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**COMPARISON STUDY OF THE READING ACHIEVEMENT OF STUDENTS
WHO HAVE PARTICIPATED IN THE FAST FORWARD PROGRAM
WITH STUDENTS WHO HAVE NOT PARTICIPATED IN THE
PROGRAM**

**By
Nancy A. Werner**

A Thesis

**Submitted in partial fulfillment of the requirements of the
Master of Arts Degree
Of
The Graduate School
At
Rowan University
May 1, 2002**

**Approved by _____
Professor**

Date Approved May 6, 2002

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ABSTRACT

Nancy A. Werner

**A Comparison Study of the Reading Achievement of Students Who Have
Participated in the Fast ForWord Program With Students Who Have Not
Participated in the Program**

2001-2002

Dr. Stanley Urban

Master of Arts in Learning Disabilities

The purpose of this study was to determine whether participation in the Fast ForWord Reading Program had an effect on reading achievement. Fast ForWord is a computer-based program that utilizes a CD-ROM as well as the Internet to enable students to learn and practice skills that are critical to language comprehension and reading development. According to Scientific Learning, the developer of the Fast ForWord Program, 40% of students need to improve their reading skills. Therefore, Scientific Learning developed a computer program that can alter speech sounds, enabling students to differentiate between phonemes, increase language skills, increase phonological awareness, expand working memory, increase processing speed, improve grammar, improve syntax, and improve sequencing.

This study evaluated the reading progress of two groups. The first group consisted of thirty-three classified students in the first through sixth grades that participated in an eight-week summer Fast ForWord Program. The second group contained twenty-six students in the second through sixth grades who did not attend the program. The students were pre tested and post tested, using the Broad Reading Component of the *Woodcock-Johnson Psycho-Educational Battery*. The data showed that groups were not equivalent at the beginning of the study, and therefore, the influence of the Fast ForWord training as a treatment to correct reading delays could not be unequivocally determined.

MINI-ABSTRACT

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CHAPTER I

INTRODUCTION

Background

The Fast ForWord Program is a computer-based program that utilizes a CD-ROM as well as the Internet to enable students to learn and practice skills that are critical to language comprehension and reading development. Each student engages in training exercises that incorporate game like activities stored on the Fast ForWord disc. The total daily session lasts for about one hundred minutes. During this time the student engages in five different computer games, each continuing for approximately twenty minutes.

Throughout each activity, computer graphics and sounds are used to provide motivation; the child receives points that are displayed as coins on the computer screen. The students are required to complete the one hundred-minute session daily, Monday through Friday, for four to eight weeks. At the end of each training session, the scores are sent to Scientific Learning Corporation in Berkley, California, via the Internet, where they are entered into a data bank. These scores are then used to determine the student's starting point for the next session. This highly individualized approach allows the student to progress according to his/her own rate. The student does not move to the next level until mastery has been attained.

Theory

According to Scientific Learning Corporation, the developer of the Fast ForWord Program, 40% of students need to improve their reading skills. It is believed that if a student has not been able to read at grade level by the third grade he/she will lose his/her enthusiasm for reading (Scientific Learning Corporation, 1997). Therefore, it is imperative that students receive additional support to assist them in improving their reading skills. The basis of the Fast ForWord Program is found in the research of Michael Merzenich and Bill Jenkins of the University of California in San Francisco. Merzenich and Jenkins have conducted in depth research in the area of brain plasticity. Their research indicated that the brain is constantly changing as it learns, therefore, frequency, reward, intensity, and motivation can be applied to increase the rate and amount of learning (Education Commission of the States, Denver, CO, 1999). Paula Tallal and Steven Miller of Rutgers University have also contributed to the evolution of Fast ForWord with their work in the area of neurological basis of language development. Merzenich, Jenkins, Tallal, and Miller have spent two decades researching the foundation for the program, which was published and marketed by Scientific Research Corporation in 1997.

From the research came the key finding that accessing technology can create an optimal learning environment. The computer can be used to alter speech sounds so that students can differentiate between phonemes, increase language skills, phonological awareness, working memory, processing speed, grammar, syntax, and sequencing. Scientific Learning Corporation has conducted intense studies of over 30,000 students as

to the effectiveness of their program and found that on average students progressed one to three years in language and reading development in a four to eight week session.

Research Question

Will the students who participated in the Fast ForWord Program make greater progress in reading than a comparable group of students who did not participate in the Fast ForWord Program?

Need for the Study

The Fast ForWord Program claims that it can assist students with reading disabilities and increase their reading ability with the participation in a four to eight week training period. It has claimed to have provided training for over 30,000 students with positive results. Scientific Learning Corporation formulated a pilot program and is using the Fast ForWord Program in over 400 schools. An independent and objective study needs to be conducted to verify Scientific Learning Corporation's results.

