strand in the web of SUSD district office, school sites and community.

In the 1997-98 instructional year, Stockton Unified School District adopted the Harcourt/Brace's Signatures language arts instructional materials for grades K-6. The publishers recommended several computer software programs, including the Amazing Writing Machine and the Ultimate Writing and Creativity Center, to enhance student writing and provide additional support for skill intervention and enrichment.
The California Instructional Technology Clearinghouse rated eighty-five word processing programs as exemplary, highly recommended or desirable (California Department of Education, 1997). Only thirty-four of these programs published since 1995, including the Amazing Writing Machine and the Ultimate Writing and Creativity Center, received exemplary evaluations.

Teachers do not always have the time and/or the knowledge to adequately evaluate these programs and develop lessons appropriate for their students' needs.

Even the most motivated teacher would be hard pressed to find resources for integrating the writing process, Signatures and the word processing programs. Neither the Schools of California On-line Resources for Education: Language Arts, http://www.sdcoe.k12.ca.us/SCORE/cla.html, nor Harcourt/Brace, http://www.hbschool.com/, provide resources for teachers to effectively integrate the Amazing Writing Machine and the Ultimate Writing and Creativity Center with Signatures. A review of the literature yielded no studies or projects that integrated the writing process, Signatures and the word processing programs.

The temptation to use graphically attractive and appealing drill-and-practice software is hard to resist. Easily managed by the classroom teacher, many of these programs can be loaded into a machine and students can manipulate the programs and be rewarded and corrected without the assistance or interaction from their teacher. Teachers without proper training on the integration of software might find this appealing. The teacher can offer technology to their students and believe that the students' needs are being met. However, Vygotskian theory asserts that while it is only possible to teach children what they are able to learn, instruction should be tailored to what children can achieve with assistance (Vygotsky, 1962). Additional research indicates that children's attention span, memory and thinking are enhanced when adult involvement and assistance are present (Samaras, 1997). Children need to be able to have the opportunity to make choices, such as selecting the appropriate word in a spell check or thesaurus list. This is how they become problem solvers. Children do not have the opportunity to learn from their mistakes if they are engaged in software that only lets them know if they made a correct or incorrect selection, because they will not understand why their choice was incorrect. They only know that they made an incorrect selection. Additionally, drill-and-practice software does not include creative activities such as composition.

This review will be divided into four sections: (a) the effectiveness of computer- assisted writing in the language arts curriculum, (b) theories on the different styles of learning, (c) theories about teachers as learners, and (d) teachers and technology training.

The Effectiveness of Word Processing Programs in Teaching the Writing Process

While studies have shown that children write more and tend to edit their work more when using computers for writing, those same studies show that just the use of the word processing programs does not actually improve the writing skills of the students (Yau, 1991). It is important to remember that computers and word processing programs are tools that support the existing curriculum while helping students become more productive and effective learners (Merrimack Education Center, 1986). Word processing programs do not improve student writing in and of themselves. Student writing improves only when word processing programs are combined with process writing instruction and effective teaching. In addition to the exposure to word processing programs, teacher intervention accompanied by new strategies for teaching the writing process is crucial (Yau, 1991). The teacher's role of both instructor and facilitator remains critical to improved student writing. It is important to keep in mind that word processing programs can neither teach nor evaluate writing content. Teachers and students must work together to achieve good writing skills (Piper, 1987). Effective instruction is critical for students to become competent writers (Heibert, 1989).

A review of the literature yielded only one study that specifically addressed the use of word processing programs and the writing process for fourth- through sixth –grade students. Apple Computers of Tomorrow (ACOT) research conducted in 1989 specifically addressed the benefits of using word processing programs with students in

grades K–12 and reported on the benefits of word processing with fourth- through sixth– grade students. The study indicated that: (a) the quality of instruction, not merely the access to computers, is the more significant factor in learning to write; (b) students maintained a level of enthusiasm, comfort, and persistence that was seldom seen when they had to write by hand to plan, draft, and revise their writing; (c) writers were much more willing to share their work when they had legible, computer-produced text on their screens and on the printed page; (d) students wrote more and better when they used computers for their daily writing activities and; (e) low-achieving students demonstrated significant improvement in the quantity and elaboration of their writing (Hiebert, 1989).

