

Effect of computer-based instruction on students' functional task performance

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Abstract

This study was designated to examine the effectiveness of Computer-based intervention (CBI) on high school students' reading performance and self-efficacy. Fifty high school students from 2 resource rooms were recruited. The students in the experimental group (CBI group) received training on the Kurzweil 3000 by the classroom teacher and the researcher and use the Kurzweil to do homework/coursework for 10 weeks. The control group did homework/coursework using paper and pencil. Scholastic Reading Inventory (SRI), Self-Perception Profile for Adolescents (SPPA; Harter, 1987), and Self-Perception Profile for Learning Disabled Students (SPPLD; Renick & Harter, 1988) were obtained to compare the changes prior to and following the study period. The CBI intervention has a significant effect on students' reading comprehension scores. In addition, there was significant difference between CBI and control group students' self-efficacy in reading competence the pre- and post-study period. The study results suggested that this reading enhancement software program is an effective CBI tool to enhance students' reading comprehension and self-efficacy in reading.

Keywords: Computer-based instruction, Kurzweil 3000, self-efficacy

1. Introduction

CBI is one of many acronyms applied to educational or instructional software. It stands for Computer-Based Instruction (Hagan, 2004). Computer-based instruction (CBI) is the term used in academic areas such as reading, writing and mathematics skills for students with learning disabilities. Additionally, CBI is the broadest terms and can refer to virtually any kind of computer use in educational settings, including drill and practice, tutorials, simulations, instructional management, supplementary exercises, programming, database

development, writing using word processors, and other applications (Cotton, 1991).

There is limited, but growing evidence to support the use of CBI in the classroom. Evidence shows that CBI appears to have positive effects on students' academic performance, motivation, and attitude (Collins, 1990; Borgh & Dickson, 1992; Elkind, Elkind, Hecker, Burns, & Katz, 2002; Elkind, 1998; Elkind, Black, & Murray, 1996; Elkind, Cohen, & Murray, 1993; Lewis, 1998; Raskind & Higgins, 1998; Raskind & Higgins, 1995).

1.1 Software program- Kurzweil 3000 and Massachusetts Comprehensive Assessment System (MCAS)

The reading software program Kurzweil 3000 is designed to help kindergarten to 12th grade students with special needs meet the requirements of the No Child Left Behind Act, such as Massachusetts Comprehensive Assessment System (MCAS), by presenting text on computer screens with visual and added auditory accessibility. This software will read text displayed on the computer screen so that users can hear and see what is displayed. This type of technology can be particularly helpful to individuals who exhibit no difficulty in comprehending spoken language yet have problems understanding language in the written form (Raskind & Higgins, 1998). In addition, students can apply the study skill tools provided by Kurzweil 3000, such as Web-reading capability, changing the speed, tone and pitch of the synthesized speech, highlighting the content, quick access to word meanings, noting taking, and even using the built-in talking word processor to compose and proofread paragraphs. Currently, most Boston Public Schools use the Kurzweil 3000 as a reasonable accommodation for students with special needs to take the MCAS.

1.2 Reading performance and CBI

Research has demonstrated that repeated readings are useful increasing a child's participation and language output (Teale & Sulzby, 1987). CBI provides a simulated reading context and the opportunity for individuals to read with less effort. Extensive opportunities to hear written language read aloud and computer supports for independent reading (and writing) would be important components of intervention programs for individuals with cognitive, physical or mixed disabilities (ASHA, 2001) There have been a small number of studies conducted that address the effectiveness of reading performance on computerized text-readers (functions that are available with Kurzweil 3000). Elkind et al. (2002) reported that the regular use of Kurzweil 3000 by students with diagnosed Attention Deficit Disorder allowed students to better attend to their reading, reduced distractibility, and increased student reading speed and amount of time they spent reading. Elkind (1998) reported that use of Kurzweil 3000 by students with diagnosed learning disabilities resulted

in improved reading rate, improved comprehension, and increased the amount of time students attended to reading tasks. The computerized text-reader was also reported to enable the students with dyslexia to read with greater comprehension and perform more effectively in reading-related tasks associated with school and work (Elkind, Cohen & Murray, 1993). In addition, adult students with reading disabilities have reported that reading with CBI was less tiring and less stressful so they could sustain reading longer and their reading rate and comprehension were enhanced (Elkind, Black & Murray, 1996).

