**Practical Considerations for the Implementation of
Keyboarding Instruction in the Elementary School**

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Once a novelty, computers are now commonplace in society both at home and at school. Samuelson (2002) reported that by 2000, public schools had approximately one computer for every four students. A national report (National Center for Educational Statistics, 2003) suggested that most elementary schools in the nation have computers available in the classroom. As a result of increased spending on technology, most students in the state of Georgia have access to at least one computer and word processing application in their classroom. According to the State Technology Inventory Survey (Georgia Department of Education, 2005a), in 2003 Georgia schools had more than 200,000 classroom computers for student use. Additionally, there were more than 100,000 student computers located in school labs and media centers throughout the state of Georgia.

With an abundance of personal computers available for use at the elementary level, it is common for students to be introduced to instructional games and activities on the computer as early as kindergarten. Often, students are introduced to word processing applications as early as third grade in order to complete projects and other assignments. In my personal experiences as a local school technology coordinator, it seems that the production of school work on the computer is often motivating to students and results in more polished work. However, one of the biggest drawbacks that teachers face when having students' complete assignments and projects on the computer is their lack of keyboarding skills. A typical fifth grade student may need forty-five minutes or longer to type a one page paper. For most students in elementary school, writing a paper is more time efficient than typing one on the computer. Many experts believe that keyboarding skills should be taught at the elementary school level (Davison & Kochmann, 1996; Jackson & Berg, 1986; Kisner, 1984; Nieman, 1996; Sormunen, 1991). Nieman (1996) voiced the opinion that if students are to function productively in our computer driven society they must be trained very early in proper keyboarding techniques.

The purpose of this literature review is to present information concerning the more practical issues related to keyboarding instruction in the elementary school setting, Although some of the current review is based on experimental studies in the area of keyboarding instruction, much of the discovered literature in this area was found to be opinion statements by professionals in the field of education and keyboarding instruction. This review begins with an introduction to keyboarding followed by a review of professional opinions on keyboarding instruction in elementary school. Practical considerations related to elementary keyboarding instruction are considered in the next section. The review concludes with a summary of findings related to the status of keyboarding instruction in the elementary school setting.

Keyboarding Introduction

Most of the early studies (1930s-1950s) presented in this review involved work with typewriting and typewriting skills as opposed to computer keyboarding skills. The early research related to the benefits of keyboarding was in actuality performed with typewriters and studied the benefits of working with typewriting activities as opposed to keyboarding activities. Several studies involving typewriting instruction with elementary students are discussed in this review. Keyboarding, as a skill, is typically discussed in terms of working on a computer. With the introduction of the personal computer in the educational setting, interest in the area of keyboarding skills in elementary schools increased significantly. Bartholome (2003) defined keyboarding as the act of placing information into various types of equipment through the use of a typewriter-like keyboard. Erthal (2003) defined keyboarding as the manipulation of the computer keyboard by touch. For all practical purposes, keyboarding is thought of as the ability to input data (letters) into a specific software application via a keyboard.

Shuller (1989) suggested that there are three levels of keyboard skills, the "hunt and peck" method, pecking without much hunting, and the "touch type" method. The hunt and peck methods require the typist to look at the keyboard at all times in order to locate specific keys. By contrast, the typist using the "touch type" method of keyboarding rarely looks at the keyboard and positions the hands on home keys using each finger to touch specific keys according to the slant of the keyboard. Individuals using the "hunt and peck" method of keyboarding typically produce words at a much slower rate than individuals that use the touch typing system. Since there has been no kinesthetic learning of the key locations, "hunt and peck" typists use time in searching for each key. Waner, Behymer, and McCrary (1992) suggested that the "hunt and peck" method results in slow keyboarding speeds because it requires conscious attention to what the fingers are doing. When copying information from written materials, which is often the situation for elementary aged students, the reduced speed produced by using the hunt and peck method becomes even more profound. In this situation, Kisner (1984) stated that the hunt and peck method of keyboarding "requires looking back and forth from copy or instructions to the keys, searching for the right keys, then looking at the screen and back to copy" (p. 21). The constant readjustment of the eyes results in a great degree of inefficiency. On the other end of the spectrum is the touch typing method of keyboarding. Dennee (1989) defined "touch typing" as control and use of the keys without looking at the keys. An individual trained in this system of keyboarding typically produces words on the keyboard at a much greater rate than someone utilizing the hunt and peck method. The increased ability to produce words results in a more efficient use of time at the computer. Wetzel (1985) suggested that increased efficiency in keyboarding skills allows students to concentrate on problem solving or composing, rather than on the process of finding letters on the keyboard.