Value of the Study

This study would be valuable for school districts considering implementing the Fast ForWord program with their students. The Fast ForWord Program is a costly endeavor. The complete program offered requires an annual site license, which includes unlimited use of the program at one site, professional development and training, technical support and implementation, unlimited toll-free access to a customer service representative, and a Web-based resource center. The price for the site license begins at

\$29,000, with higher costs possible depending on the number of sites. A summer program license is also available for approximately \$10,000. The estimated cost per student for this program would be \$985 a year.

The Fast ForWord program requires an extensive time commitment. Any district considering utilizing this program must be able to schedule its students so that they are available to participate in the program one hundred minutes Monday through Friday for four to eight weeks. Both the cost factor and time allotments needed, require a commitment from both the school and the student, therefore any district contemplating the implementation of this program would benefit significantly from independent, objective studies conducted of the program.

Definitions

Brain Plasticity-the phenomenon that experiences affect neurons and influence connections between networks of neurons. If experiences occur over and over in time new neural groups develop, grow, and strengthen (Gillam, 1999).

Phonics – A teaching methodology, which requires students to be able to associate letter, symbols with the sounds they make. Once the symbols are mastered, the student then blends the symbols into syllables and eventually words (National Reading Panel, 1999).

Phonological Awareness – It is the ability of a person to detect rhyme, separate the sounds in words, and detect consonant and vowel sounds (National Reading Panel, 1999).

Phonemic Awareness- Phonemes are the smallest unit of sound. Phonemic awareness is the ability of a person to identify and manipulate phonemes in the spoken word. It is part of the broad term of phonological awareness (National Reading Panel, 1999).

Auditory Discrimination- The ability to identify whether two spoken words are the same or different (National Reading Panel, 1999).

Temporal Processing Deficit Hypothesis- failure in reading results from the brain's inability to sequence phonological processes. Some theorists believe it is the result of an impaired timing mechanism involved in the temporal organization of perception (Chiappe, Stanovich, and Siegel, 1997).

Limitations

The students, who participated in the Fast ForWord program, were those who had been classified as special education students. The program was offered during the summer of 2001, July 9th through August 31st. It was made available to any classified student in the district who was interested. Therefore, the students who participated were those whose parents were also interested and concerned about their child's reading progress and had the means to transport them to and from the program site. Hence, the group used during this study represented a convenience group.

Second, the students were given two post-tests. Due to budgetary meetings and deadlines, the student had to be tested by the district in September, so that the supervisor

of the special education department could report on the immediate findings of this program to the board of education to justify its existence for the future.

Third, there was a lack of control of Rosenthal effects, that is the same individual conducting parts of the training was also conducting the pre and post testing (Gillam, 1999).

CHAPTER II

REVIEW OF THE LITERATURE

When a child learns to read it changes his/her world forever. It is almost a magical experience to be able to look at print and construct meaning from it. Reading has been extremely important to our society; therefore, a non-reader does not experience the same benefits as that of a reader. Reading impacts a person's world daily, whether it is from the newspaper to become aware of current events, reading street signs to find a certain location, or reading a menu. Although reading is a critical intellectual ability, it is our second most important intellectual accomplishment. The most important intellectual accomplishment is that of language, because without language acquisition one would never learn to read (Gunning, 2000). Having realized the importance of these two concepts, Scientific Learning designed the Fast ForWord Program to assist children with improving both their language and reading skills.

Components of a Reading Program

There are many components that constitute an effective reading program. According to the National Reading Panel (1999), the following elements must be present: (1) alphabetics, including phonemic awareness instruction and phonics instruction, (2) fluency, which includes guided oral reading and independent silent reading, and (3)

comprehension, including vocabulary instruction and text comprehension instruction. Phonemic awareness, which provides the foundation of a reading program, has been identified as the ability to hear individual sounds in a word (National Reading Panel, 1999). A phoneme is the smallest unit of sound that can be detected in the spoken language. For example the word cat would consist of the three phonemes /c/ /a/ /t/. The word ship consists of three phonemes, /sh/ /i/ /p/. In the word ship, the /sh/ can not be broken into two individual sounds so a person only hears the three sounds although there are four letters used to represent the word. The findings and determinations of the National Reading Panel, (1999) were that students who were given phonemic awareness training performed better in the areas of reading and spelling. Phonemic awareness training provided children with the essential foundation of the alphabetic system. Auditory discrimination has been deemed important for reading development. Auditory discrimination has been identified as the ability to discriminate between two different words, that is identifying whether two words sound the same or different. Once phonemic awareness has been comprehended, phonics instruction, another critical component of reading can occur. Phonics instruction teaches children the relationship between actual letters and sounds. It has differed from phonemic awareness because the student does not use the visual symbols in phonemic awareness, which is a purely auditory skill. The National Reading Panel, (1999) found that phonics instruction provides great benefits for students in Kindergarten through sixth grade. In Kindergarten, phonics instruction enhances both reading and spelling skills, and by first grade phonics instruction assists with decoding, spelling, and comprehension. In older students, phonics instruction helps with decoding, spelling, and oral reading, yet it does not seem

to significantly improve comprehension (National Reading Panel, 1999). Studies have shown that phonemic awareness along with letter knowledge are the two best indicators of reading progress during the first two years of instruction (National Reading Panel, 1999). Phonemic awareness training has facilitated reading acquisition skills, therefore, teachers, administrators, and parents have been interested in reading programs that incorporate this training. Fast ForWord claims that it has done just that (Scientific Learning Corporation, 1997).

