THE EFFECT OF ELEMENTARY SCHOOL KEYBOARDING INSTRUCTION ON STUDENTS' WRITING ASSESSMENT SCORES

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Abstract

***Purpose**: The purpose of this study was to determine if there was a difference in the writing scores for each of four traits—development, focus and organization, language, and conventions—as measured by the Tennessee Comprehensive Assessment Program (TCAP) writing assessment for students who had a formal keyboarding course versus those who did not have formal keyboarding instruction. **Method**: A causal-comparative ex post facto research design was used. The Statistical Package for the Social Sciences Version 22 using the chi-square Pearson's test was used to analyze data for all research questions. The test value for alpha (∞) was at the .05 level of significance for each null hypothesis. **Results**: For all null hypotheses, the p value was greater than .05 for each grade level as well as for the total of all grade levels. The chi-square test results showed no dependency between test scores and keyboarding instruction. There was no statistically significant difference in the TCAP writing assessment scores for each of the four traits for Essay 1 or Essay 2 for students who had a formal keyboarding course compared to those who did not. However, there was a practical difference as shown in the pass rate percentages.*

Introduction

Personal computers first appeared in elementary classrooms in the 1980s. Students worked with the computers but were not initially provided instruction in correct keyboarding techniques. By the time these students enrolled in high school keyboarding classes, they had already developed poor habits (Erthal, 1998).

In 1983 the National Business Education Association (NBEA) appointed a task force to forecast how business education relates to each level of education. The task force determined that computer use should be a part of instruction through each grade level. NBEA concluded that students at the elementary level must learn to use computers properly as well as learn proper keyboarding techniques (Bartholome, 2003). Learning to type is no longer viewed as simply vocational learning. Keyboarding is a life skill as well as a literacy skill (Dickerson, 2007).

In contemporary elementary schools, standardized testing is frequently administered via computer. Thus, it is imperative to begin teaching keyboarding and word processing skills at the elementary school level; and students should practice these skills in the same manner that they will be tested.

Review of Literature

The introduction of early keyboarding instruction reduces poor habits and improves spelling, writing, and reading comprehension (Zeitz, 2008). Typewriting

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studies have shown that elementary-age children are capable of keying correctly and that typewriting (keyboarding) enhances learning in language arts. In addition to helping students learn to read, write, and spell, Bartholome (2003) found that the added use of the computer and keyboard improves students' attitudes toward their own schoolwork. Word processing programs give students the ability to organize their ideas, to produce more coherent writing, and to work with large quantities of data more efficiently (Trapasso, 2015).

Keyboarding as a Cognitive Automation Skill

Davis, Christodoulou, Seider, and Gardner (2012) explained the difference between intelligence and skill. They stated that skills are a product of intellectual work. More specifically, skills are the cognitive performances that are a result of intelligences. Typing skill requires a person to receive feedback from touch, kinesthetic/motor memory, and vision sensory systems. As typing skills increase, the kinesthetic/motor memory takes over for vision. The fingers know how to locate commonly used keys just as they know how to print letters (Stevenson & Just, 2014).

When students perform a task such as typing, skill level affects the cognitive performance. Cognitive automaticity, the ability to perform a task without conscious awareness, allows more space for higher-order thinking (Trubek, 2011). Automaticity in keyboarding requires individuals to type without thinking about the individual keys (Zeitz, 2008).

In *Higher-Order Thinking Skills to Develop 21st Century Learners*, Conklin (2011) explained how higher-order thinking skills include both critical and creative thinking, noting that "higher-order thinking skills will increase academic achievement as well as produce lifelong learners" (p. 1). Conklin cited Progrow's research, which indicated that higher-order thinking skills alone substantially increased student performance on a variety of standardized tests. Conversely, Barkaoui (2013) stated that "poor keyboarding skills may force test-takers to focus their attention and cognitive resources on motor activities and, consequently, other processes and aspects of writing might be left unattended to, which can lead to poor text quality and lower test scores" (p. 1). Figure 1 charts the effect of keyboarding skills on a student's cognitive performance.