Professional Opinions on Keyboarding Instruction in Elementary School

Historically, typewriting and keyboarding have been a component of the secondary business school curriculum (Toppe, 1991). As the number of computers in the

elementary school setting has increased, there has been increased discussion on the role of keyboarding skills in the elementary school setting. Educators have expressed differing opinions related to the appropriateness of keyboarding instruction at this level. Areas in which opinions differ include whether "touch type" keyboarding should be taught at the elementary level as well as why, how, and who should teach it. Through the years, proponents of keyboarding instruction at the elementary level have applauded many benefits of working on a typewriter/keyboard. One of the most obvious benefits of acquiring keyboarding skills at an early age is the ability to utilize a computer in a more effective and efficient method as a result of being able to produce words on a keyboard at a faster rate. To effectively use the computer for writing purposes, a student should be able to keyboard at least at the same rate that he or she can write (Shuller, 1989). At least one author (Pisha, 1993) suggested that keyboarding requires less physical and cognitive demands than handwriting and should be taught before handwriting. Troutner (1983) commented that learning to efficiently keyboard at an early age removes one of the main obstacles that children encounter when using a computer. Similarly, Wetzel (1985) stated that students with adequate keyboarding abilities possess a greater ability to concentrate on matters involving problem solving and composing rather than on the mechanics of typing. Wetzel suggested a speed of 10 words per minute as an adequate keyboarding speed for an elementary age student.

Waner, et al. (1992) shared the opinion of many business educators that elementary students should receive keyboarding instruction in order to prevent development of inefficient keyboarding skills. Similarly, Nieman (1996) commented that it is important to master the process of touch typing at an early age so that bad habits related to the "hunt and peck" method are avoided. As with any motor skills, it seems logical that once inappropriate habits develop, they are difficult to break. Bartholome (2003) quoted Wayne Colahan's thoughts from 1935 that to "allow students to typewrite without method is to build up faulty habits of typewriting that will later have to be broken down before the touch system can be taught" (p. 2). Some researchers (Kahn & Freyd, 1990) do not believe the "bad habits" theory is an appropriate reason to teach keyboarding at the elementary school level. These authors have questioned the difficulty of unlearning bad habits. They point out their experiences with many students who successfully learned to touch type in high school after years of utilizing the "hunt and peck" method of keyboarding and suggest that it only takes twelve hours of formal keyboarding instruction to undo any bad habits that have developed previously. Kahn and Freyd have argued that the teaching of the touch typing method to elementary age students is an "exaggerated response to children's unfamiliarity with keyboards and is developmentally inappropriate" (p. 1).

Some researchers believe that students should receive keyboarding at the elementary level not for the prevention of incorrect keyboarding habits, but for the academic benefits that keyboarding and keyboarding skills enable. Nieman (1996) suggested that with the advent of the Internet age, it is important for students to be able to access, sort, learn, write, and communicate rapidly at an early age. Early researchers (Krevolin, 1965; Rowe, 1959; Wood & Freeman, 1932) suggested that the process of typing in itself is associated with positive academic benefits in a variety of subject areas. Many of these early studies focused on the academic benefits associated with using a typewriter instead of increased speed resulting from typing instruction. In fact, Wood

and Freeman (1932), a study often cited as one of the landmark projects in this area, did not offer formal instruction on how to efficiently use the typewriter, but rather let their research subjects use the "hunt and peck" method of typing. Wood and Freeman demonstrated with a large sample group (N=14,949), that those students who participated regularly in a typing class achieved greater gains in all subject areas than those students who did not participate in the class. Similarly, Rowe (1959) demonstrated reading and vocabulary gains in third and fourth graders (N=24) who participated in a typing program versus those who did not participate in the program.

