

## **THE STATUS OF ELEMENTARY KEYBOARDING— A LONGITUDINAL STUDY**

**Harriet Rogers, Jody Laehn, Anne Lang, Deb O’Leary, and Mary Sommers**

### **Abstract**

In this technology-driven world, the computer is a vital learning tool for students of all ages, and the use of computers at home and at school is rapidly increasing. Children as young as pre-kindergarten are using computers in classrooms across the country. The National Educational Technology Standards (NETS) indicate that students in kindergarten, first, and second grade should have an awareness of basic computer operations and concepts. As states mandate computer literacy, are they also requiring keyboarding instruction that develops efficient inputting skills?

A research study was conducted in May, 2003, to determine if the number of school districts that offered keyboarding instruction at the elementary level has increased since more elementary children use the computer as a writing tool. The purpose of the study was to determine the status of elementary keyboarding in the State of Wisconsin and to compare data from 1993, 1996, and 2003 as to the following questions: 1) At what grade was the “touch” method of keyboarding taught? 2) Who taught keyboarding? 3) How much time was allocated? 4) When was keyboarding reinforced? 5) What software was used to teach keyboarding? 6) What textbook was used? and 7) What computer environment was used?

Over the ten-year period (1993—2003) more elementary schools included keyboarding instruction in the curriculum, beginning with an early awareness in kindergarten through second grade. Third grade, followed by fourth grade, received the most responses as to when the formal introduction of the touch method of keyboarding began. Elementary classroom teachers are the primary instructors in teaching keyboarding. The most common instructional time for teaching keyboarding was 30 to 40 minutes once a week for 36 weeks. Reinforcement of keyboarding instruction was considered important as most school districts indicated subsequent reinforcement. A keyboarding software package was preferred over using a textbook for keyboarding instruction. The type of computer used for elementary keyboarding instruction changed from Apple computers to PC environments.

## Introduction

Since the invention of the first “practical” typewriter in 1867 by Christopher Latham Sholes of Wisconsin, extensive studies have been conducted evaluating the typewriter as a learning and writing tool. Research done as early as 1932 found that elementary children who typed their work achieved greater gains in all subjects than those who did not type their work (Hoot, 1986). In 1959 research showed that third and fourth grade students who attended a summer typing program improved in reading and vocabulary scores. In 1971, first graders who participated in a reading/typing program were significantly better in comprehending paragraph meaning and word study skills (Hoot, 1986). Keyboarding was also found to be highly motivating and led to more positive attitudes toward spelling (Anderson-Inman, 1990).

As technology advanced over time, the typewriter gave way to the computer. Students of all ages are now using the computer as a vital learning tool in classrooms. According to a study completed by Sormunen (1989) almost every elementary school in the nation had computers available in the classroom. In 1989 a questionnaire was sent to 1,000 randomly selected administrators throughout the United States to obtain their opinions about elementary keyboarding. Based on the 519 responses, 74 % of the administrators indicated that keyboarding should be required of every student; 78% felt it should be taught at the elementary level; and 50% felt that third grade was not too young to learn keyboarding. An overwhelming 80% felt that touch keyboarding (positioning the hands on the homerow, using each finger to key specific keys according to the slant of the keyboard) was necessary for efficient operation of a computer and that language arts skills can be increased by using the computer. Sixty-two percent stated that keyboarding was a basic literacy skill (Condon, 1989).

Traditionally, typewriting skills—now referred to as keyboarding skills—were taught in high schools by business education-licensed teachers who had been trained to teach the psychomotor manipulations of keyboarding. However, with the enormous increase of computers in middle and elementary schools, the introduction of the touch method of keyboarding was occurring in lower grades (Rogers, 1997). With the increased opportunity for children to use the computer as a writing tool, are they learning an efficient inputting skill? As early as 1986, a major concern was

Children often develop their own hunt-and-peck-systems. These systems are inefficient; without keyboarding skills, students take longer at the computer. Keyboarding is now as important as penmanship, yet many students learn the keyboard without guidance, waste limited computer time, and develop habits that may be difficult to change (*Type to Learn*, 1986, p.1).

This concern still exists, as cited in *Education World: Technology in the Classroom*: “As schools have concentrated on teaching students how to use computers to obtain and

produce information, they have paid little attention to teaching them how to type on the keyboard quickly, accurately, and with correct technique” (2003).

Controversy continues as to who should teach keyboarding, what skills should be taught, at what grade level/age, and for what length of time. Traditionally, only the business education-licensed teacher taught keyboarding. With the present trend toward the introduction of keyboarding at the elementary level, are elementary-licensed teachers now teaching these skills? Are they being properly trained to teach the psychomotor skill?

A research study conducted in 1996 reported the increase in the number of elementary classroom teachers that were teaching keyboarding compared to previous years. In 1993, the study found that business education teachers were primarily responsible for teaching elementary keyboarding (70% of respondents), but by 1996, 54% were business education teachers (Rogers, 1997).

