TYPEWRITING/KEYBOARDING INSTRUCTION IN ELEMENTARY SCHOOLS

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INTRODUCTION

I am frequently asked questions about the teaching of keyboarding in elementary schools. I have been interested in the area of typewriting/keyboarding for over 40 years, having taught typewriting in junior high schools for 13 years and having taught a methods class for business teachers for almost 30 years. My doctoral dissertation was related to the improvement of spelling with the use of the typewriter. During that process I found that there was a considerable amount of research regarding typewriting instruction in the elementary schools which dated clear back to the early 1930s. Thus, with the advent of the personal computer and placing the personal computers in elementary schools, I became quite interested in the teaching of typewriting/keyboarding at the elementary school level. During the middle 1980s an elementary school teacher and I wrote a textbook entitled "I Can Keyboard," published by Glencoe Publishing Company. Thus, this paper is a summary of some of my research and experience related to teaching typewriting/keyboarding and public school instruction during the last 40 years. Perhaps this information will help those who must make decisions about elementary keyboarding instruction. This paper is organized in a series of questions and answers and is provided as a service to people who wish to be involved with the use of computers in elementary school.

WHAT IS TYPEWRITING/KEYBOARDING?

Typewriting involves the manipulation of keys on a standard typewriting keyboard with the emphasis on the typed copy or output. The output is produced on paper at the same time as the input is provided. With the advent of personal computers, typewriters began to become extinct. In fact, electric typewriters are no longer made in the United States. Electronic typewriters had an era of influence in the 1980s which is also gradually decreasing, and virtually all input on a keyboard-like device in today's world is on a computer. The one remaining aspect is that the computer keyboard is almost the same as the typewriter keyboard. In fact, the placement of the letters of the alphabet, commonly used punctuation marks, numbers, and symbols is almost exactly the same as the placement on the typewriter keyboard. Thus, the skill of inputting, or keyboarding, on the typewriter is very similar to the skill of inputting, or keyboarding, on a computer. Typewriting also included the production of documents including memos, letters, reports, essays, etc. Nowadays the production of those documents is done with some kind of a word processing program, but formatting, appropriate use of grammar, spelling, and punctuation, etc. are the same as when documents were produced on typewriters. The difference is that word processing packages are easier than typewriters to use to produce documents. Keyboarding is generally defined as the act of placing information into various types of equipment through use of a typewriter-like keyboard. Keyboarding produces copy which appears on a display screen and is recorded and stored in memory for later access or output. Hard copy is not the immediate product of keyboarding. Keyboarding emphasizes input. Thus, typewriting and keyboarding are not synonymous. However, students learn standard keys in both typewriting and keyboarding. For purposes of this paper I may use the terms typewriting and keyboarding interchangeably. I am talking about the ability to input information on a typewriter-like keyboard using the touch system of keyboarding.

WHY TEACH KEYBOARDING?

Personal computers are revolutionizing society. This revolution started in the late 1970's and continues to mushroom. Over 16 million personal computers were sold in the United States in 1995. Over 34 million units were sold worldwide (Computer Almanac, 1996). To put this number in perspective, yearly unit sales of PCs and automobiles are now in the same ballpark. Reports in *Computer Almanac* further state that by the end of 1994 the installed base of PCs exceeded 80 million units in the United States and 200 million units worldwide. Almost 50 percent of the workforce use computers on the job (Digest of Educational Statistics, 1996). Andy Grove, chairman of the board of Intel Corporation, predicts that by the end of this decade annual PC sales will surpass 100 million units worldwide, more than sales of cars and TVs. Furthermore, the number of U.S. homes with one or more personal computers increased to about 38 million households in 1995, and this number continues to increase at about 16 percent a year, according to Robert Fox (1996). Interestingly, a recent survey indicated that 72 percent of 8-12 year olds reported spending time on a PC during the last 30 days as opposed to 55 percent of 6-7 year olds and 67 percent of teenagers (Computer Almanac, 1996). It can readily be seen that children of all ages, from elementary school upward, are using personal computers. However, are these students learning to input data efficiently? Sandberg-Diment (1984) says that "whether you are a business tycoon or a baker, you can't compute like a pro until you master typing." People who used to find "hunt and peck" keyboarding sufficient realize that it doesn't make much sense to have a computer with lightning speed if the information inputted into the machine trickles in like molasses in January. In fact, Sandberg-Diment states that keyboarding is "the most crucial computing skill." It appears that keyboarding instruction in the elementary schools is very sporadic. In many instances, instruction is provided by someone who is in charge of the computer laboratory who does not understand teaching and learning. Some states, such as Wisconsin, require certificates to teach keyboarding. Some district personnel do an excellent job in teaching keyboarding at the elementary school level. I, personally, have been involved with several school districts, most notably the Nebo School District in the Provo/Orem, Utah area and the Davis School District in the Kaysville/Bountiful, Utah area. These school districts, among other school districts, have made concerted efforts to organize elementary school keyboarding. However, there appears to be some resistance to this instruction, and sometimes this resistance is related to time. At other times it is related to the question of "Can elementary school students learn to keyboard?"