Just as there are proponents of teaching keyboarding at the elementary level, there are those who believe keyboarding should not be taught at this early level. Reasons for this train of thought focus mostly on child development and logistical issues. Fleming (2002) suggested finger size, manual dexterity, coordination, fine motor skills, and attention as all being developmental issues to consider when deciding if and when keyboarding instruction should be offered to elementary students. Kahn and Freyd (1990) pointed out that the prescribed reaches of touch typing were designed for adult hands and are not appropriate for children. Another child development issue that may affect keyboarding instruction is the motivational level of the young student. Nichols (1995) stressed in her discussions that third graders involved in her study were developmentally ready for keyboarding lessons, but that they posed a much greater challenge than older students (4th-6th grade) in terms of motivation and focus on keyboarding lessons. Motivational level is an important factor that must be considered when determining at what age/grade keyboarding instruction should begin. Sormunen (1993) supported the belief that keyboarding teachers have long held, that a student's persistence is an important factor in learning how to keyboard. In her study, which focused on learning styles, she reported that "the one learning style factor that related to keyboarding achievement was persistence" (p. 37). Persistence requires the ability to deal with failure. Without the ability to deal with failure, which many elementary students do not possess, keyboarding instruction and practice may not be successful. Similarly, in a study involving fifth and sixth grade students (N=25), Wronkovich (1988) commented on the reduced motivational level over time for students participating in keyboarding instruction. The author noted that after the second week of keyboarding instruction, the newness of the keyboarding instruction greatly diminished and by the third week "the tedium of drill and practice become apparent" (p. 44). Olinzock (1998) was of the opinion that there was not enough time in the already full elementary curriculum to offer appropriately designed keyboarding instruction. There is little doubt that available time is one of the main barriers that has to be overcome in order to implement a successful program of keyboarding instruction at the elementary level. Kahn and Freyd (1990) stated that it is often difficult for teachers "to find thirty to forty-five minutes, three times a week for six weeks in the elementary school schedule" (p. 43) to offer keyboarding instruction. According to Kahn and Freyd, this is the amount of time that is recommended for minimum mastery of keyboarding skills.

Practical Implications

Many practical considerations must be addressed when planning for keyboarding instruction. Among professional educators a variety of opinions and questions exist related to the issue of keyboarding instruction (Waner, et al, 1992). Who? What? When? Where? Why? These are all questions being asked by interested professionals (Nieman, 1996). The following section will elaborate on some of these questions and review professional opinion on this topic.

Touch Typing Instruction vs. Familiarity

There are professionals in the field of keyboarding instruction who believe that an appropriate level of keyboarding speed can be developed without any form of instruction or practice (Olinzock, 1998). This belief has sparked debate as to whether or not students at the elementary level should be trained in the touch method of typing or simply be given enough time on the computer so that they become more familiar with the locations of the letters on the keyboard. Shuller (1989) stated that proponents of this familiarization approach believe that students have the ability to type quickly enough to facilitate their writing without learning to touch type. In an article that argued against the teaching of touch type methods to elementary students, Kahn and Freyd (1990) discussed findings from two personally administered research projects: "Microcomputers in Writing Development" and "Cooperative Writing in Computer Environments." In both of these projects, the authors utilized repeated observations to assess student experiences. The former project examined the word processing and writing experiences of ten classes of kindergarten through fourth grade students over a three year time period, while the latter project involved the teaching of word processing to fourth and sixth grade students without any formal keyboarding instruction. Based on their findings from these projects with elementary students, Kahn and Freyd (1990) stated that students "became familiar with the keyboard as they wrote, and the more they wrote, the more familiar they became" (p. 42). Through keyboard familiarization activities, these authors demonstrated average increases in keyboarding speed from six to eleven words per minutes without any formal keyboard instruction. The increased keyboarding speed of the students resulted from one hour per week of word processing over a seven month period. The authors suggested that this attained speed of 11 words per minute was sufficient for students to work within word processing programs without being negatively affected by their keyboarding skills. In contrast to these opinions, Pisha (1993) commented that although it is accepted that faster keyboarding will develop spontaneously with regular computer use, it is his belief that most students are not provided enough time on the computer to develop adequate skills. Pisha goes on to express the opinion that some instruction in the touch typing method is desirable so that the student can begin to learn the process. However, it is the opinion of Kahn and Freyd that the teaching of touch typing as opposed to the familiarization approach introduces children to a new set of problems for which there is no need.