1.3 Students' perceived self-efficacy

The perceived academic self-efficacy is defined as personal judgments of one's capabilities to organize and execute courses of action to attain designed types of educational performances (Bandura, 1977). Students' beliefs in their efficacy to regulate their own learning and to master academic activities determine their aspirations, level of motivation and academic accomplishments (Bandura, 1993). As Bandura would put it, academic self-efficacy refers to people's convictions about their own capabilities for successfully executing a course of action that leads to a desired outcome.

High academic self-efficacy is shown to be a very strong predictor of academic achievement (Bandura, 1997; Multon, Brown, & Lent, 1991; Pajares, & Miller, 1994). Increased self-efficacy is accompanied by enhanced intrinsic motivation, the ability to sustain high levels of motivation and achievement-oriented behavior, persistence in the face of difficulties, and better problem solving (Bandura, 1997). Numerous studies demonstrated that efficacy beliefs are influenced by the acquisition of cognitive skills, but they are not solely the reflection of them (Bandura, 1997). Studies have shown that children with the same level of cognitive skills differ in their intellectual performances depending on the strength of their perceived self-efficacy (Schunk, 1989). Moreover, perceived self-efficacy is a better predictor of intellectual performance than skill alone (Bandura, 1997).

Currently, few studies have been conducted to assess students' perceived self-efficacy after intensive CBI. The present study focuses on this variable. In addition, the effectiveness of this specific reading software on high school students' reading comprehension was investigated in this study.

2. Methodology

This is a pre-post test control group design research. Fifty high school students with special needs (i.e., learning disability, Attention Deficit Hyperactivity Disorder, Attention Deficit Disorder, emotional disturbance, etc.) were recruited from two classrooms at a public high school in Massachusetts. There were no significant differences between control and CBI group on their gender ($\chi^2(1, N=50) = 1.282; p > 0.05$), age ($t(48) = .598; p > 0.05$), and race ($\chi^2(3, N=50) = 7.371; p > 0.05$). Students were divided into two groups by class, each with equal numbers of students with disabilities. The students in the experimental group (CBI group) received training on the Kurzweil by the classroom teacher and the researcher and use the Kurzweil to do homework/coursework for 10 weeks. The control group will not use the Kurzweil and will do homework/coursework using paper and pencil. Scholastic Reading Inventory (SRI), Self-Perception Profile for Adolescents (SPPA; Harter, 1987), and Self-Perception Profile for Learning Disabled Students (SPPLD; Renick & Harter, 1988) were obtained to compare the changes prior to and following the study period.

2.1. Instruments

The assessment tools used in this study were as follows:

- 1) Scholastic Reading Inventory (SRI): the SRI is a reading comprehension test that assesses students' reading levels and tracks students' reading growth over time. Its validity has been assessed in large studies.
- 2) Self-Perception Profile for Learning Disabled Students (SPPLD; Renick & Harter, 1988): The SPPLD is a self-report measure for assessing both children with LD and normally achieving children in terms of their domain-specific judgments of their competence and their perceived worth or esteem as a person. The SPPLD assesses nine domains of self-perception: general intellectual ability, reading competence, spelling competence, writing competence, math competence, social acceptance, athletic competence, physical appearance, and behavioural conduct. A global self-worth score is also obtained. The nine scales are distinct from each other, with limited to moderate intercorrelations. For the purposes of the present study, the researcher will

only use the General Intellectual Ability Subscale, Reading Competence Subscale, Writing Competence Subscale, Spelling Competence Subscale and the Math Subscale.

(3) Self-Perception Profile for Adolescents (SPPA; Harter, 1987): SPPA assesses adolescents' self-perceptions of competence in the domains of athletics, behavioral conduct/morality, close friends, jobs, romantic appeal, scholastics, social acceptance (by peers), and global self-worth. Each response is scored on a Likert-type scale ranging from low competence (1) to high competence (4). High mean scores reflect high perceived competence in a given domain. For the purpose of the present study, the researcher will only use the Scholastic Competence Subscale.