Sormunen (1991) conducted a study regarding the existence of elementary touch typing instruction. This study found that elementary classroom teachers are teaching keyboarding, but only 12% had any formal preparation in teaching keyboarding. A study conducted in 1989 found that educational administrators felt that in-service training for elementary teachers would be necessary to provide them with enough expertise in teaching keyboarding (Condon, 1989). McLean (1994) suggested that instruction can be supplied by elementary teachers who have taken a keyboarding methods course, or a business education teacher who has had elementary learning methods, or a combination of elementary classroom teacher and a business education teacher. Consensus of most studies indicates that a “knowledgeable” teacher is needed to help students develop appropriate techniques, as well as provide motivation and reinforcement (Nieman, 1996).

Many studies have documented the value of children learning touch keyboarding (McKay, 1998; Owston, 1997; Bartholome, 1996; Nieman, 1996; Hoot, 1986). Rogers (2003) lists the following benefits for children who are introduced to the touch method of keyboarding:

1. Improvement in language arts—reading, spelling, and writing ability.
2. Improvement in efficiency in using the computer as a writing, editing, and computing tool, thereby maximizing classroom time.
3. Improvement in attitude toward writing—less frustration in looking for keys rather than entering information.
4. Improvement in proper keyboarding techniques and use of the computer, thereby eliminating the formation of bad keyboarding habits for later word processing and computer applications.
5. Improvement in motivating all students toward doing schoolwork.
6. Improvement in creative thought.
7. Improvement in integrating keyboarding with all subject areas.
8. Improvement in preparing all students for a technological society.

Keyboarding skills are included in national and state standards as part of essential input technologies. The National Business Education Association (2001) recommends keyboarding instruction in Level 1 (Grades K—6) and the International Society for Technology in Education (ISTE) recommends that students use input devices, such as the mouse and keyboard, to successfully operate computers prior to second grade (2000).

The National Educational Technology Standards (NETS) and South-Western Publishing Company have developed a scope and sequence for computer literacy that includes the formal introduction of touch typing beginning at the third grade level. The Wisconsin's Model Academic Standards for Business state that by the end of the fourth grade, students will develop touch keyboarding techniques.

Erickson (1993) addresses the controversy of when keyboarding should be taught and states that all students, ages 8 and up, can learn keyboarding skills, but the ideal age for effective keyboarding instruction and learning is the upper elementary school level (ages 10—12). Erthal (1998) states that the general consensus is about age 8 or 9 or grade 3 or 4 because children at this age possess the necessary fine motor skills, eye-hand coordination, and reading ability to succeed in keyboarding. Lambourne (1992) presents many developmental reasons why fourth grade is the ideal time to teach keyboarding skills.

However, in an article in *Education World*, the author quotes “There is no longer an ideal time for formal (keyboarding) instruction because younger and younger children are imitating older siblings and parents by wanting to work with computers” (2003). Numerous studies indicate that keyboard learning should be taught prior to using the computer, especially since students need formal instruction to acquire keyboarding skills using the touch system (PCBEE, 1997; Nieman, 1996; Prigge and Braathen, 1993).

Students should be able to demonstrate the correct touch method of keyboarding after successfully completing 25 to 45 hours of instruction according to the Policies Commission for Business and Economic Education (1997). The suggested time frame for a basic keyboarding program according to Erickson (1991) is 40 to 45 class periods of approximately 30 to 40 minutes in length. Depending on the grade level and the number of 30-minute class periods, 15 to 35 hours of instruction in Grade 3 or Grade 4 is recommended by Hoggatt (2004).

## **Findings**

To determine the status of elementary keyboarding instruction and to compare the growth of elementary keyboarding over a ten-year period, questionnaires were mailed in 1993, 1996, and 2003 to all school districts in Wisconsin. During the years 1993 and 1996, Wisconsin had 428 school districts. By 2003, two small school districts consolidated, resulting in 426 total school districts. As shown in Table 1, the response rate in 1993 was 67%, representing 285 school districts; the response rate in 1996 was 66%, representing 284 school districts; and the response rate in 2003 was 60%, representing 256 school districts. The lower response rate in 2003 was attributed to the timing of when the questionnaires were

mailed to the school districts. Questionnaires were mailed in late April, 2003, with a follow-up completed in May, 2003, compared with January, 1996, and March, 1993.