Program Design for Elementary Keyboarding Instruction

   If and when it is determined by a school that keyboarding instruction in the touch type method should be provided at the elementary level, there are several questions that need to be addressed. One oft asked question is "At what age or grade level should keyboard instruction begin?" Among educators there is quite a bit of disagreement on this point. Historically, the role of teaching keyboarding skills has fallen upon business education teachers at the middle and high school levels. However, some experts believe that keyboarding skills should begin before those skills need to be applied for some type of project. Dennee (1989) voiced the opinion that keyboarding instruction should begin one grade before the students become extensively involved in keyboarding applications. Erthal (2003) suggested that students should receive formal instruction in the touch system of keyboarding before they begin to use the computer for anything more than single key responses.

   Several researchers have suggested that it is appropriate to teach touch typing in the early elementary grades. Dennee (1989) suggested that eight and nine year olds have the necessary eye-hand coordination and reading skills to be successful in keyboarding. Other professionals believe that keyboarding skills should be postponed until at least the upper elementary grades. After an "exhaustive review of the literature" MacIntyre (1990) concluded that fifth or sixth grade is an appropriate level at which to introduce keyboarding instruction. Bartholome (2003) pointed out that some authors have suggested fifth grade as the ideal time to learn keyboarding, but he went on to state that "fifth grade may be too late because there may be too many bad habits already engrained" (p. 2).

   Several variables relate to the amount of total time that should be committed to keyboarding instruction at the elementary level. These variables include number of minutes per day, days per weeks, and total days of instruction. It seems logical that the more instruction that is provided to the student, the more improvement that will be seen in keyboarding skills, but the developmental level of the elementary child must also be considered. Teaching elementary age students how to keyboard should not be approached in the same manner as teaching the same skill to middle or high school students. Nieman (1996) stated that elementary students do not have the attention span for the drill and practices techniques that have traditionally been used to teach keyboarding skills to older students. Citing feedback from ongoing programs, Jackson and Berg (1986) suggested that approximately 30 hours of keyboarding instruction should be offered to students during their time in elementary school. The authors offered the alternatives of 15 hours per year for two consecutive years or 10 hours per year over a three year period. While the total time of instruction is an important factor, it is the general opinion of many professionals within the field that keyboarding instruction for elementary students should be designed around short, regularly scheduled sessions, preferably daily sessions that are no longer than twenty to thirty minutes. Similarly, Dennee (1989) suggested that an instructional session for elementary school keyboarding should be thirty to forty minutes with approximately fifteen minutes of this time being teacher instruction and twenty minutes for practice. Dennee also suggested that six or seven weeks of daily instruction are needed for keyboarding skills to develop.

Program Design Obstacles for Elementary Keyboarding Instruction

Total instructional time is one of the most important factors in determining the level of improvement that will take place in keyboarding skills, however, a limited time in the instructional day is one of the main obstacles cited for the inability to implement a consistent keyboarding curriculum at the elementary school level. Researchers agree that the elementary school day is overcrowded and teachers often are reluctant to spend instructional time on non-required activities (Olinzock, 1998). Waner, et al. (1992) stated that "finding thirty minutes a day, three days a week for a month to spend on keyboarding instruction is difficult" (p. 29). Solutions have been offered to this problem of limited time. Some researchers (Hoot, 1986; Pisha 1993: Wetzel, 1985) have suggested that keyboarding instruction should be substituted for some of the time that currently exists for language arts. Nieman (1996) suggested keyboarding skills should be included in the writing curriculum since that is the area that will benefit the most. Waner, et al. expressed the opinion that keyboarding method instructors should take on the role of convincing elementary teachers that "allotting time for keyboarding from their already-crowded curriculum can be beneficial for the teachers as well as the students" (p. 28).