Other research has implications on the effect of word processing and the writing process although it does not specifically address grades four through six. Borthwick (1993) reviewed forty-one research studies completed between 1929 and 1983 that investigated the effects of typewriting and word processing on the development of elementary school students' language arts skills, including writing. The collected evidence revealed the greatest positive effect on the development of writing skills was when students used a word processor. The study concurred with the ACOT finding that writing skills improved because students using word processing typically spend more time writing (Baker, 1990). A review of the literature yielded twenty-three studies conducted between 1988 and 1997 on the use of the technology and language arts. None of these studies refuted Borthwick's conclusions.

The California Instructional Technology Clearinghouse gave exemplary status to thirty-four writing programs published since 1995 for fourth through sixth graders. At the same time, only the ACOT research discussed above focused on the implementation of writing programs for students in these grades (Heibert, 1991).

As indicated by research findings, the most beneficial use of technology in language arts is in teaching the writing process (Borthwick, 1993). Research has shown

that when students use technology, specifically computer word processing programs to write, they work faster and write more (Liechty, 1989). Students' work tends to become longer and more detailed (Borthwick, 1993). The more students write, the more practice they get and the more proficient they become (Liechty, 1989). Students can learn the rules of language structure and grammar with the assistance of tools such as the spell check and the thesaurus. It is in this way that they can become independent learners, not relying on the teacher to always have to check their work (Coley, Cradler & Engle, 1997). Revising and peer editing become easier and more productive for students (Heibert, 1991).

The review of research by Anna Leichty on the use of word processors in the teaching of writing cited above showed that there is strong evidence that children using word processors spend more time on writing, monitor their work more often than those who do not, and are more likely to work collaboratively than students who did not (1989). Because the computer makes it easier for students to edit their written work, they are more willing to do so, improving the quality of their work. Studies have also found that students are more comfortable and adept at critiquing and editing written work when that work is shared with other students over a network. The work shared with other students tends to be of higher quality (Coley, et. al., 1997). Students are more willing to share their work with their peers and cooperate in peer editing and review when they had legible, computer-produced text on their screen and on the printed page (Heibert, 1989).

Research, reported by Hiebert as part of the Cupertino Apple Classrooms of Tomorrow (ACOT) project, indicated that students who used a computer during the writing process maintained a level of enthusiasm, comfort, and persistence seldom seen by students writing, revising and drafting by hand (1989). A 1987 study done in Toronto, Canada public schools revealed similar results. Ninety teachers and 180 students in grades one, three, and six were divided into three control groups and three

experimental groups by grade level. At the end of a six-month period, the findings showed that the children who used computers for writing increased and improved their writing skills (Larter, 1987).

Spell checkers and thesauri assist students engaged in writing tasks by providing them with cues and options from which the students can select. The decision is still in the hands of the student and not relinquished to the technology. This frees the student up to think about the content of their writing. A study done by Janice Adele Meyer showed that spell checkers have no negative effect on student performance. While spell checkers have not been shown to significantly increase student achievement on standardized tests, scores indicate that poor spellers made larger gains in spelling achievement than did average or good spellers when a spell check tool was utilized with student writing (1987).

Theories on the Different Styles of Learning

While research supports the use of word processing to improve student performance (Borthwick, 1993; Leitchy, 1992; Merrimack, Educational Center, 1993), the programs do not operate in isolation. As with all good teaching, the use of technology needs to be linked to the appropriate learning styles.