Touch typing is an example of a cognitive automation skill. Learning to type by touch allows writers to focus on their writing, which leads to better test scores. According to Connelly, Gee, and Walsh (2007), "An increase in the amount demanded by one component, such as transcription (handwriting or typing), will mean fewer cognitive resources are available for the other components" (p. 1). Consequently, children who do not develop these skills may be limited in the quality of the work they can produce due to having fewer cognitive resources accessible to work effectively on the writing task. Children must become fluent in keyboarding to develop writing skill using a word processor just as it is necessary

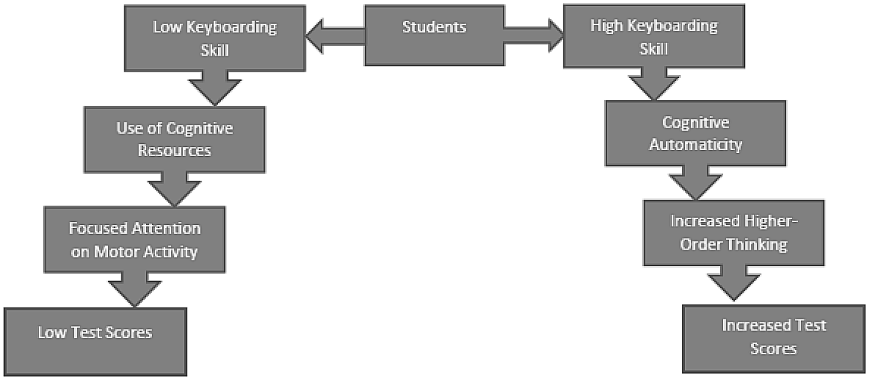

Figure 1: Cognitive Performance.

for children to learn how to use pencil and paper before learning to compose by handwriting.

Impact of Keyboarding Skills on Open-Ended Computerized Test Scores

Many states have recently switched to computerized, standardized student assessment tests. Various methods of research have focused on keyboarding and computer skill levels and their impact on writing assessments. Beginning in the 1990s, several states added written components to their student assessments. Russell and Haney (1997) researched the effect computer versus paper and pencil testing had on the performance of 120 middle school students on multiple choice and written test questions. Results showed that students accustomed to writing on computers were more successful. Although Russell and Haney (2000) recognized the increased use of computers in schools, they did not see the computers utilized in state testing.

Shorter (2001) examined third-grade students in four classrooms to determine if directed or independent keyboarding instruction affected composition fluency and quality. Two classes were randomly assigned to the experimental group, and two were assigned to the control group. The experimental group was divided into two sub-groups: directed keyboarding or independent keyboarding. Students spent 20 minutes each day on keyboarding instruction for 12 weeks. The students did show progress in keyboarding skills, but only a small number exceeded their handwriting speed. The researcher was unable to determine the effects of keyboarding on composition fluency and quality due to the lack of students who were proficient in keyboarding. However, this study did determine that the most effective method to improve keyboarding skills is for students to be directed by a teacher.

Connelly et al. (2007) researched 300 primary school children in the United Kingdom in a study that measured handwriting and keyboarding fluency. The

students' ages ranged between four and eleven years. All students received communication technology training (mainly word processing and PowerPoint) that was suited to each age level. All students completed a composition by hand and by keyboard. Results showed that handwriting speed was consistently faster than keyboarding speed. Test results for the keyboarding compositions were up to two years behind the handwritten compositions by grade level.

Trapasso (2015) studied 62 fifth-grade students in an experimental design study. Typing speed and handwriting speed were evaluated. The typing and handwriting speeds were moderately correlated with each other. Participants composed a written and typed curriculum-based measurement for written expression. Each writing sample was scored on total words written and writing sequences. When handwritten and typed scores were compared, results showed a significant difference for the production-dependent variables but no significant difference for the performance-dependent variables.