Temporal Processing Theory

The idea that temporal processing has been a component skill of language acquisition continues to be debated. Temporal processing has been identified as the ability to process sound segments as they occur sequentially in time (Veale, 1999). The concept of auditory temporal processing and its effect on reading has been studied for over one hundred years. In 1875, Exner began the study of temporal processing. In 1963, Effron determined that it takes ten times longer to recognize temporal order than it does to complete an auditory discrimination task. (Veale, 1999). According to Merzenich and Tallal, the creators of the Fast ForWord Program, children with “learning language impairments” have been unable to sequence auditory and visual information at a rapid pace. They have referred to this as a generalized temporal processing deficit and believed that it can emerge by a child’s first year. By the age of one, children without this deficit have been able to mark boundaries between syllables and words (Veale, 1999). It has been their belief that temporal processing correlates with communication skills and it is essential to the perception and production of speech in children. Some of

the causes that have been given for the deficit include heredity, that is the child received faulty language from one of the parents, otitis media, in which there has been an interference with the clarity of acoustic signals, or the child has been unable to complete mental representations of phonetic information (Gillam, 1999). Merzenich and Tallal suggested that limitations in the integrating and segmenting of temporal information could lead to neurological changes and hence impede language development (Scientific Learning Corporation, 1996). Although the temporal processing deficit theory has seemed interesting and logical to some, it is only a hypothesis and has not been proven. The Fast ForWord Program has included activities that improve temporal processing skills that it deems necessary to acquire speech. Two staunch opponents to this theory have been Studdert-Kennedy and Mody (Gillam, 1999).

Studdert-Kennedy and Mody believe that students with dyslexia and language learning impairments have had difficulties with processing certain frequency and amplitude characteristics of speech, and that has been more important than temporal processing for building phonological representations (Gillam, 1999). Other studies have concurred that higher level phonological representations, not temporal processing are pertinent to language and reading disorders (Gillam, 1999).

Brain Plasticity

Another key component of the Fast ForWord Program has been the construct of brain plasticity. It is the belief of Merzenich that the brain unlike a rigidly fixed computer chip can be retrained with intensive training. This idea of retraining the brain led to the development of the Fast ForWord games, which have been compared to mental

aerobics for areas of the brain that support language skill (Greenwald, 1999). Brain Plasticity has been the theory that the cortex of the brain can be altered. Merzenich believed that activities inspire the individual neurons of the brain and influence the connection between networks of neurons, therefore, by providing the brain with intense and systematic experiences, new neural groups will actually form, grow, and strengthen (Gillam, 1999). Thus, it is believed by Merzenich and his colleagues that the brain can be retrained resulting in changes in perceptual learning, cognitive skill learning, and motor skill learning (Harrison S. & Gimbel J.F. 1998).

Merzenich and his colleagues studied adult monkeys to identify brain plasticity. The adult monkeys were trained to process rapidly occurring tactile and acoustic stimuli. It was determined that by utilizing strict behavioral training, a monkey's brain could be reshaped. Critics argued that these findings were on monkeys and not children, therefore, there was no direct evidence that the Fast ForWord Program alters children's brains (Gillam, 1999).

However, the philosophy of the Fast ForWord Program was based on the idea of brain plasticity. Merzenich believed that 15% of students have been unable to break words into phonemes, so they developed an alternative way to chunk sounds and syllables. If during the first six to ten months of a child's life, sound was perceived as muffled or he/she had impaired tonal parts of sound, the brain identified syllables instead of phonemes. As a result they have been unable to decipher individual phonemes or develop the hearing of rapid successive sounds, which has had a negative impact on their reading skills (Harrison S. & Gimbel, J.F., 1998). By having provided these students with multiple experiences, the Fast ForWord Program has claimed to retrain the brain to

overcome deeply embedded perceptual impairments in the speech and language processes (Scientific Learning Corporation, 1996).