Table 1
Research questions and instruments

Research questions	Instruments	Subscales
<i>Does regular use of Kurzweil 3000 significantly affect students' academic self-efficacy?</i>	Scholastic Competence Subscale of Self-Perception Profile for Adolescent (SPPA) Self-Perception Profile for Learning Disabled Students (SPPLD)	Scholastic Competence General Intellectual Ability Writing Competence Spelling Competence Reading Competence Math Competence
<i>Does the daily use of Kurzweil 3000</i>	Scholastic Reading	

<p><i>significantly improve the reading comprehension scores of high school students with special needs?</i></p>	<p>Inventory (SRI)</p>
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3. Result

3.1. Scholastic Reading Inventory (SRI)

An Independent-Samples T Test was applied to ensure that there was no significant difference between control and CBI group on their pre-test scores of SRI ($t(43) = .439; p > 0.05$). The repeated measures were applied to determine whether the changes (differences) of SRI scores in CBI group were significantly different from the changes of SRI scores in control group. The study results suggested there were significant differences between CBI and control group on their reading comprehension scores from SRI test pre-and post the study period ($F(1,43) = 4.28, p = 0.13$).

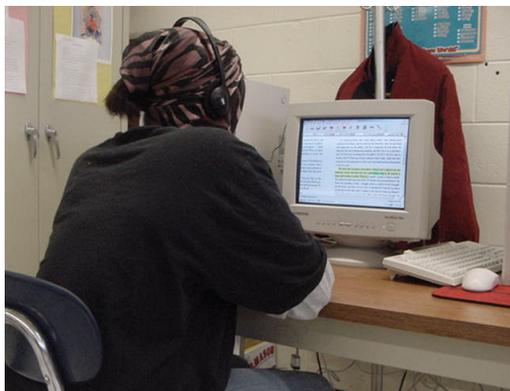


Figure 1 Using CBI to read

3.2. Self-Perception Profile for Learning Disabled Students (SPPLD) & Self-Perception Profile for Adolescents (SPPA)

The repeated measures were applied to determine whether the changes (differences) of subscales scores of SPPLD in CBI group were significantly different from the changes of subscales scores of SPPLD in

control group. The researcher found that there was significant difference in between CBI and control group on their Reading Comprehension Subscale scores pre-and post the study period ($F(1,47) = 6.718, p = 0.045$). There were no significant difference found in General Intellectual Ability Subscale ($F(1, 47) = 2.984, p > 0.05$), Writing Competence Subscale ($F(1, 47) = .441, p > .05$), Spelling Competence Subscale ($F(1, 47) = 2.197, p > .05$) and the Math Subscale ($F(1, 47) = .705, p > .05$).

The repeated measures were applied to determine whether the changes (differences) of subscale scores of SPPA in CBI group were significantly different from the changes of subscale scores of SPPA in control group. The researcher found that there was no significant difference in between CBI and control group on their Scholastic Comprehension Subscale scores pre-and post the study period ($F(1,47) = .323, p > 0.05$).

4. Discussion

From the positive results on students' reading comprehension scores and the improved self-efficacy in their reading competence of this study, this CBI tool might be considered a useful tool to assist students who have special needs and as an accommodation to help them compensate for their learning differences. In other words, Kurzweil 3000 could be helpful in bypassing certain disabilities the students have. It could sharpen their study habits by providing the following:

- 1) a supportive nature of both seeing and hearing text as it is read aloud, paired with instant access to pronunciation and definition of words.
- 2) the ability to hear the text repeated as often as needed.
- 3) the ability to progress at each student's own reading pace
- 4) a text highlighting function that could assist students with remaining focused on task.
- 5) an opportunity to access texts that were written at their interest level, not just their current independent reading level.

By reading the text aloud, the software bypasses the students' decoding deficits and allows them to successfully "read" the text. In addition, the ability to hear the text as often as needed and the instant access to pronunciation and definition of words made the

students read independently, easily, accurately and quickly; meanwhile, those functions can prevent students' social embarrassment by reducing the frequencies of asking the information repeatedly, helps them to stay on task longer with less fatigue, finish assignments in a timely manner and foster success. The text highlighting feature could provide a cue to focus on one word or a segment of a sentence so the entire text on a page would not be overwhelming (Wissick, 2000). Thus, students are more willing to read.

There were a few limitations in this study. First, it was almost impossible to keep teachers blind to treatment group and control group. Due to the nature of this experimental study, the researchers needed teachers' full participation in applying the Kurzweil 3000 software program to the CBI group. Furthermore, the sample size was relatively small so it might not be representative for the population of high school students with special needs. This study's results suggested that a further investigation of the effects of CBI training with larger sample size is warranted to ascertain how it affects students' long-term academic success.

Acknowledgements

The authors would like to acknowledge the support of the Mary Tobin from Boston Public School, Massachusetts, USA.

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