**Table 1**

*Summary of Responses*

Surveys	Districts Represented	Response	Percentage
Surveys received in 1993	428	285	67%
Surveys received in 1996	428	242	
Follow-up surveys in 1996	--	42	66%
Surveys received in 2003	426	192	
Follow-up surveys in 2003	--	64	60%

Over the ten-year period (1993—2003), more school districts are including keyboarding instruction in the elementary grades. As shown in Table 2, the number of school districts including keyboarding has increased from 54% in 1993 (153 responses) to 73% (207 responses) in 1996 to 85% (218 responses) in 2003. The number of school districts not introducing keyboarding instruction in the elementary grades has decreased from 46% in 1993 to 27% in 1996, to 15% in 2003. All of the following percentages calculated in this study are based on the 153 “yes” responses (54%) of the total responses in 1993; the 207 “yes” responses (73%) of the total response in 1996; and 218 “yes” responses (85%) of the total response in 2003.

**Table 2**

*Elementary Keyboarding Results*

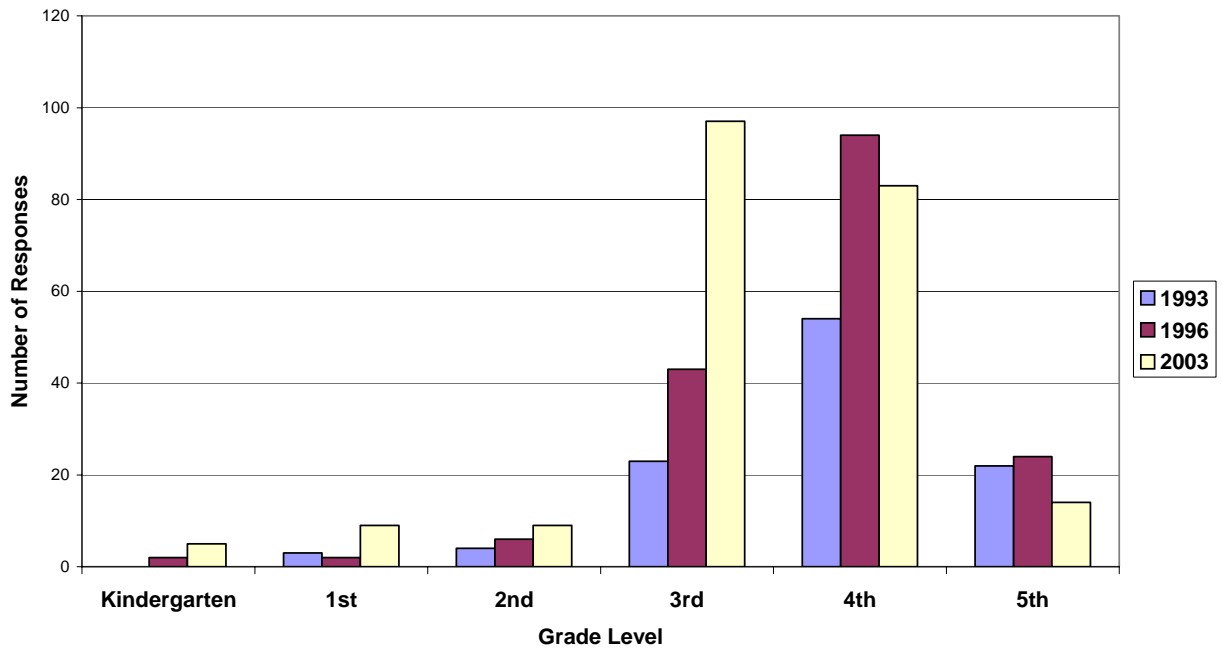
Year	Total Responses	YES	%	NO	%
1993 Introduction of Keyboarding	285	153	54%	132	46%
1996 Introduction of Keyboarding	284	207	73%	77	27%
2003 Introduction of Keyboarding	256	218	85%	38	15%

As indicated in Table 3, the touch method of keyboarding (positioning the hands on homerow, using each finger to key specific keys according to the slant of the keyboard) was most often introduced at the third grade level in 2003 (97 responses, 45% based on 218 total “yes” responses) compared to 42 responses (20.3%) in 1996 and 24 responses (15.7%) in 1993. This is an increase from the previous studies in which fourth grade received the most responses with 93 responses (44.9%) in 1996 and 54 (35.5%) in 1993. In the 2003 study,

fourth grade received the second highest number of responses, 83 (38%). Fifth grade received positive responses in 2003 from 14 (6.4%) school districts, in comparison with 24 (11.6%) of the 207 total responses in 1996 and 22 (14.3%) of the total 153 positive responses in 1993.