CAN ELEMENTARY SCHOOL STUDENTS LEARN TO KEYBOARD?

Business educators have known since the early 1930s that elementary school students can learn to type (keyboard). Not only can elementary students learn to type, but those who do type improve their language arts skills. This information was provided in a landmark study by Wood and Freeman, reported in 1931, as well as a later study conducted by Erickson in 1959. We know that elementary students have finger dexterity, as evidenced by the fact that elementary students can learn to play the piano quite well. Even though we know that elementary students can learn to type, there has been no compelling reason to spend vast amounts of money to teach typewriting in the elementary schools. Now that computers have been introduced to the elementary schools there is a compelling reason to teach students to keyboard. Williams (1984) reported that computers are best used for most students as word processors on which they can write, correct, and edit. "The keyboard is the best way to work with the computer, and a class in typewriting or keyboarding is essential." Elementary teachers have also found that students enhance their language arts capabilities as they use various word processing programs and personal computers. For instance, in just three short months of keyboarding twice a week a teacher in the Salt Lake City elementary schools noticed benefits. She reported that "the kids are more careful about the beginnings and endings of their sentences. They recognize structure better and pay more attention to details." In addition, she found that the keyboarding program instilled her students with confidence in using a microcomputer. (Salt Lake Tribune, December 5, 1983)Many other studies have reported similar results. To cite just a few of these studies, Conard reported in 1935 that "the typewriter can be used advantageously in most, if not all, of the subjects of instruction in the middle school." There is fairly consistent evidence that the typewriter's influence on spelling is more favorable than on any other subject tested in the Stanford Achievement Test. Colahan also reported in 1935 that the teaching of typewriting in the elementary school using the touch system, standard machines, and regular class organization with a qualified teacher had been sufficiently successful in the schools of Woodstock, Illinois to have the Board of Education incorporate typewriting instruction in the elementary schools for the school years 1935 and 1936. Colahan also reported that good pedagogy calls for the touch system in all typewriting classes. To "allow the pupils to typewrite without method is to build up faulty habits of typewriting which will later have to be broken down before the touch system can be taught." Here's a statement which was recognized in 1935. **Business teachers today recognize this problem, but for some reason or other, it is not recognized by much of the leadership in the elementary schools.** Nathan Krevolin (1965) taught elementary school students to type in the 1950-60s. He also reported that "experiments in the teaching of typewriting to preschool and elementary school children have been carried on for more than three decades. These studies have shown incontrovertibly that children of these ages can learn to operate the typewriter correctly and usefully. In addition, there is considerable evidence that typewriting accelerates learning in the language arts areas." Anderson further verified the ability of elementary school students to learn to type in his research reported in 1983. Anderson stated that "the results of this experiment and of those identified in the review of literature indicated that elementary children of the age level examined are very capable of handling the rigorous task of keyboarding." Anderson indicates that when children start to use the microcomputer keyboard it is essential that keyboarding skills be taught as early as possible. He suggests the third grade. However, Bartholome and Long (1986) experimented with elementary school students in the first and second grade and found that first and second graders could learn to keyboard as well. They did find that second graders seemed to do better than first graders, although first graders could keyboard. Unquestionably, elementary school students can learn to keyboard.