When teaching keyboarding skills to elementary aged students, it is important to stress technique over speed and accuracy. Nieman (1996) stated that "speed should not be stressed until after all the keys and proper techniques have been learned" (p. 28). She went on to suggest that this would probably not be until sixth or seventh grade. Olinzock (1998) stated that "keyboarding is a psychomotor skill that requires proper teaching by a qualified instructor who is knowledgeable of research findings and appropriate methods of teaching" (p. 24). Dennee (1989) stressed that even though the expected outcome of keyboarding skills is to be able to touch type, the emphasis with instruction should be on the position of the body and hands and correct keystroking technique. It is these factors that will lead to skill development with consistent practice. For the aforementioned reasons, it is important that if keyboarding is taught at the elementary level that the instructor receives proper training. Inadequate teacher training is another reason often related to the inability to implement a consistent keyboarding curriculum. A number of researchers (Davison & Kochmann, 1996; Nieman, 1996; Prigge & Braathen, 1993) have suggested that in many cases keyboarding at the elementary level is not taught using proper techniques because the individuals instructing the lessons have little understanding of the process for developing keyboard skills. Keyboarding is considered to be a complex psychomotor skill (Fleming, 2002). In an article in which they argued for the *integration* of technology into the elementary curriculum, Davison and Kochmann voiced the opinion that although most elementary school teachers have been well trained in child development, few have been adequately trained in psycho-motor skill development.

Methods of keyboard instruction

Many systems of keyboarding instruction have been developed through the years. Historically, keyboard instruction has been entirely teacher led with an instructor calling out drills and monitoring student performance. Beginning in the 1980's, with the increased interest in keyboard skills for younger students, instructional methods for

younger students began to emerge. Within the genre of teacher led instruction, there has been at least one method developed specifically for the elementary aged student. The Diana King method, as discussed by Nichols (1995) and Peterson (2000), is a teacher led method of teaching keyboarding skills that uses rhymes to teach key locations. In his discussion of this teaching method, Peterson stated that in the Diana King method "the alphabet is taught in order, associating a rhyme including the key and the finger which is used to strike a key" (p. 10). As the popularity of the personal computer increased over the past two decades, a variety of software applications were developed for the purpose of teaching keyboarding. Some of these software applications were built specifically with the elementary age student in mind. Researchers have varying thoughts as to which method of instruction is best for the elementary student. Davison and Kochman (1996) pointed out some of the downfalls of keyboarding software by stating that many of the popular keyboarding packages violate basic rules of psychomotor skill development. Bartholome (2003) commented that the use of keyboarding software should be approached with caution. He believes that these software programs can promote poor habits and incorrect technique due to their inability to provide feedback. After a review of the literature, Erthal (2003) is of the opinion that no software program has been shown to be superior to capable, teacher directed keyboarding instruction.

Increases in Keyboarding Speed Resulting from Keyboarding Instruction

When keyboarding instruction is offered, it is important to have a general idea of what the expected gains will be in regard to keyboarding speed. Research findings have varied on this matter. After 12 hours of keyboarding instruction, Sormunen (1988) reported observing keyboarding speeds of 13.7, 15.4, and 13.9 words per minute in third, fourth, and fifth graders, respectively. Pretest scores for these same students were 6.6, 8.3, and 9.9 words per minute. Students in this study participated in self-paced instruction via a typing software program for 20 minutes a day, 3 times a week, for 12 weeks. In a longitudinal study that provided students with more consistent keyboard practice, Sormunen (1991) reported average keyboarding speeds of 24.5 words per minute by the end of fourth grade. Keyboarding instruction in this study took place in daily half-hour sessions for four weeks. Students also participated in instructional activities for the remainder of the year in which they utilized keyboarding skills for at least one half hour per day. The author followed these students through the end of their fifth grade year, by which time their average keyboard speed was 33.5 words per minute. Results from this study indicate that the most important aspect of increased keyboarding speed may be the opportunity to practice learned skills and techniques over long periods of time. In a later study, Sormunen (1993) demonstrated average typing speeds of 17.3 words per minute in fourth grade students after one school year of keyboarding instruction. The average keyboarding speeds for the students at the beginning of the year was 6.8 using the hunt and peck method. These students were provided one month of daily keyboarding instruction at the beginning of the school year and reinforcement was provided on a daily basis for the remainder of the school year as students completed academic work.