**Table 3**

*Keyboarding Instruction*



Note: 1993 N = 153; 1996 N = 207; 2003 N = 218

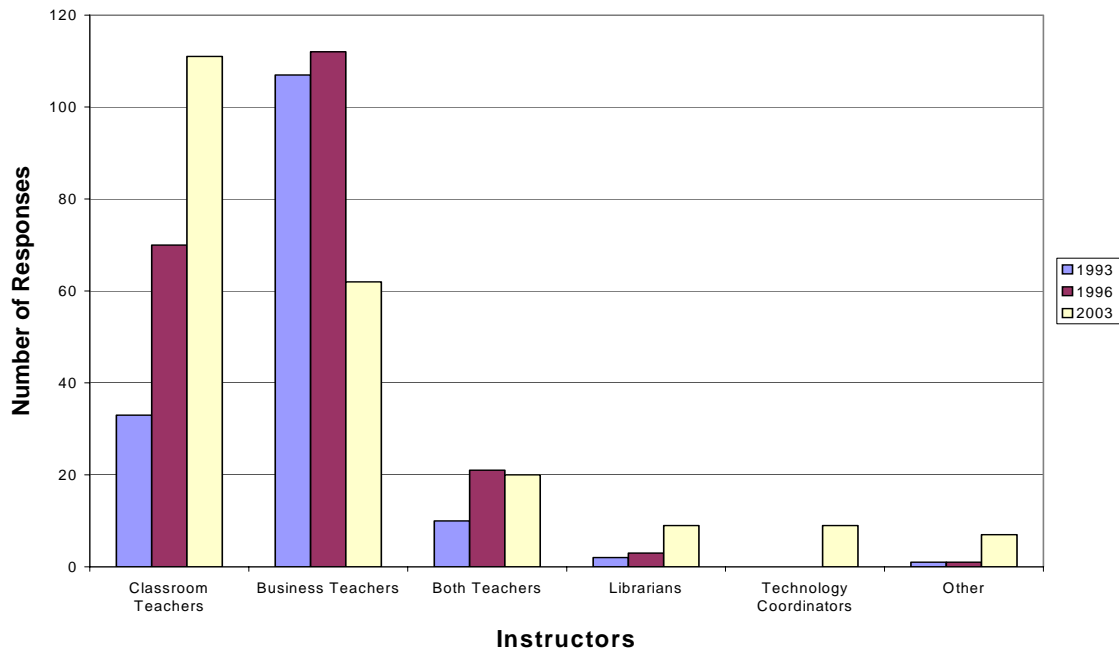
An overall increase in the introduction of the touch method has occurred in grades kindergarten through second grade. In 2003 keyboarding was introduced in kindergarten in five (2.3%) school districts, compared to one response in 1996 and no responses in 1993. At the first-grade level, keyboarding instruction was included in nine (4.2%) districts, compared to one in 1996 and two in 1993. School districts included keyboarding at the second grade in nine (4.2%) school districts in 2003, compared to six in 1996 and three in 1993.

As Table 4 indicates, there has been a dramatic increase in elementary classroom teachers being the primary instructor of keyboarding. In 1993, business education teachers were responsible for teaching elementary keyboarding (70%) of 153 total positive responses. By 1996, there was an increase in the number of classroom teachers teaching keyboarding,

but the business education teacher still represented more than half of the responses, 54% of 207 total positive responses. However, by 2003, classroom teachers were the primary instructor of keyboarding (50.9%, 111 responses). Business education teachers represented 28.5% of the 218 total positive responses. In 2003 many schools reported that the elementary classroom teachers were assisted by librarians or technology coordinators.