AT WHAT GRADE LEVEL SHOULD KEYBOARDING BE TAUGHT?

From the evidence available about research on keyboarding, it appears that early elementary school students can learn to keyboard. Some researchers suggest that fifth grade is the ideal time. However, the fifth grade may be too late because there may be too many bad habits already engrained. Therefore, it appears that when students start to use microcomputers to type words and sentences, they should be taught keyboarding. Bartholome and Long (1986) found that first and second graders with one-half hour of instruction three days a week could learn to type the alphabetic keys with commonly used punctuation marks at the rate of 15-30 words a minute in one semester of instruction. Psychological research on teaching typewriting also indicates that the student needs to be typing somewhere around 20-25 words a minute to have the keyboarding response patterns somewhat automated. The danger also lies in the fact that many people believe that to provide keyboarding instruction at a singular grade level is enough. Typewriting is like any other skill. The more you work on the skill the better you become at the skill, and, if you don't use the skill, you may lose the skill. Thus, I recommend that there be some continual emphasis on keyboarding throughout the elementary school and junior high school years. My recommendation is indicated in the following keyboarding scope and sequence. Of course, variations can be accommodated. The main idea is to spend some time on keyboarding as a student progresses. As a student gets to the junior high/high school level, he/she should then be working on higher speeds, and, of course, people who continue to work on the keyboarding in the high school level are people who want to use their keyboarding skills for high level word processing and other inputs. Keyboarding emphases at various grade levels are stated in the Keyboarding Scope and Sequence chart on the next page. Another guide for keyboarding instruction is a statement produced by the Policies Commission for Business and Economic Education. (1984) The Policies Commission is a consortium of people represented by many national business teacher organizations. The Policies Commission states that students should be introduced to keyboarding at the elementary school level and continue their skills in middle/junior high school and other levels of education. The Policies Commission believes that the following objectives are appropriate for an elementary school keyboarding course of 25-45 hours of instruction.

- Demonstrate the correct touch method for operating alphanumeric keys.
- Demonstrate the correct straight copy speed of 25-40 words per minute.
- Demonstrate the ability to work from straight copy and rough draft material.
- Demonstrate the ability to proofread both alphanumeric and numeric data.
- Demonstrate the ability to follow oral and written directions.
- Demonstrate the ability to compose at the keyboard.

The Policies Commission also recommends that the student learn to operate the ten-key numeric pad, but to me, this is a different issue. Learning to operate the alphabetic keys and commonly used punctuation marks is the most important part of keyboarding at the early elementary school level.

IS THERE A BACKGROUND OF RESEARCH AND KNOWLEDGE AS TO HOW TO TEACH KEYBOARDING?

Business educators have studied and researched keyboarding for over 100 years. Thus, there is a vast background of knowledge and research on how to teach keyboarding (typewriting). Frank McGurrin of Salt Lake City was the first practical exponent of keyboarding and typewriting using the touch system. In 1878 McGurrin, inspired to teach himself without looking at the keys and by using all fingers such as the present touch system which we currently use, McGurrin challenged all comers and remained the undefeated typewriting champion of his day. Following his use of the all-finger method, many other educators became converts. In those days there were international typewriting contests, and soon only those who used the touch system were winners. The success of students of the all-finger touch system in these contests added proof of the superiority of the all-finger typewriting method. It was not until 11 years later that Bates Torey published a manual of practical typewriting describing the touch system. In the early 1900s the touch system of teaching typewriting swept the U.S. It became very popular in 1916 when World War I increased the demand for trained typists.