Traditionally, intelligence has been defined as that which focuses on the capacities that are important for the success in school, mainly linguistic symbolization and logical-mathematical symbolization (Gardner, 1995). These are the areas most easily assessed through short-answer tests. Howard Gardner defined intelligence as the capacity to solve problems or to fashion products that are valued in one or more cultural settings, and provided a detailed set of criteria for what counts as human intelligence (Gardner & Hatch, 1989, p. 5). The areas of intelligence defined by Gardner are not easily assessed by short answers. They are more accurately assessed

through performance that includes paragraph and essay assessment, the kinds of performances accessed within the writing process.

Learning styles affect the way teachers and students receive and process information. The work of Gardner identifies three required conditions for the development of a particular type of intelligence: a) the opportunity to learn; b) that society values the development of the intelligence; and c) the individual values the developing intelligence (Reiff, 1997, p. 302).

The constructivist approach to learning compliments the multiple intelligence approach by identifying a variety of learning modalities addressed by teachers to help students gain an understanding of the writing process using technology. Debra Walker (cited in Lambert, et al., 1995), stated that the basic principles of constructivism suggest that: (a) learning is an active rather than passive process; (b) learners gain more knowledge when they share ideas and problem-solve together; (c) learning must be based on individual and shared experiences; and (d) the reflection of new knowledge is necessary for creating sense of new information. New learning is gained through values, beliefs and by prior experience (Lambert, et al., p. 171).

These four principles of constructivism align themselves to Gardner's Multiple Intelligences. Principle (a) above, that learning is an active rather than passive process, parallels Gardner's linguistic, spatial and kinesthetic intelligences. Principles (b), (c), and (d) align themselves with the interpersonal intelligence. The gaining of information is strengthened through communication and collaboration with others.

Combining word processing with teaching the writing process allows students to use active learning (Willis, Stephen, & Matthew, 1996). The opportunity to manipulate keys on the keyboard, move text and add artwork enhances the use of kinesthetic, visual and spatial learning styles. Collaborative work and peer editing also encourage both interspective and introspective skills (Armstrong, 1994).

Theories about Teachers as Learners

It is the opinion of Jerome Bruner and Lev Vygotsky, two of the original constructivist theorists, that the process of knowing is influenced and shaped by reflection, meditation, and social interactions. They wrote that learners construct meaning from personal values, beliefs, and experiences. Knowledge exists within the learner (Lambert, et al., 1995).

As the technological awareness of teachers increases, they continue to build on their competency skills and their ability to effectively integrate technology into their curriculum. As teachers receive more training and information, they begin to prioritize what they would like to gain from their new knowledge and how they will reorganize their instruction to include technology (Sandholtz, Ringstaff, & Dwyer, 1996). Because technology is a new area of personal professional development, teachers often revert back to the role of a novice learner with no prior experiences to draw upon. This gives teachers an insight into how their students process new information because they have to rethink how they learn new concepts and what motivates them to learn. These insights cause them to rethink their own teaching strategies and their role in the classrooms (Caverly, 1997, p. 58).

One strategy for developing technology integration skills in teachers is helping them to create an awareness of how technology integration works. Teachers need to see first-hand how the implementation of technology into the curriculum can enhance student learning. The 1995 Office of Technology Assessment (OTA) study found that helping teachers learn how to integrate technology into the curriculum might be one of the most critical factors for successful implementation of technology application in schools (Baker, 1989). The OTA suggests taking a new approach to staff development. Rather then retain the familiar model of receiving information from

"experts" in training sessions, teachers can be connected to technology in more constructivist ways. Staff development could include: action research, conversations with peers, reflective practices and projects (Coley, et.al., 1997).

The classroom visit, one strategy for observing implementation, has a major drawback. Cornelia Bruner describes the reluctance teachers often feel about opening their classrooms to the scrutiny of their peers (1992, p. 5). Teachers often feel intimidated by having peers observe and coach them. The resistance of peer evaluation can be overcome with a variety of strategies. The OTA study recommends: training master teachers, the establishment of model schools or classrooms where applications can be developed and shared, training administrators, establishing teacher technology resource centers, and delivering interactive staff development using a satellite and the Internet (Coley, et. al.,1997, p. 45).