**Table 4**

*Keyboarding Instructors*

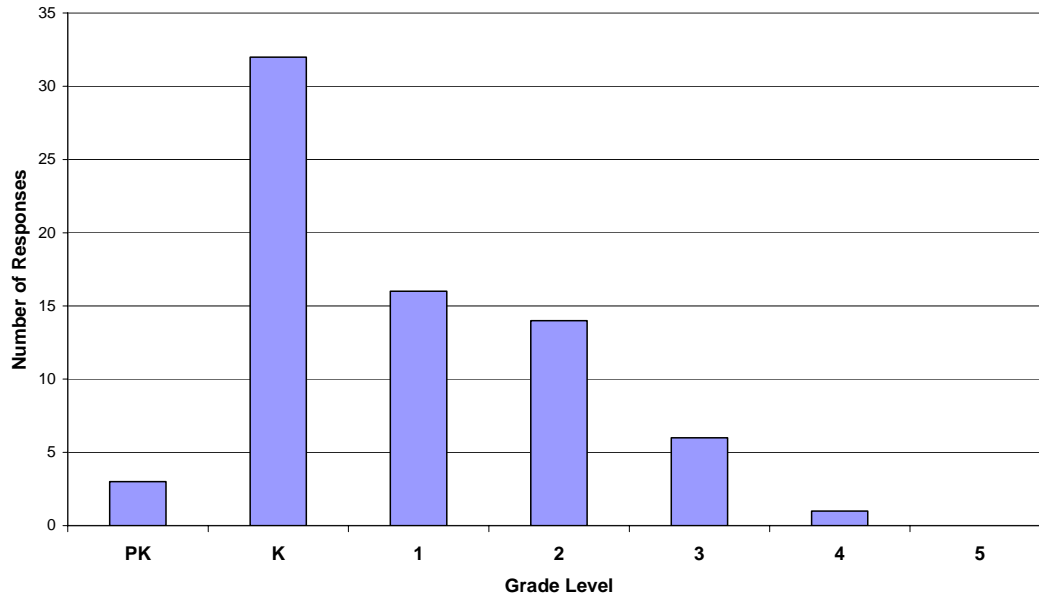


Note: 1993 N = 153; 1996 N = 207; 2003 N = 218

Respondents in 2003 were asked if they offered any introductory instruction to the keyboard before any formal instruction (touch method) was given. Of the 218 school districts that offered elementary keyboarding, 86 (39.5%) answered “yes,” and 132 (60.5%) answered “no.” Many schools described this early keyboarding awareness as informal. Students were introduced to correct computer posture, the color-coded system of keyboarding, and proper left/right hand placement. Table 5 indicates the grades where early keyboarding awareness occurred. This question was not asked on the 1996 or 1993 questionnaires.

**Table 5**

*Early Keyboarding Awareness 2003*



Note: N=86

Early keyboarding awareness occurred most often at the kindergarten level with 32 responses (37.2%), followed by first grade with 17 responses (19.8%), second grade with 14 responses (16.3%), third grade with 13 responses (15.1%), fourth grade with 7 responses (8.1%), and pre-kindergarten with 3 responses (3.5%).

The instructional time allocated for teaching the touch method of keyboarding varied greatly from school to school, from teacher to teacher, and with each grade level. The most common instructional time indicated in 1993 and 1996 was 25—45 minutes every day for 6 weeks. However, in the 2003 survey, most responses indicated once a week for 36 weeks for 30 to 40 minutes (21 responses, 9.6%). Eighteen school districts (8.3%) reported offering keyboarding instruction every day, for 6 weeks, for 30—45 minutes. Ten school districts (4.6%) reported twice a week, for nine weeks for 30 minutes.

In answer to what software was used to teach keyboarding, Table 6 indicates a shift over the ten-year period from MicroType: The Wonderful World of Paws to Type to Learn/Type to Learn, Jr. Every year new keyboarding software becomes available. Schools also reported using a combination of software to fit the various grade levels.

**Table 6***Instructional Software*

Software	1993		1996		2003	
	Responses	%	Responses	%	Responses	%
<i>MicroType: World of Paws</i>	54	35.3	49	23.7	28	12.8
<i>Ainsworth Keyboard Trainer</i>	4	2.6	11	5.3	5	2.3
Type to Learn/Type to Learn, Jr.	8	5.2	11	5.3	67	30.7
<i>Mavis Bacon Teaches Typing</i>	4	2.6	8	3.9	20	9.2
<i>Ultra Keys</i>	2	1.3	8	3.9	14	6.5
<i>Touch Typing for Beginners</i>	5	3.3	7	3.4	0	---
<i>All the right Type</i>	6	3.9	7	3.4	13	6.0
<i>CompuKeys</i>	10	6.5	7	3.4	0	---
<i>Alphabetic Keyboarding</i>	3	2.0	7	3.4	0	---
Various other software packages	15	9.8	25	12.0	55	25.2
Did not use instructional software	42	27.5	67	32.3	16	7.3