KEYBOARDING SCOPE AND SEQUENCE Lloyd W. Bartholome, Utah State University			
	TOPIC	TIME FRAME	SKILL LEVEL ALPHABETIC COPY
Grades 1 or 2	Home Keys	3-4 hours	Don't measure
Grades 2 or 3	1. Alphabetic keys and commonly used punctuation marks 2. Spelling words and other short activities	30-35 hours	20 wam*
Grade 4 or 5	1. Review alphabetic keys and introduce numbers and commonly used symbols. 2. Incorporate in language arts	25 hours	30 wam
Grades 6 or 7 or 8	Review skills Use skills in all language arts. Use for personal use, reports, essays, letters, etc.	min. of 1 semester-- 190 hrs 1 yr if preparing for vocational skill	40 wam
Grades 9-10	Introduction to business skills (word processing, database, spreadsheets, etc.)	1 semester	40-50 wam
Grades 11-12	Advanced business skills (word processing, database, spreadsheets, etc.)	1-2 semesters	50+
NOTE: Students can use word processing programs and microcomputers at any grade level where equipment is available. *Words a minute--a standard word is five strokes, spaces, etc.			

The early emphasis on keyboard mastery included memorization and memorization devices. By 1920 keyboard fingering became standardized with the right thumb used for the space bar and with each finger assigned a certain diagonally arranged group of keys very similar to the present touch system. There were also many methods of introducing the order of the keys, but after considerable research it was found by D.D. Lessenberry at the University of Pittsburgh that the skip-around approach was the best way to introduce the keys. (Russon and Wanous, 1973) This means that the keys are introduced randomly, avoiding the opposite hand/same finger introductions in a given lesson. For instance, "i" and "e" would not be introduced in the same lesson. In the early 1920s the perfect copy standard was abolished and gradually the evolution of the concept of technique, speed, and accuracy became apparent. The concept of technique with appropriate speed and not emphasizing accuracy until responses are automated has been identified as the most appropriate concept.

This is like instruction in any skill. Being a baseball fan, I always begin my presentations with a demonstration of how to throw a curve ball. One must use the correct technique to get the correct spin on the curve ball or the ball will not curve. Thus, one must have the student work on the technique until the response becomes automated. The pitcher can throw the curve at the appropriate speed, and it will curve. The pitcher does not think about the placement of the curve ball or the accuracy of the curve ball until the technique and the speed portions have become automated. This same analogy can be used for virtually any skill and is supported by a huge body of research in the physical education area. There are also many psychological principles in teaching this skill. These principles are identified later in this paper.

WHAT ARE SOME GENERAL PRINCIPLES FOR TEACHING ELEMENTARY SCHOOL CHILDREN HOW TO KEYBOARD?

I have taught many elementary school teachers how to teach keyboarding in various workshops throughout the state of Utah. At a recent workshop in the Nebo School District, these principles were reiterated, and the school district was kind enough to distribute the principles to the teachers. Some of the ideas are indicated below:

District Keyboarding Objective All school district students will leave the district with the keyboarding skills necessary to continue their education and become meaningfully employed.

Obstacles to this Objective Incorrect keyboarding habits prevent students from achieving the desired proficiency. Poor habits develop through years of improper use prior to receiving formal training. Some habits are difficult to break once formal instruction is initiated.

The Solution All students must use correct keyboarding techniques from the time that they start using the keyboard. Proper technique will become natural as they apply these principles each time they keyboard.

The Approach to Use Direct instruction and supervision will ensure the development of excellent keyboarding skills. The primary focus is proper keyboarding technique with appropriate speed. When this has become automated, emphasis will be placed on accuracy. Direct instruction has proven to be the most effective way to introduce the keyboard and teach correct techniques. The use of computer software to teach keyboarding must be carefully scrutinized. It may seem like a good idea, but these programs can contribute to poor keyboarding habits and inappropriate keyboarding techniques. For instance, typing tutorials can demonstrate, but typing tutorials cannot provide feedback. Thus, students can very well type copy that is spelled correctly, but the input was done incorrectly. For instance, one could use one or two fingers to type a sentence with no typographical errors. The software cannot check whether students are using correct fingers on the keys. In the initial stages of keyboarding students may be faster when using one or two fingers. But their speed has limited potential. Information on the following pages suggests some specifics to help elementary school keyboarding teachers.

EVALUATION IN ELEMENTARY KEYBOARDING

Technique First If students are graded on technique, they will value technique. You may also find it helpful to help students set personal goals for technique and letter mastery.