Listro (1994) compared keyboarding speeds in students who received instruction via keyboarding software. Half the students (N=18) in the study practiced on uncovered

keyboards and the other half (N=18) practiced on covered keyboards. After 15 weeks of once weekly instruction (15 minutes per session), students in the two groups averaged keyboarding speeds of 7.8 and 7.7 words per minute, respectively. It should be noted that Listro performed no pretest and assumed a beginning typing speed of zero words per minute. In order to measure the results of the instruction, it would seem a pre-test of typing ability is an important factor to consider. Additionally, students received keyboarding instruction only once per week. Though keyboarding speed gains for the two groups of students were almost identical, it would seem that these two methods of instruction could be better compared in a better designed research study.

Using two different methods of instruction, Nichols (1995) provided students in grades three though six with keyboarding instruction once a week for the entire school year. One method of instruction was teacher directed (Diana King Method) and the other was software directed (Type to Learn). At the end of the school year, average typing speeds for the groups of third, fourth, and fifth graders participating in the instructor led sessions were 5.1, 6.5, and 8.4 words per minute, respectively while students participating in the software directed instruction averaged speeds of 6.4, 7.8, and 9.8 words per minute, respectively. The results in keyboarding speed were achieved in 12 weeks using the instructor led method, but took 21 weeks using the software based instruction. Buhs (1996) demonstrated average typing speeds of 7.1, 8.6, and 9.9 words per minute for third, fourth, and fifth graders, respectively. These results were achieved by a combination of students, some receiving teacher based instruction once per week and others utilizing keyboarding software. Peterson (2000) demonstrated keyboarding speeds of 17.2 words per minutes in a combined group of fourth and fifth graders using the Herzog system of instruction. Students in this study participated in sixteen 30 minute lessons using this system. Results from this study indicated that the student who received teacher directed instruction via the Herzog method had significantly higher keyboarding speeds than those students who received software directed instruction from the Type to Learn program.

At least one study focusing on the familiarization approach to learning keyboarding attempted to measure keyboarding speed. Kahn and Freyd (1990) reported on their "Microcomputers and Writing Development" project in which sixth grade students became familiar with the keyboard through writing activities. In this study, after teachers introduced students to the idea of home keys, no more formal instruction was given. The students' exposure to the keyboard consisted of one hour per week composing and revising schoolwork. The authors reported that during the school year, keyboarding speed of the sixth graders increased from 6.6 to 10.1 words per minute. Although the 10.1 words per minutes speed is not equal to that reported for even younger age groups in other studies, the authors argued that this speed allowed students to make adequate use of word processing applications without the need for time intensive training in touch typing skills.

Status of Keyboarding Instruction

This section is not meant to be the most current description of the status of keyboarding instruction, but to provide a general idea of how some school systems and

states have initiated mandatory keyboarding instruction due to its perceived importance as part of the overall curriculum. Implementation of educational programs are initiated and terminated on a regular basis. It is unknown whether the programs discussed in this section are still in place. There have been only a few studies that have reported on the status of keyboarding instruction in the United States. Lloyd Bartholome, head of the Business Information Systems and Education Department at Utah State University has been studying typewriting and keyboarding for over 40 years. In his report on keyboarding research, Bartholome (2003) indicated that keyboarding instruction in the elementary schools across the United States is very sporadic. He stated that there have been few states that have attempted to implement systematic keyboarding instruction within the elementary school environment. Nieman (1996) indicated that at least four states (Texas, Minnesota, New York, and Virginia) mandated keyboarding classes. Nieman did not provide specifics as to the grade level at which these states initiated keyboarding instruction; however, he did state that fifth grade was the most common grade for initiation of instruction. Extensive surveys of elementary schools in the state of Wisconsin were conducted to determine the status of keyboarding instruction (Rogers, 1997; Rogers, Laehn, Lang, O'Leary, & Sommers 2003). The findings of this research indicated that over a 10 year period there was a significant increase in the number of school districts providing keyboarding at the elementary level. Rogers, et al. reported that the number of school districts including keyboarding instruction had increased from 54% in 1993 to 85% in 2003. Although it is difficult to generalize these findings to other states, it does seem that keyboarding is a more common occurrence in the elementary school setting than it was ten years ago.