Purpose of the Study

The purpose of this study was to determine if there was a difference in the writing assessment scores for each of the four traits—development, focus and organization, language, and conventions—as measured by the Tennessee Comprehensive Assessment Program (TCAP) writing assessment of students who had a formal keyboarding course compared to those who did not.

Methodology

This study investigated students with various levels of keyboarding skill to determine if keyboarding skill level made a difference on writing scores of tests that were administered via computer through a comparison of computerized (TCAP) writing assessment scores. A quantitative research design was used. More specifically, a causal-comparative *ex post facto* research method was used since the research intended to establish a cause-effect relationship between data that were collected after the fact (Johnson, 2001).

The following eight research questions guided this study:

1. Is there a difference in the TCAP writing development trait scores on Essay 1 for students who were enrolled in a formal keyboarding course compared to those who were not?
2. Is there a difference in the TCAP writing focus and organization trait scores on Essay 1 for students who were enrolled in a formal keyboarding course compared to those who were not?
3. Is there a difference in the TCAP writing language trait scores on Essay 1 for students who were enrolled in a formal keyboarding course compared to those who were not?

4. Is there a difference in the TCAP writing conventions trait scores on Essay 1 for students who were enrolled in a formal keyboarding course compared to those who were not?
5. Is there a difference in the TCAP writing development trait scores on Essay 2 for students who were enrolled in a formal keyboarding course compared to those who were not?
6. Is there a difference in the TCAP writing focus and organization trait scores on Essay 2 for students who were enrolled in a formal keyboarding course compared to those who were not?
7. Is there a difference in the TCAP writing language trait scores on Essay 2 for students who were enrolled in a formal keyboarding course compared to those who were not?
8. Is there a difference in the TCAP writing conventions trait scores on Essay 2 for students who were enrolled in a formal keyboarding course compared to those who were not?

The population of the study consisted of students from one suburban middle school in a middle Tennessee county during the 2014–2015 school year who received a score on at least one essay of the TCAP writing assessment. Essay 1 included 916 participants, and Essay 2 included of 906 participants. The number of participants varied between essays due to 10 special education students who responded only to Essay 1. The dependent variables in this study were the 2014–2015 TCAP writing assessment scores for each of the four traits of all students in the middle school. The independent variable was formal keyboarding instruction, which was scheduled at this middle school as a nine-week exploratory course.

The TCAP writing assessment was required for all Tennessee students in Grades 3–11 and was administered in February 2015. State school districts had a testing window of February 2–27 to complete the test. Students in grades 6, 7, and 8 had two separate writing prompts to read and respond to with two independently constructed response essays. The writing prompts consisted of science or social studies texts and did not require any prior background knowledge. Selected texts consisted of passages from previously published sources and were reviewed by teachers. The texts and rubric were aligned to each grade level as determined by Tennessee's English Language Arts standards, thus ensuring the assessment's validity and reliability. The allotted test time was 2.5 hours with 2 hours of assessment time and a 30-minute break. The test was administered online using the Measurement Incorporated Secure Testing (MIST™) program.

The authors of the TCAP writing assessment, Measurement Incorporated, hired and trained evaluators who used two separate rubrics developed by a committee of educators to score student essays. Each essay had a specific rubric for grading and was scored independently. One rubric was used to assess an argumentative essay; the other was for an informational/explanatory essay. The scoring rubric for each

essay included four traits: development, focus and organization, language, and conventions. Each trait was scored individually on a 4-point scale, with 4 being the highest. Students received a separate score for each of the four traits.

Students had been assigned randomly to a keyboarding class by computer-generated scheduling. A nine-week keyboarding course was part of an exploratory class rotation for middle schools. Participants for this study were grouped based on this prior scheduling. The sixth-grade participants completed 16 alphabetic keyboarding lessons from the *9th Edition Century 21 Computer Applications and Keyboarding* textbook. The lessons were teacher directed, which meant the students received instruction from the teacher instead of a computer program. The seventh- and eighth-grade participants completed 20 alphabetic keyboarding lessons using the MICROTYPE 5 software. These lessons involved independent instruction. The teacher demonstrated and then monitored students during the MICROTYPE 5 lessons.