One of the main challenges of integrating technology into the curriculum is breaking through barriers that are in the minds of teachers. These are often deeply held beliefs about learning and the efficacy of different instructional activities. Additionally, teachers often view technology as an add-on to a curriculum already crowded with priorities (Sandholtz, 1997).

Project CHILD, Computers Helping Instruction and Learning Development, demonstrated that by encouraging teachers to experience the different elements of the basic principles of constructivism, they enjoyed more success when implementing technology in their curriculum. This five-year investigation of nine Florida elementary schools, which began in 1987, involved both technology and the implementation of a team environment among teachers. Three to six computers were placed in each classroom. Teachers received training, which included not only the technological aspects of the program, but also emphasized the establishment of a team environment. The project called for a unique synthesis of effective practices, student interaction and a new classroom organizational structure for elementary students. The key finding

from the study concluded the Project CHILD had been an effective method of teaching students (Coley, et. al., 1997). The following section examines these studies as they are put into practice within teacher training models.

Teachers and Technology Training

Only fifteen percent of California's teachers have had at least nine hours of education technology training (Coley, et al.,1997). This is not enough to use technology effectively in their teaching. Examples of successful implementations of technology in the classroom indicate that teachers learning how to integrate technology into the curriculum require intensive professional development and support. This appears to be a critical factor for the successful implementation of technology applications in schools. Project CHILD (Butzin, 1992) and Helgate Elementary School in Missoula, Montana (Whitehead, 1993) are successful examples of programs that support teacher empowerment with technology training. These models feature teaching teams, peer coaching and staff development.

Modeling successful technology integration is more successful than simply teaching the process (Brunner, 1992). The National Staff Development Council tells us that rather than receiving knowledge from experts, teachers "should have the opportunity to collaborate with peers, researchers, and students to make sense of the teaching and learning process in their own contexts" (Coley, et al., 1997).

" Insufficient teacher staff development remains a major obstacle to the successful implementations of advanced technology applications in California's

schools and insufficient technical support for teachers limits their ability to use technology on a regular basis and use it effectively" (Rockman & Weiler, 1997, p. 4).

In a statewide study of education technology in California, three major problems were identified: (a) student access to technology is inadequate, (b) many teachers do not have the professional development or technical support they need to use technology effectively, and (c) technology is rarely integrated into curriculum and instruction (Rockman, et al., 1997). The need for effective technology staff development is not unique to California.

Only one-third of the nation's teachers have had as much as ten hours training in computer applications and this training is mostly in the form of one- day workshops (California Department of Education, 1996). This report emphasizes the need for more technology training for teachers. However, effective professional development must be ongoing and provide one-on-one support. Occasional workshops are not enough (Zehr, 1998). Workshops should be offered throughout the school calendar year, giving teachers an opportunity to choose a time and day when it is most convenient for them to attend. Workshops also should offer a variety of skills and varying levels enabling teachers to choose workshops that address their needs. It is recommended that districts set aside a minimum of 25 percent of the technology budget for the purpose of staff development (Lee, 1996).

Once teachers become comfortable with technology itself, additional staff development and ongoing support increase their confidence and their abilities. During an Apple Classrooms of Tomorrow (ACOT) study, researchers discovered that when technology is integrated into the curriculum and not taught as a separate subject, teachers are less concerned about the curricular tradeoffs and both teaching and learning becomes enhanced (Sandholtz, et al., 1997). Teachers often adopted more of a constructivist role in their classroom, even if they had not previously used this practice. The classrooms became more learner centered.