In a thorough review, Knox (2003) reported on the status of keyboarding instruction in the 11 states governed by the Southern Association of Colleges and Schools. These states included Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, and Virginia. Knox concluded that based on curriculum and benchmark information found on official state websites that implementation of keyboarding instruction typically occurred at the middle school level. The author reported that even though the National Business Education Association suggests that keyboard instruction occur at all grade levels, only four of the states included in her study had keyboarding instruction written into their state curriculum guides at the K-5 level. In 2003, North Carolina and Texas both offered keyboarding instruction at the K-2 level, while keyboarding instruction was found in the curriculum guides of Kentucky and Virginia at the 3-5 grade level. Knox went on to report that all other states with the exception of Tennessee began keyboarding instruction between sixth and eighth grades. Tennessee had no formal instruction written into its state guidelines until ninth grade.

A review of the Georgia Learning Connections website (Georgia Department of Education, 2005b) found that if teachers followed the instructional guideline set forth by the state Georgia, students would first be exposed to keyboarding skills in the sixth grade. This is in agreement with Knox (2003). State keyboarding standards fall under the subject area of Technology and Career Education., which is a middle school exploratory class. The lone standard related to keyboarding skills states that the students will be able *to operate an alphanumeric keyboard using the touch system*. This same standard is repeated at the seventh and eighth grade level. No standards related to using the touch

type method of keyboarding were found at the high school level. Additionally, when last checked in 2005, no lesson plans or resources are listed on the Georgia Learning Connections website related to keyboarding instruction. According to this information, there does not appear to be a systematic plan in place at the current time to improve elementary keyboarding skills in the state of Georgia.

Conclusions

From a review of the literature it is apparent that keyboarding instruction, which has historically been delegated to the middle and high school business education teacher, is currently receiving much more attention at the elementary level. A few states and local school systems were found to encourage keyboarding instruction at the elementary level through their curriculum guides; however, in most situations if keyboarding instruction was being offered at the elementary level, it was not a result of state guidelines. Although some would argue the point, the preponderance of the research supports the idea that many now believe that keyboarding skills should be taught at the elementary level. There is little doubt that the ability to utilize the keyboard efficiently can assist students in many educational endeavors. Although keyboarding is increasingly being taught at this early level there are still a variety of opinions commonly expressed associated with the issues related to keyboarding instruction in the elementary school. It seems that an individual can find research to support whatever argument he or she might want to make. If it is believed that children should just be taught keyboard familiarity as opposed to touch typing, there are practitioner opinions to support that idea; however, there are many researchers who believe students need to be instructed in the skill of touch typing during the elementary school years as opposed to the keyboard familiarity method. Even among those that believe it is appropriate to teach keyboarding skills in elementary school, there are differing opinions as to when instruction should begin. There seems to be a general consensus among these researchers that somewhere between third and fifth grade is the most appropriate time to begin keyboarding skills; it is widely suggested that students receive keyboarding instruction prior to the time that they will be expected to utilize the keyboard for school related work. Most of the available research indicates that students in the elementary grades have the capability to learn touch typing and increase the rate of their keyboarding speed. Many believe that for students in elementary school to write effectively using a keyboard and computer, their keyboarding speed should at least be equal to their handwriting speed. There are also those who believe that teaching touch typing skills at such an early age is developmentally inappropriate. These individuals typically cite growth and development and motivational issues as barriers to providing keyboarding instruction to younger students. Research indicates that students in grades three through five can achieve speeds that range from 10-20 words per minute using the touch type method. Higher keyboarding speeds have been demonstrated with prolonged usage. The research indicates that the teaching of touch typing to elementary school students should be approached quite differently than for older students. With elementary aged students, the research suggests that 20-30 minute instructional sessions are the most appropriate. Additionally, consistency of instruction is very important with most keyboarding professionals suggesting three to five instructional sessions per week for a

minimum of eight to twelve weeks.

       After a review of the literature, there appears to be opportunity for more research in the area of elementary keyboarding instruction. Although several authors in the literature mention that student keyboarding speeds should at least reach the same level as handwriting speed, based on this review, few researchers have incorporated comparisons of handwriting and keyboarding speeds into their studies. Additionally, it appears that few authors have attempted to incorporate the utilization of typing masks into keyboard instruction. These masks, which cover the keyboard during instruction, may play a role in how much success students achieve when receiving keyboarding instruction. It will be my goal to incorporate these ideas into the current research project.

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