Fast ForWord Components

The Fast ForWord Program, a computer based CD-ROM program, has focused primarily on language skills as well as “language to reading skills”. Scientific Learning Corporation developed it for students who have had difficulty perceiving individual sounds in a word and have been unable to decode these sounds into words. Each disc contains seven activities that are presented in a game-like format. Students are required to complete five of the seven activities daily. Each activity lasts for approximately twenty minutes, so by the end of the session the student will have engaged in 100 minutes of training for the day. The student is expected to engage in the training session for five days a week and for four to eight weeks. The activities that have focused on phonemic awareness occur at five levels of acoustically modified sound. The audio of each game lengthens and intensifies the phoneme’s tones. At the first level the auditory stimulus has been more significantly distorted by electronic means. As the student progresses through each level the speech patterns become more rapid until the student reaches level five which would be that of normal adult conversation. This skill may benefit a dyslexic student who has been unable to discriminate between the consonant vowel patterns of /da/ and /ba/ which differ in the first 40 milliseconds of speech (Macaruso & Hook, 2001). The brain has been trained to recognize word sounds first in isolation, then in groups of sounds, next in words, and finally in sentences. The critical language skills that have been fostered in the Fast ForWord games have included temporal sequencing,

phonemic awareness, phonological awareness, working memory, syntax, and grammar. In order for this program to be effective it is imperative that the student be compliant. That is he/she has been present at all of the sessions and works continually throughout each activity. For this to occur there must be a dependable person available to monitor each student. A token economy system has been built into the program. The student earns points as he/she answers each question correctly. For some students though, this may not be enough, therefore an outside reward may also be necessary. Once the student has completed the 100 minutes, the scores are sent via the Internet to Scientific Learning Corporation. The individual student's results are then uploaded to Scientific Learning Corporation's database. This is known as the SLc Lesson. Either a summary or detailed report is then sent to the sending site. The Fast ForWord program is not a flexible one, the individual must complete the entire program.

Due to the technological aspects of this program, there are certain requirements that are necessary in order to utilize this program. A MacIntosh computer requires a Power PC 601,603, or 604 processor. A Mac OS 7.55 or higher operating system and double speed CD-ROM drive is needed. A PC requires a Pentium MHz processor as a minimum. It must be equipped with Windows 95, quad speed CD-ROM, 16 MB of memory, 16 bit sound 28.8 kbps baud modem with Direct Internet Connection, Netscape, Navigator 3.01 or Microsoft Internet Explorer 3.01. Each student in the program must be licensed and is unable to share the materials with another individual. A contract must be signed for the use of the software as well as the Internet connection.

The Fast ForWord program has been developed for students between four and fourteen years of age with communication impairments, such as dyslexia, sensory integration deficits, or central processing disorders (Harrison, S. & Gimbel, J.F., 1998).

It has been intended for clients with poor phonological awareness, difficulties with language comprehension, reading disabilities, spelling disabilities, difficulty understanding concepts and directions, and impairments in discriminating words (Veale, 1999). Benefits have been shown with students who cannot process sounds fast enough to comprehend natural speech. Scientific Learning Corporation has suggested that a comprehensive test that measures receptive phonology such as the *Sequential Temporal Analysis Report (STAR)* be used as a screening device to determine a student's eligibility for the program.

Theoretical Base of Fast ForWord

The idea and development of the Fast ForWord program grew out of studies developed by Scientific Research, primarily Merzenich, Tallal, Jenkins, and Miller. Their first study included seven children between the ages of five and nine who were diagnosed with language expressive and receptive delays and were having difficulty with reading. These children engaged in intense language therapy treatment for four weeks. Each session lasted for three hours daily and the children attended these sessions five days a week. During the session the student spent part of the time working on two computer programs, which are currently the "Circus Sequence" and "Phoneme Identification" games on the Fast ForWord Program. The rest of the time was spent in

individualized speech and language therapy conducted by a clinician. Each participant was given one to two hours of listening homework to complete daily. Upon completion of the program the students were given the *Tallal Repetition Test*. This test measures memory for commands and grammatical comprehension. The results showed an increase in language skills, auditory processing speed, speech discrimination, phonemic awareness, phonological awareness, grammatical comprehension, syntactic comprehension, overall language comprehension, receptive language skills, and expressive writing skills (Education Commission of the States, Denver, CO, 1999). The *Tallal Repetition Test* correlates highly with the *Token Test*, therefore, Scientific Learning Corporation has determined that actual changes in temporal processes have been related to changes in processing language (Gillam, 1999).

The second study, which led to the development of the FastForWord Program, involved 22 children ranging from 5-5 (years-months) to 10-0. These children were divided into two groups with matching non-verbal intelligence and receptive language abilities. Both groups received 3 to 5 hours of intense therapy sessions daily. The first group once again participated in the computer games of “Circus Sequence” and “Phoneme Identification.” They were also introduced to two new computer games, “Old MacDonald’s Flying Farm” and “Phonic Match.” Besides working on the computer, this group participated in individual therapy sessions with a clinician and received homework daily. All of the activities contained acoustically altered speech. The second group was involved in individual therapy sessions, received homework, and played video games; none of their activities contained modified speech. Although both groups showed some gains after the program, the group that received the acoustically altered speech

demonstrated greater gains in temporal processing, speech discrimination, and grammatical comprehension (Education Commission of the States, Denver, CO, 1999).