An application was submitted to the Tennessee State University Institutional Review Board (IRB) for research approval. Upon approval from the IRB, a written request was submitted to the Assistant Superintendent for Curriculum and Instruction of the county to obtain permission to conduct this study. Another written request was submitted to the principal of the selected middle school to request approval to obtain data from the computerized TCAP writing assessment and keyboarding course rosters. Information regarding school and student confidentiality was included in both letters.

Once approval was granted, test data were collected as an Adobe .pdf file. That file was converted into a Microsoft Excel spreadsheet and then transferred to SPSS Version 22. Data were analyzed in SPSS using the chi-square Pearson's test for all research questions. The chi-square test was selected since the research sought to determine if there was a significant difference between two or more categorical variables from a single population. The test value for alpha (∞) was at the .05 level of significance for each null hypothesis.

Findings

For each null hypothesis the p value was greater than .05 for each grade level as well as for the total of all grades. Chi-square test results showed no dependency between test scores and a keyboarding course. These results indicate that there was no statistically significant difference in the TCAP writing assessment scores for each of the four traits—development, focus and organization, language, and conventions—for Essay 1 or Essay 2 of students who had a formal keyboarding course compared to those who did not.

Although the chi-square statistic results indicated no dependency between TCAP writing assessment scores and having taken a keyboarding course, there was a practical difference, as shown in the pass rate percentages. The pass rate is the percent of students who scored a 1, 2, 3, or 4 on the specific trait, with 1 being

the lowest possible score and 4 being the highest. The pass rate percentage was important to the research because it showed that the percentage of participants who scored a 4 was higher or equal in every grade level for students who had keyboarding. The total percentage of participants who scored 4 was also higher for students who had keyboarding. Descriptive information from the pass rate of 4 was higher for keyboarding; however, the statistics show that there was no statistically higher difference.

Limitations of the Study

This study did not consider the language arts or writing class scores of the participants. The research focused on the keyboarding skill of students who participated in a formal 9-week keyboarding course and the difference in TCAP writing assessment scores. Writing ability and prior keyboarding experience were not factors in this research. However, all students from the school population performed poorly overall on the TCAP writing assessment, regardless of keyboarding skills, which suggests poor writing skills may not be overcome by participation in a keyboarding course.

Recommendations for Further Research

The TCAP writing assessment may not have been an ideal form of assessment to determine whether a formal keyboarding course makes a difference on computerized test scores. Thus, a more suitable form of assessment should be used for future keyboarding studies. A second recommendation is to increase the number of participants who were enrolled in a formal keyboarding course. In this study, 35% of the participants had a keyboarding course and 65% did not. This difference in enrollment numbers may have been a factor in the flawed premise that students who type well perform better on the computerized TCAP writing assessment. Increased numbers for comparison might provide a more balanced distribution of the pass rate.

Epilog

Students are required to use computers in schools as early as kindergarten, yet many do not receive proper instruction to prepare them for future standardized testing. Children today grow up in a digital world in which education has been transformed by the increased use of computers and the Internet (Peterson, 2005). Keyboarding and word processing skills are extremely important in early education. Students should be encouraged to use these skills to communicate and collaborate with others. Using computers when writing allows students to revise and edit, which gives them a better sense of control over their writing.

Implementation of keyboarding and computer curriculum in many elementary and middle schools is a work in progress. School leaders must determine what

role computers and technology curricula will play in their schools. Decisions must be made regarding computer integration into core subjects and professional development for teachers, among other issues (Dooling, 2000). As Dooling (2000) noted, "If we want children to learn technology, they've got to use technology" (p. 1).

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