Note: 1993 N=153; 1996 N=207; 2003 N=218

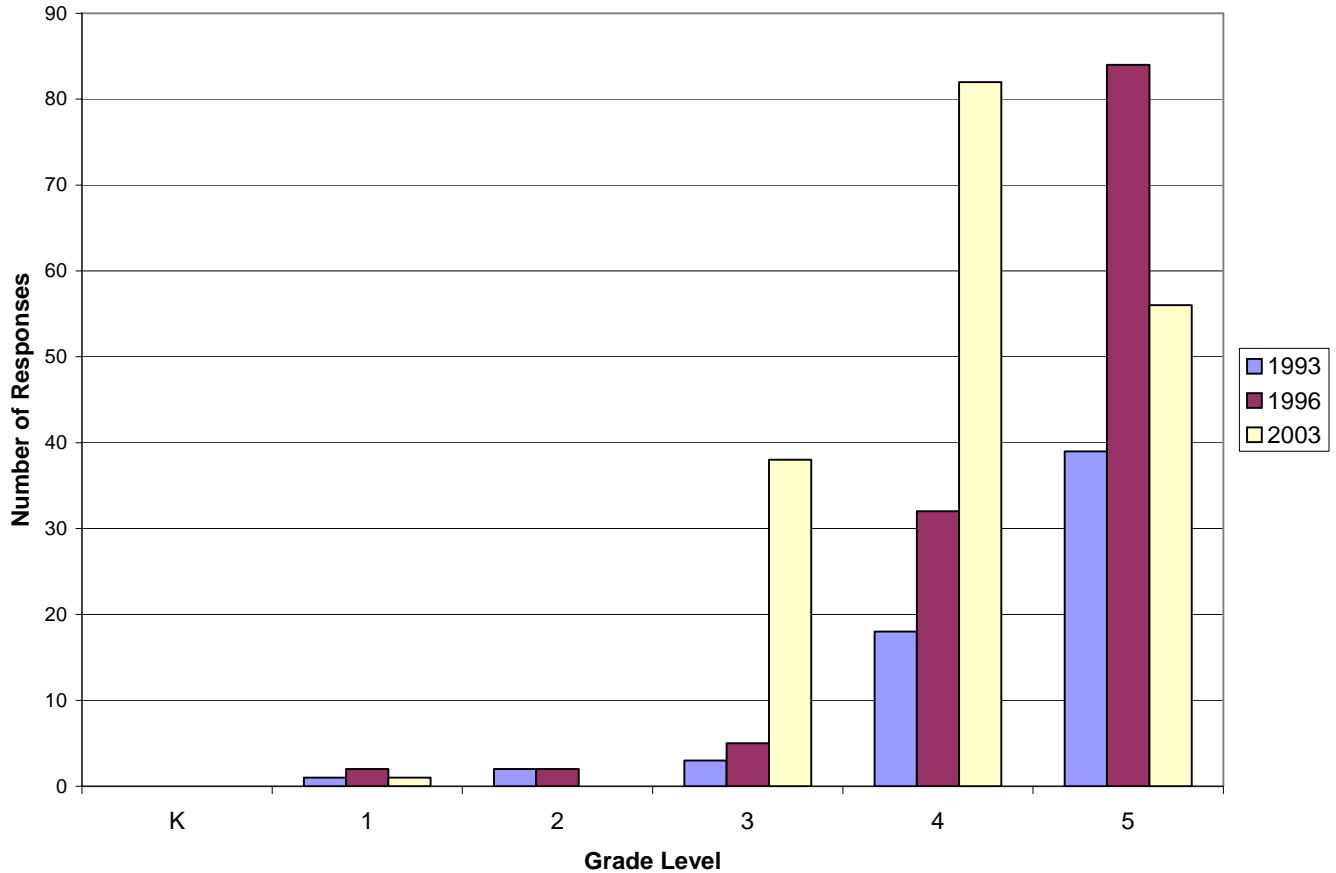
Respondents were asked to identify what textbook, if any, was used in teaching keyboarding. In the 2003 survey, 132 responses (61%) indicated that no textbook was used. Most schools preferred to use software for instruction. However, of the textbooks that were used, “Paws” textbooks (*Paws Presents Computer Keyboarding or Computer Keyboarding, An Elementary Course*) received the most responses in all three studies—26 responses (12%) in 2003; 67 (32.4%) in 1996; and 35 (22.9%) in 1993. Another popular textbook, *I Can Keyboard*, received 18 responses (8.3%) in 2003; 33 responses (15.9%) in 1996; and 25 responses (16.3) in 1993.

Once the touch method of keyboarding was introduced, reinforcement of correct keystroking was measured. Table 7 compares data from 1993, 1996, and 2003. In 2003, 177 schools (81%) reported keyboarding reinforcement, compared to 205 (99%) in 1996 and 105 (68.6%) in 1993. The largest percentage of reinforcement occurred in the year following the introduction. For example, in 2003, the third grade received the most responses for the introduction of keyboarding and therefore, fourth grade received the most responses, 82 (46.3%) for reinforcement, with 45 schools (25.4%) indicating reinforcement in the fifth grade.

In 1996 and 1993, fourth grade received the greatest percentage of responses for the introduction of keyboarding; therefore, fifth grade received the most responses for reinforcement. Many school districts in all three surveys reported that the keyboarding skill was reinforced at every grade level following the introduction.

**Table 7**

***Keyboarding Reinforcement***



Note: 1993 N = 153; 1996 N = 207; 2003 N = 218

The amount of time allocated for reinforcing keyboarding at the elementary level varied greatly. Responses varied from 2 weeks to 36 weeks. Most respondents indicated that they devoted 36 weeks for reinforcing keyboarding skills.

When asked what textbook was used for the refresher class, the various Paws texts received the most responses in all three surveys, 2003, 1996, and 1993. When asked what software was used for the refresher class, the same software used for introducing keyboarding was also used for refreshing keyboarding skills. For example, in 2003, *Type to Learn/Type to Learn, Jr.* received the most responses in introducing keyboarding instruction and, therefore, received the most responses, 40 (22.6%) based on 177 total responses to this question.