These two studies were the basis for the Fast ForWord program along with twenty years of brain research. However, one must remember that the students in the preliminary studies received training for three to four hours daily compared to a student receiving Fast ForWord training for one hour 40 minutes per day. Besides working on the computer, the students in the preliminary group also received instruction from a clinician each day and were given homework activities. The students in the Fast ForWord program did not necessarily receive either. Thus, the two initial studies cannot be considered the basis for the effectiveness of the Fast ForWord Program (Gillam, 1999).

In 1996, Scientific Learning Corporation conducted a field study of the Fast ForWord Program. This field test included 500 students working at 35 sites throughout the United States and Canada. The participants ranged in ages from four to fourteen and were diagnosed with difficulties in listening or language comprehension. The degree of their impairments ranged from mild to severe. The sample included students with autism, pervasive developmental disorder, central auditory processing disorder, attention deficit disorder, and dyslexia (Gillam, 1999). Its objective was to confirm the success of the Fast ForWord Program outside the Scientific Learning Corporation laboratory and in a real world setting (Education Commission of the States, Denver, CO, 1999).

Pre and posttests were administered to each student, but the tests that were used were not uniform to each child. One test given, *the Token Test for Children*, measured the student's ability to follow spoken directions. Prior to the Fast ForWord Program, the

students performed well below average on this test, approximately two standard deviations below the mean, but after the program, the students scored at the average level raising their scores by one standard deviation. *The Auditory Word Discrimination: The Goldman Fristoe Woodcock Test of Auditory Discrimination Test* was given to measure the children's ability to discriminate between similar sounding words in a quiet environment and a noisy environment. The age level results of this test rose from 7% prior to the program to 39% after the completion of the program. The students' overall language development was measured by *The Clinical Evaluation of Language Fundamentals (CELF-3)* and *The Test of Language Development*. On the *CELF-3* expressive subtests, which required the child to recall and formulate sentences the percentage of children scoring at or above the standard mean of the test rose from 5% to 20%. On the receptive tests, which included understanding spoken words and sentences, following directions, and understanding the relationships between words and categories, the scores rose from 7% to 27%. With regard to *The Test of Language Development*, which measures the child's ability to combine sentences, understand sentence structure, understand word meanings, and make generalizations, the scores at or above the standard mean rose from 15% to 42% (Education Commission of the States, Denver, CO, 1999).

In 1997, Scientific Learning Corporation conducted another field study to substantiate the findings in its previous study (Gillam, 1999). This study consisted of 400 students in Kindergarten through third grade in nine school districts in California, Texas, Illinois, Indiana, and Nebraska. The students in the study were classified as at risk students in the area of language arts or reading. These students were then randomly assigned to an experimental group or a control group. These two groups were matched in

age and gender. Findings indicated that prior to the Fast ForWord training, the students in both groups scored at the 12.5 percentile in language comprehension, but after the training the control group improved to the 21st percentile whereas the Fast ForWord group scored at the 49th percentile. Seventy-one per cent of the children that received training had improved their language comprehension skills by 1.8 years; furthermore, it was noted that 75% of the children who had undergone this training were removed from the at risk category (Education Commission of the States, Denver, CO, 1999).

Criticisms of Fast ForWord

According to Scientific Learning Corporation, 90% of students that have been instructed in the Fast ForWord Program have demonstrated measurable gains in the areas of auditory discrimination, following directions, listening, speaking, and language development. However, not everyone has bought into this novel idea. One of the staunch critics of the Fast ForWord Program has been Psychologist Michael Studdert-Kennedy, chairman of Haskins Laboratory, a leading center of speech and language at Yale University. His belief is that the Scientific Learning Corporation's studies have been biased and have not been conducted with a proper control group (Greenwald, 1999). Studdert-Kennedy has been opposed to the theory of the temporal processing deficit being the key reason for language and reading difficulties. Another criticism of this program has been the reports of the gains in language development. Across all levels the scores reported from students who have participated in this training have risen one standard deviation which is not unusually large compared to other therapies. A third criticism is that throughout each testing session a standard error of measurement or

confidence interval was never reported. A fourth criticism has been that the tests administered were not uniform to all participants, and that the Fast ForWord activities teach to the tests being administered. A fifth criticism has been that besides standardized testing no other indications of how the students are doing within their classroom and home environment has been studied. A sixth criticism is the internal and external validity of the studies, such as the criteria for selecting subjects, the limited testing, the lack of control of the Rosenthal effect which states that the person providing the training should not be conducting the pre and post testing, the absence of control groups, and there having been no pre and post testing of spontaneous language (Gillam, 1999). The seventh criticism has been that the effectiveness of the Fast ForWord program has not been empirically validated by individual experimentation (Gillam, 1999).