Sense of Touch Students who lose their place often may be looking at their fingers. Some students feel they need to look at their monitor often to check their accuracy. Looking away from the copy makes the student less efficient. Ask students who are watching hands what sense they are not using (sense of touch).

Peer Tutors It is difficult to always know what all ten fingers of each student in an entire class are doing. Peer tutoring can be used to allow students to take ownership of evaluation and to check for understanding of instruction. One teacher said to the students, "Ask your neighbor to sit up straight."

Evaluating Errors The cause of the error is more important than the fact that the student made a mistake. Many errors are the symptoms of faulty keyboarding technique, wrong finger curve, eyes not on copy, or posture. The teacher should try a quick type-through before assigning practice in order to better anticipate student difficulties. Errors such as reversals, typing an "e" instead of an "r", and omission or addition of letters are more often due to poor planning or thinking than they are to inaccurate finger placement. Other causes of errors include tension, wandering attention, faulty reading, or the wrong mind set. Watch students for signs of fatigue, moving heads, massaging, or tight facial expressions.

Computer Laboratory Management Here are some helpful hints for computer laboratory management and keyboarding instruction.**Elementary Keyboarding Instruction Materials**

Pre-Lab Objectives *Note: For a more successful experience with teaching keyboarding, teachers should become familiar with the lab and computers in their schools. The following concepts should be taught in the classroom before entering the computer lab.*

- Introduce computer hardware using pictures and computers
- Monitor/Screen/Terminal
- Keyboard - use charts and mats
- Main keys - enter, space bar, escape, arrow keys, backspace
- Keys to practice or learn
- Disk drive
- Mouse
- Earphones
- Printers
- Discuss proper lab procedures
- Conduct
- Seating
- Soft touch - no pounding or banging on keyboard or mouse
- Discuss proper care of computer components
- Monitor
- Avoid contact to eliminate static electricity
- Keep hands away from monitor to avoid smudges and dirt
- Disks and Keyboard
- Have clean hands when using the computer
- No food or drinks allowed in computer lab
- Keep magnets away from computers and disks - They will erase or alter important information on your hard drive or disks
- Handle disks and disk drives properly
- Familiarize students with proper computer terminology (Information Technology Core Curriculum)
- Use the standard list (i.e. keyboard, monitor, mouse)
- Add additional terms as needed
- Use finger gymnastics (vital for smaller children)
- Must work all fingers
- Strengthen finger muscles, dexterity, and the ability to move fingers independently
- Arrange for parent helpers or older student helpers

PSYCHOLOGICAL PRINCIPLES

Following are some psychological principles and helpful learning ideas that I have used over the years. These principles and ideas relate specifically to keyboarding. However, they also relate to skill and other instruction in the teaching/learning process.

Motivation: interest, effort, and following directions The keyboarding teacher will motivate students best by contributing to a feeling of success and progress.

The Spacing Effect "One of the primary psychological principles of learning is that distributed practice is better than massed practice. That is, practice for several short periods of time is better than practice over a single but equal long period of time. An example of this principal is learning to play the piano. Practicing the piano for a half-hour each day for six days is better than practicing for a three-hour block one time in six days. In other words, the practice is distributed or spaced." (Bartholome and LaBonty, 1994)

Other Ideas Efficiency of learning increases when students know their rate of progress.   Repetition in itself is of no value unless it is meaningful and purposeful to the student. Process the learning task with the students; seek to motivate them by involving them in decisions about their learning. Start with short periods of practice and work up to longer periods of practice as students develop keyboarding stamina. Conduct "finger gymnastics" as a productive break to reinforce finger strength, flexibility, and individual motion. Formulate an objective:
Choose a specific objective for each session. For example, introduce or review a specific letter. Select the objective at the correct level of difficulty:

- *The pace should be challenging without moving so fast that students have not achieved a level of comfort with prior learning. If students move through the material too quickly they tend to fall back to poor habits.* Anticipatory set: related to similar past experience with the learner actively involved.