Respondents were asked how many days/weeks word processing/formatting was taught and what software was used. In the 2003 survey, 104 school districts responded to this question. Many respondents indicated that word processing was integrated into other subject

areas and not taught separately. The weeks dedicated to teaching word processing/formatting varied from 2 weeks to 36 weeks. One day a week received the most responses in 2003. Microsoft Word dominated the responses in 2003 with 75 responses (72%) as the software preferred for word processing/formatting, followed by AppleWorks with 16 responses (15.4%). In previous studies AppleWorks had 28 responses (18.3%) in 1993 and 44 responses (21.3%) in 1996. Microsoft Works software gained in 1996 from 8.5% (13) in 1993 to 21.3% (44) in 1996.

When asked what curricular areas where keyboarding/word processing was integrated, language arts received the most responses in all three studies. Social Studies and Science also received a large number of responses.

Over the ten-year period, 1993—2003, the type of computer used for elementary keyboarding instruction has changed. In 1993, Apple IIGS, Macintosh, and Apple IIe computers dominated in elementary school buildings with 73% Apple environments and 27% IBM/PC computers. By 1996, Apple still dominated, but IBM/PC computers gained, representing 48% compared to 52% Apple environments. However, by 2003, PC computers dominated in elementary school buildings with 62.8%, compared to 23.3% Apple/Macintosh computers. Gaining increased popularity, battery operated keyboards (AlphaSmarts) received 12 responses representing 13.9% of all responses (N = 258). Several respondents reported using more than one kind of computer or keyboard.

The 2003 survey asked respondents whether or not a grade for keyboarding instruction was included on a report card. An overwhelming 140 responses (69.7%) indicated that no grade was given for elementary keyboarding. Sixty-one (30.3%) respondents, however, indicated that a grade was included on elementary students' report card.

When asked what the maximum expectation for a one-minute timing was at each grade level, most responses indicated between 10—15 wpm (words per minute) for students in grades two through four, and 15—20 wpm for fifth-grade students. Many respondents indicated that speed was not measured or the wpm was not known.

## **Conclusions**

The following conclusions may be drawn based on the findings of this study:

1. Over the ten-year period (1993—2003) more elementary schools are including keyboarding instruction in the curriculum. The number of schools offering keyboarding instruction in kindergarten through fifth grades has increased.
2. Keyboarding instruction is being included in the elementary curriculum at earlier grades. More kindergarten, first, and second grade students are starting with an early awareness of keyboarding.

3. Third grade received the most responses in 2003 regarding when the formal introduction of the touch method of keyboarding was introduced, compared to fourth grade in 1996 and 1993.
4. Elementary classroom teachers are the primary instructors in teaching keyboarding skills. In previous years, the business education teacher was mostly responsible for teaching keyboarding. To assist in teaching keyboarding, media specialists or technology coordinators are working with the classroom teacher.
5. School districts are using a combination of software and keyboarding materials to teach keyboarding and for reinforcement at multiple grade levels.
6. A keyboarding software package was preferred over using a textbook for keyboarding instruction.
7. The most common instructional time for teaching keyboarding in 2003 was 30 to 40 minutes once a week for 36 weeks. Many schools reported teaching keyboarding every day for 6 weeks for 30—45 minutes, which was the most common instructional time reported in 1996 and 1993.
8. Reinforcement of keyboarding instruction was considered important as once the touch method was introduced, most school districts indicated subsequent reinforcement. Many school districts indicated that the skill was reinforced at every grade level following the introduction.
9. The software/textbook used for refreshing keyboarding skills was the same material used for the introduction of keyboarding.
10. Microsoft Word was the most preferred software for word processing/formatting in 2003. AppleWorks and Microsoft Works received the most responses in 1996 and 1993.
11. Keyboarding/word processing was integrated most with language arts and social studies.
12. Over the ten-year period from 1993—2003, the type of computer used for elementary keyboarding instruction changed from Apple computers to PC environments.
13. Battery-operated keyboards are becoming popular in teaching keyboarding as the availability of the only computer lab in the elementary school building is scheduled for other purposes.
14. Most respondents in 2003 indicated that a specific grade was not given to students for elementary keyboarding instruction.
15. The maximum expectation for a one-minute timing (speed) was between 10—15 wpm for students in Grades 2 through 4, and 15—20 wpm for fifth-grade students.

## Discussion

School districts are realizing the importance of keyboarding skills for elementary children. Learning an efficient inputting skill is as basic as learning handwriting in today's technology-driven world. As more school districts include elementary keyboarding instruction in the elementary grades, elementary classroom teachers are being asked to teach these skills. These teachers need instruction and direction as to the methodology in developing a psychomotor skill.

School districts need to develop a K—12 computer technology curriculum that includes keyboarding instruction. This keyboarding instruction needs to be structured, consistent, and sequential:

“Structured” means that a designated amount of time is scheduled for keyboarding instruction. The recommended amount of time devoted to formal keyboarding instruction is 30 to 40 minutes every day or several days a week until all the keys have been introduced. The grade level that formal keyboarding instruction is scheduled varies from school district to school district. The appropriate grade level for the formal introduction of the touch method of keyboarding will depend on when children are inputting sentences frequently to the point that bad habits are being formed. Formal introduction needs to precede frequent computer use. Whenever children are using the computer, correct computer posture and techniques need to be taught and reinforced.