Advantages and Disadvantages of Fast ForWord

The concept of the Fast ForWord program has just commenced. Scientific Learning Corporation has been continuing to develop new aspects to the Fast ForWord Program. It is in the beginning stages and much more experimentation and research needs to be conducted to prove its effectiveness. However, the question has been what to do with the children who are demonstrating difficulties today and cannot wait for the testing to validate whether or not to use the program. Therefore, educators and parents need to stay current and research the advantages and disadvantages of this program. One advantage of this program is the ease with which children's performance data can be reported. Parents and teachers receive reports on the child daily; these reports have included detailed information as well as a summary. Charts and graphs have been

included to display the child's progress. A second advantage has been the utilization of technology. Computers assure that the information being relayed to the student is precise. Previously, audiotapes were used to deliver information that used human voices and may have contained human error, now digitally controlled speech is being used to ensure preciseness. The computer is objective. If a clinician is providing the therapy, a student may sometimes come to the correct answer by the clinician's intonations or physical gestures. A third advantage has been the game like design of the program. This design tends to hold the attention of the student longer than typical therapy sessions. A fourth advantage has been that only certified personnel are allowed to run the program. Fast ForWord has provided intense training for the person conducting the program. A fifth advantage has been that the program has been rooted in research. This program incorporates the culmination of twenty years of brain research (Veale, 1999).

There are also some disadvantages to think about before deciding on the implementation of this program. First, would be the cost of the program. Second, would be that the games have been designed to the test, therefore it has been hard to deem whether the students will be able to take the information and generalize it so that they can use it within their daily life. Third, this program has been made available to the public before its efficacy has been fully documented. Finally, this program follows the idea of distance learning where the child never gets to fully interact with one individual (Veale, 1999).

It is important to remember the National Reading Panel's findings on an effective reading program, that a program needs to include several components such as alphabetics, fluency, and comprehension. Fast ForWord tends to focus on the alphabetic

principal, but more is needed if a child is going to read and comprehend (National Reading Panel, 1999). Fast ForWord may be considered a supplemental program to a more diversified reading program. Some critics believe that Scientific Learning Corporation has not proven the advantages of their program over other programs such as Orton Gillingham (Macaruso and Hook, 2001).

CHAPTER III

DESIGN OF THE STUDY

Population

The study was conducted in the Mantua Township Public School System. Mantua is a suburban township located in Gloucester County, New Jersey. Once a rural area, much of the land has been sold to developers and the population of Mantua Township continues to increase. Mantua is located approximately fifteen miles from Philadelphia, Pennsylvania, and it takes a commuter eighteen minutes to travel to the city. The average home price in the township is \$ \$105,738. Most of the residents own their own home, but approximately 9.8% rent. Its current population of 10,074 includes 24.8% between the ages of 0 to 17, 64.7% between 17 to 65, and 10.5% over the age of 65. Its per capita income is \$17,316 and its median household income is \$42,841. Its general level of education is that of some college with no degree earned.

The township houses three elementary schools. These schools contain students in pre-school through sixth grade. The students attend Clearview Regional Middle School in seventh and eighth grades, and Clearview Regional High School from ninth through twelve grades. The students of Mantua Township along with students of Harrison Township comprise the population at the middle school and high school. There are approximately 1400 students enrolled in the three elementary schools, 600 enrolled in the middle school, and 1100 attending the high school. The per pupil expenditure in the elementary school is \$6,772, and the student teacher ratio is 19:1.

Method of Sample Selection

The Fast ForWord Program was offered to the students in the special education program in grades Kindergarten through sixth in the three Mantua Township elementary schools. The program lasted for eight weeks during the summer, beginning July 9, 2001 through August 31, 2001. The students' parents were responsible for transporting the participants to and from the Fast ForWord site. Hence, some students who may have been interested in the program, yet whose parents either worked or did not have a car at home were excluded because transportation was not provided. Forty-nine students signed up to participate in the program, however, not all followed through with it. Thirty-two students were selected to become the experimental group of the study. The students were selected based on attendance and the ability to acquire pre test and post test data. Therefore, the experimental group may be considered a convenience group. The experimental group contained 20 boys and 12 girls. All of the students were attending one of the three elementary schools in the district and each was receiving special education instruction. The students in the experimental group entered the first through sixth grade in September, 2001. A control group of 26 students was also chosen for comparative information. The control group consisted of 15 males and 11 females entering the first through sixth grade in September, 2001. These students were receiving special education services, but did not participate in the Summer Fast ForWord Program. The control group was chosen at random.

Collection of Data

The goal of this study was to determine whether students who participated in the Fast ForWord Program would make greater gains in reading than their peers who did not participate in the program. To do this the Broad Reading Component of the *Woodcock-Johnson Psycho-Educational Battery* was administered to both groups of students. The students were pre-tested using form A of the test during March, 2001. A post-test using form B was administered in September, 2001 and a second post-test using the *Woodcock-Johnson Psycho-Educational Battery* Form A was administered in February, 2002. *The Woodcock-Johnson Psycho-Educational Battery* was utilized because it is a standardized test. Its validity and reliability make it a respected test that has been widely used throughout the years. It contains two parallel forms that allow for pre and post testing. Results are reported in term of age equivalents, grade equivalents, standard scores, and percentiles.