- *Students have to work hard at learning to write, read, and memorize math facts. Teachers can help students recognize the need to extend the same level of effort in order to become proficient at keyboarding.*
- Motivation Success: *Help students see their progress immediately. Student efficiency of learning increases when they know their rate of progress. Progress must be measured in terms of perfecting technique. Stroking speed begins very quickly if correct techniques are used. To gain speed, the learner needs only to eliminate the pauses between strokes.*
- Level of concern: *When students are graded on technique they work harder on developing technique.*
- Interest: *Young students are naturally interested. Older students will maintain motivation as they see their keyboarding skills or techniques improve. Point out achievements, things they can do that they couldn't before.* Knowledge of results: specific and immediate
  Students do not need to be corrected on keyboarding technique as much as they need to understand why technique is important. Students need reinforcement that they are acting correctly.
- Feeling tone: *Teachers need to establish positive feeling tone about keyboarding technique. Anxiety and stress cause muscular tremor, lack of mobility, or excessive motion.*
- Closure: *Reflective thinking aids the learning process. For example, discuss the new letter learned and peculiarities about typing the letter.*
- Modeling: correct demonstration and known criteria *Teachers should set criteria for success and model according to the criteria. Students will expect the teacher to use proper technique, too.*
- Practice Reinforcement: *Give sufficient practice to master the new letter before introducing a new letter.* Best when sessions are short and often: *Distributed practice over short intervals over a longer period of time is more effective in developing skills than concentrated practice.*
- Monitor and adjust: *Student boredom or lack of focus does not necessarily mean they have mastered a letter and are ready to move on. Teachers need to find positive ways to motivate students and vary the practice without shortcutting the focus on technique.*
- When to move on! It is tempting to let students hurry through practice, or to transpose their own writing too soon. Such activities can be counterproductive if the student is not ready.
- Typing skill develops when there is reasonable finger dexterity, concentration on using the se
- Sense of touch, persistent practice, enthusiastic interest, and the self-confidence that comes through seeing one's own progress.
  Students are ready to move on when: they are comfortable with the present skill AND they are able to key present material using proper technique.

SUMMARY

Computers are becoming as common, or more common, than automobiles. Almost 50 percent of the workforce use computers on the job. In addition, three-fourths of the 8-12 year olds spend time on the PCs, and this number continues to increase. The input device for personal computers is a typewriter-like keyboard. Inputting is commonly called "keyboarding." When youngsters begin to use computers, they should learn how to keyboard. Research evidence over the years is very positive that elementary school youngsters can learn how to keyboard (type). Keyboarding (typewriting) skills also enhance their language arts abilities. A half hour a day for three days a week for one semester can provide students with the necessary keyboarding skills to automate their responses so that they can keyboard faster than they can write. Keyboarding should be taught when students start to input words and sentences on the keyboard. Otherwise, students get bad habits which are almost impossible to break. Keyboarding is also an ongoing skill, and like any other skill, should continue to be practiced. There is a body of evidence as to the best ways to teach keyboarding. That body of evidence includes the techniques approach, just as teaching any skill includes the techniques approach. There are many principles to use in teaching keyboarding, and these principles should be applied to enhance keyboarding skills. I have not addressed the issue of appropriate materials. In the 1980s I wrote a textbook which was a very successful textbook called "I Can Keyboard." My co-author was Ilone Long, who taught first and second grade at Edith Bowen Laboratory School on the Utah State University campus. We researched the text materials by having the students use the materials before we introduced them in our textbook. The publisher was Glencoe Publishing Company. Glencoe Publishing Company subsequently merged in a joint effort and is now called Glencoe/McGraw-Hill. They spun off their elementary keyboarding texts to SRA Inc. SRA is not reprinting the text. If you'd like to obtain information, please contact SRA at the following address and phone number.
Ms. Ruth Cochrane
Vice President and Publisher
SRA/McGraw-Hill
250 Old Wilson Bridge Rd., Suite 310
Worthington OH 43085
Phone: 1-800-468-5850
or
1-614-438-6000

I have been encouraging SRA to revise the text with a software package so that we can get appropriate materials into the hands of elementary school teachers. Feel free to contact them and let them know your needs so that they will know of the demand for elementary school keyboarding materials. Thanks for your help! My e-mail address is LBART@B202.USU.EDU

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