The fact remains that we must provide more and better professional development for educators in the area of technology. While researchers strongly advocate that teachers increase their constructivist approach to learning, opportunities for teachers to learn just how to do this are rare. Most staff development is lecture driven and offers very little opportunity for teachers to interact with the new information or with one another (Sandholtz, et. al., 1997). The most important staff development is the kind of staff development that allows teachers opportunities to explore collaborate and engage in active learning. Principals who attended part of the training provided by the ACOT staff returned to their school sites pledging to: (a) provide time for teachers to plan together and to reflect on their practices; (b) give recognition to team efforts; and (c) ensure that teachers had ample time to develop curriculum objectives that promote team teaching (Sandholtz, et al., 1997).

Jessica Siegel, in her article "The State of Teacher Training," listed the eight key elements and benefits of exemplary technology staff development: (a) local staff members are used for workshop support; (b) teachers have easy access to the technology they were trained on; (c) teachers are primary trainers of teachers; (d) training is tied directly to classroom/curriculum/school reform objectives; (e) a minimum of 25 percent of the technology budget is set aside for staff development; (f) learning to use technology is required, not voluntary; (g) site and district administrators need to participate in all staff development; and (h) time for technology staff development is integrated into teachers' work schedules (as cited in Lee, 1996, p. 13).

It is within the power of each school district to support its teachers and supply them with the tools that they will need to successfully implement technology into the classrooms. Investments in educational technology will fail to provide a return if schools do not use it well. Teachers must be given sufficient and rich opportunities to learn to use it in productive ways (Jerald, 1998). Critics of the use of technology warn of using technology just for technology's sake. Drill and practice teaches certain

things to certain kids, but getting them to think is not one of them (Trotter, 1998). The argument of whether or not to bring technology into the classroom is almost a moot point. It seems to be a given these days that soon every classroom will have one or more computers. Where the challenge for educators lies is how to use the technology to enhance student learning. The question now is how can we use it (technology) to help young students acquire literacy that is more hospitable to dialectical discourse? (Burniske, 1998).

Jane M. Healy spent over two years visiting classrooms and homes to observe the ramifications of technology use. She reported that what she saw was not encouraging. Some of her findings included too many ill-informed software choices; inadequate teacher preparation; children engaging in idle clicking, game-playing, and silly surfing; lack of relevance to curriculum; expensive equipment obsolete or ill-used, to name just a few (Healy, 1998).

During one ACOT project, teachers used technology in a lecture drill-and practice-style. Then they gradually changed their patterns to include more dynamic experiences for children. At least 70% of the teachers said they had moved to using more interdisciplinary content giving students more opportunity to review and revise their work, work cooperatively with their peers, and most important, to become reflective about their work (Zehr, 1998). What researchers found was that technology itself does not improve teaching. Schools and districts that provide teachers with equipment, training and support will see results through technology-rich curricula where both teachers and students are focused on learning (McDaniel & Umekubo, 1997). Robert Price, a New Haven Connecticut education consultant, states "Technology integration is not just about picking a good piece of software. It's about good practices in the classroom" (Zehr, 1998).

If we are to successfully prepare our students for the future, we must learn to integrate technology into the school curriculum and instruction. In order to do this,

teachers must be given ample opportunity to receive quality training, coaching, and most importantly, time to reflect on and revise their instructional practices. It is critical that these elements be in place if teachers are to improve student achievement and prepare their students for higher education or the workforce of the future.

In order for the resource book to be fully implemented and successfully used by the intermediate teachers, the authors make the following recommendations:

1. All district Language Arts staff development activities address the integration of technology into the content areas for all students.
2. A cadre of technology coaches be established to provide on-site support and advice for teachers integrating technology into the writing process.
3. The school district encourage intermediate teachers to gain additional training and expertise by joining and participating in professional organizations such as Computer Using Educators.
4. The district set aside at least 25 percent of its technology budget to provide staff development in the area of curricular integration.
5. The district curriculum department work with the research department on the design and implementation of an assessment which studies the effectiveness of the use of computer-assisted writing when used with language arts instruction.
6. Further research should be carried out to measure the effectiveness of the use of computer-assisted writing programs in the writing achievement of intermediate students.

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