Design and Analysis of Data

Both the experimental group and the control group were pre-tested in the spring of 2001 (May and June). Both groups were administered Form A of The Broad Reading Component of *The Woodcock Johnson Psycho-Educational Battery*.

During the summer of 2001, the experimental group participated in the Fast ForWord Program. From July 9, 2001 through August 31, 2001, the students were required to attend the program Monday through Friday for two and half-hours each day at the Centre City School's computer lab. Each student was assigned to a computer and given a disc and headphones to use. An adult coach was assigned to a group of four or

five students. The coach's job was to keep the students on task, encourage the children to continue working, keep track of the daily points earned, and provide the students with reinforcers, such as stickers, candy, and popsicles. The students were given five games to complete daily. Each game lasted approximately 20 minutes and the students were allowed to break in between activities. The activities were presented in a game like format and worked on the areas of phonemic awareness, phonics, language comprehension, and following directions. At the end of the daily session the students' scores were downloaded and sent, via the Internet, to Scientific Learning Corporation. The scores were then registered and the activities for the next day determined by Scientific Learning Corporation. The Fast ForWord Program was an individual one so the student progressed at his/her own rate.

In September both the control group and experimental group began the new school year in the recommended placement that was mutually agreed upon by the parents, the teachers, and the Child Study Team at the annual review conferences. All of the students participating in the study were receiving special education services in one of the following ways: in-class support provided by a special education teacher, replacement reading provided in the resource center, or reading instruction within a self contained environment. The students in both groups were being educated in one of the three elementary schools within the district. The students receiving in-class support were instructed with the *Spotlight on Literacy* series published by McMillan, McGraw-Hill. The students receiving replacement reading and those in a self-contained placement were utilizing SRA's *Reading Mastery Program* or *Decoding Program*, a direct instruction program. The students were once again tested using Form B of the Broad Reading

Component of *The Woodcock Johnson Psycho-Educational Battery* to determine immediate growth.

Once the children had received five to six months of instruction within their placement, post testing was again conducted in January and February of 2002, to determine the effectiveness of the Fast ForWord Program. The students were given the Broad Reading component of the *Woodcock-Johnson Psycho-Educational Battery* Form A. The results were then used to determine the progression and regression of reading development within both groups.

CHAPTER IV

ANALYSIS AND INTERPRETATION OF DATA

In order to answer the research question posed in Chapter I, an independent samples t-test was applied to the pre-test to determine the two samples that came from the same population. The null hypothesis that the means of the treatment (M_1) and the control group (M_2) were the same as stated as follows

$$H_0: M_1 = M_2$$

To test the hypothesis an independent samples T-Test was applied (Shannon & Davenport, 2001) and the null hypothesis was rejected. The treatment group manifested a statistically significant lower level of reading ability at the $< .001$ level of probability. The output from this independent samples t-test is contained in table 1.

***Table #1**

Pre-test Mean Level of Reading Achievement in the Experimental and Control Groups on the Broad Reading Component of the Woodcock Johnson Revised Psycho-education Battery

PRE-TEST (N=53)				
	Mean	SD	dF	t
Fast ForWord Group (n=27)	1.97	1.24	26	7.59
Control Group (n=26)	2.92	1.34	25	12.08

***significantly different at < .001 level**

$$H_0 M_1^1 = M_1^2$$

Post-test Mean Level of Reading Achievement in the Experimental and Control Groups on the Broad Reading Component of the Woodcock Johnson Revised Psycho-education Battery

POST TEST (N=58)				
	Mean	SD	dF	t
Fast ForWord Group (n=32)	2.99	1.48	31	11.43
Control Group (n=26)	3.76	1.20	25	15.95

***significantly different at < .001 level**

$$H_0 M_1^1 = M_1^2$$

These data show that groups were not equivalent at the beginning of the study, and therefore, the influence of the Fast ForWord training as a treatment variable could not be unequivocally determined.

Prior to the Fast ForWord program, pre-testing was conducted on twenty-seven of the thirty-three students who actively participated in the program, along with twenty-three of the twenty-six students targeted as the control group. These students were administered Form A of the Broad Reading component of the *Woodcock-Johnson Psycho-Educational Battery*. The students were then post-tested in September, 2001 to determine regression over the summer months using Form B of the *Woodcock-Johnson Psycho-Educational Battery*. Therefore, Form A of the Broad Reading Component of the *Woodcock-Johnson Psycho-Educational Battery* was once again given to the students in February, 2002. Post-testing was conducted on all of the students in the Fast ForWord group and the control group. The scores were calculated into grade equivalent scores. The individual gain scores can be viewed in Appendix A.

DISCUSSION

There are other methods of data analysis that could be applied to control for the initial non-equivalence of the experimental and treatment groups. First, pupils in the control group could be matched on the basis of reading achievement with pupils who received Fast ForWord. Of course other extraneous variables could still influence the outcome such as parental interest or overall cognitive ability. Adding matching variables would help reduce the non-equivalence of the control versus the Fast ForWord group.