“Consistent” means that every student receives keyboarding instruction. Children that miss keyboarding instruction because of band or music lessons are at a definite disadvantage because of the additional memorization of key locations that were presented in their absence. These children will have to memorize the keys missed in addition to the new keys being presented in the next lesson.

“Sequential” means that once the keyboarding instruction begins, reinforcement continues in succeeding grades. Studies indicate that keyboarding is a skill that progresses through the years. Children should be required to use correct keyboarding techniques whenever using the computer. All classroom teachers, librarians, technology coordinators, and computer lab aides should require children to use correct keyboarding techniques. Structured reinforcement of keyboarding leads to children attaining a usable skill, thereby reducing frustration and maximizing computer time. Children with a usable keyboarding skill concentrate on what they are keying and not where the keys are located.

Prior to formal keyboarding instruction, early keyboarding awareness is necessary for children to learn correct computer posture, left/right hand placement, homerow location, and correct operation of the enter/return, space bar, and backspace/delete keys.

Software programs are becoming popular to assist elementary classroom teachers in teaching keyboarding. While software programs have many advantages, the main disadvantage is confirming that children are actually using correct techniques as they

complete each lesson. Observation is essential by a knowledgeable instructor in requiring children to use the touch method of inputting.

Studies indicate a dramatic increase in language arts skills as a result of children inputting words and sentences frequently using a computer. Keyboarding and language arts are a dynamic duo. Keyboarding should be integrated with language arts and other subject areas, such as social studies and science. Word processing of projects in academic subjects is easier when children possess a usable keyboarding skill.

### References

- Anderson-Inman, L. (1990). Keyboarding across the curriculum. *The Computing Teacher*, 17 (8), 36.
- Elementary/middle school keyboarding strategies guide. (1992). Reston, VA: National Business Education Association.
- Education World: Technology in the Classroom (2003). Teaching keyboarding—when? Why? How? Retrieved April, 2003. <http://www.educational-world.com/atech/archives/keyboard.shtml>.
- Erickson, L. (1993). *Basic keyboarding guide for teachers*. Cincinnati, OH: South-Western Publishing Co.
- Erthal, M. (1998). Who should teach keyboarding and when should it be taught? *Business Education Forum*, 53 (1), 36-37.
- Hoggatt, J.; Shank, J.; and Trabel, D. (2004). *Bernie's Typing Travels*. Cincinnati, OH: South-Western.
- Hoot, J. (1986). Keyboarding instruction in the early grades: Must or mistake? *Childhood Education*, 63 (2), 95-101.
- International Society for Technology in Education. (2000). *National educational technology standards for students: Connecting curriculum and technology*. Eugene, OR: International Society for Technology in Education in collaboration with the U.S. Department of Education.
- Lambourne, P. (1992). Striking fourth graders—the ideal time for teaching keyboarding skills. *Occupational Therapy Forum*, June 3, 4-5.
- McKay, M. (1998). Technology and language arts: Great support for every classroom! *Book Report*. 17(3), p.33-36.
- National Business Education Association. (2001). *National standards for business education: What America's students should know and be able to do in business*. Reston, VA: National Business Education Association.
- Nieman, P. (1996). Introducing early keyboarding skills. *Business Education Forum*. 51 (1), 27-30.

Owston, R. and Wildeman, H. (1997). Word processors and children's writing in a high-computer-access setting. *Journal of research on computing in education*. 30(2), 202-216.

Policies Commission for Business and Economic Education (1997). Policy Statement 35: This we believe about keyboarding. *Policies statements: Policies commission for business and economic educational*. Cincinnati, OH: South-Western/Thomson.

Prigge, L. and Braathen, S. (1993). Working with elementary students in keyboarding. *Business Education Forum*, 48 (1), 33-35.

Rogers, H. (1997). A longitudinal study of elementary keyboarding computer skills. *Academy of Education Leadership Journal* 1(2), 55-57.

Rogers, H. (2003). Elementary keyboarding issues. Retrieved August 10, 2003, from <http://academics.edu/cni/rogers>.

South-Western/Thomson. (2003). Retrieved April 5, 2003, from <http://www.swep.com>.

*Type to Learn* (1986). Pleasantville, NY: Sunburst Communications.

Wisconsin Department of Public Instruction (1991). Keyboarding—a position paper on keyboarding. Joan Blank Loock, Consultant for Business Education, Madison: Wisconsin.

Wisconsin Department of Public Instruction (2003). Wisconsin Model Academic Standards—Information Systems/Technology. Retrieved July 24, 2003, from <http://www.dpi.state.wi.us>.