Another method of dealing with non-equivalence is statistically equating the two groups by using analysis of co-variance. Another technique is to design the study so that each subject serves as his or her own control. Neither of these techniques is within the

scope of the present study, but will be applied at a later date by the project advisor and this researcher.

CHAPTER V

SUMMARY

The Fast ForWord Program is a computer-based program that utilizes a CD-ROM as well as the Internet to enable students to learn and practice skills that are critical to language comprehension and reading development. Each student engages in training exercises that incorporate game like activities stored on the Fast ForWord disc. According to Scientific Learning, the developer of the Fast ForWord Program, 40% of students need to improve their reading skills. Therefore, Scientific Learning developed a computer program that can alter speech sounds so that students can differentiate between phonemes, increase language skills, phonological awareness, working memory, processing speed, grammar, syntax, and sequencing.

Scientific Learning Corporation has conducted its own intense studies to the effectiveness of its program and found that on average students progressed one to three years in language and reading development in a four to eight week session. This independent study investigated the claims, by asking the question, "Will students who participated in the Fast ForWord Program make greater progress in reading than a comparable group of students who did not participate in the Fast ForWord Program?" This study evaluated the reading progress of two groups. The first group consisted of thirty-two classified students in the first through sixth grade that participated in an eight-week summer Fast ForWord Program. The second group contained twenty-six students in the second through sixth grades who did not compete in the program. The students

were pre tested in March of 2001, and post tested in February 2002, using the Broad Reading Component of the *Woodcock-Johnson Psycho-Educational Battery*.

FINDINGS

The findings of this study indicate that both the Fast ForWord group and the control group made significant improvements in reading development. However, the Fast ForWord Group exhibited a greater gain than that of the control group. The mean score of the Fast ForWord group's pre test was 1.97 and the post test mean was 2.99, displaying a gain of +1.02. Nonetheless, the students in the control group improved their reading by +. 84. The pre test mean for the control group was 2.92 and the post test was 3.76. None of the students in the Fast ForWord group demonstrated regression in reading, although one student's scores showed no improvement. However, in the control group two students showed regression. It must be mentioned that the analysis showed that prior to the Fast ForWord intervention, the reading skills between the two groups was not equivalent. The control group displayed a more advanced reading level than the Fast ForWord group.

CONCLUSIONS

The results of this study reflect that the students who participated in the Fast ForWord Program displayed an increase in reading achievement. However, the control group also demonstrated an increase. The pre testing showed that the control group was functioning at a higher reading level than the Fast ForWord group and therefore, the groups were not equal. However, it can not be ruled out that one of the reasons that may

have lead to an increase in the reading achievement of the Fast ForWord students was the program itself. Besides the actual Fast ForWord program other factors need to be taken into consideration to determine its effectiveness.

The first factor is that the Fast ForWord Program was conducted during the summer months. If this program was not offered, many of the students who participated in the program would not have benefited from any formalized reading program throughout the summer. Therefore, this program may have actually extended their basic school year so that normal reading regression throughout the summer months would not have taken place. Whereas students in the control group did not have the exposure to any formalized reading activities throughout the summer and as a result regressed. Hence, when both groups returned to school in September, the control group may have needed more review than did the Fast ForWord group who received instruction throughout the summer months.

A second factor may be the reading program used during the school year. Since both groups demonstrated significant progression, one could argue that is was the effect of the reading program being utilized in the classroom rather than the Fast ForWord program. However, it still must be noted that the Fast ForWord group demonstrated greater progression, which could be a result of Fast ForWord.

A third factor that should be considered is the individual placement of each child. Some of the students may have had a switch in their placement from the 2000-2001 school year to the 2001-2002 school year, and received more individualized reading instruction. Once again it can be argued that they are reading better because they are in

the correct placement receiving the correct services and the increase in reading is not the result of the Fast ForWord Program.

This study involved classified students within a single elementary school district. Further studies that would be beneficial would include a wider sample of students. It is also necessary that the students be separated into categories that compare the same age level and disability level. Comparing a sixth grade resource center student with a first grade multiply disabled student is not as beneficial as comparing two sixth grade students functioning on the same reading level, using the same classroom reading materials. Besides changing the sample to be studied, it might be beneficial to modify the instruments used to assess the students. Along with a standardized test it may be helpful to also investigate the student's progress in the classroom, by interviewing teachers and assessing a portfolio of the students' work.

In conclusion it is important that the Fast ForWord Program continues to be studied. The Fast ForWord Program is still in its infancy stage, and it continues to be further developed and marketed. As it evolves it is important that research continues to be conducted to verify its own conclusions. It would also be beneficial to conduct a long-term study that tracked the reading progress of students who participated in the Fast ForWord group throughout their school experience to determine the effectiveness.

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APPENDIX

The following chart shows the gain scores for the individual students in the Fast ForWord Group and the Control Group.

Fast ForWord Group

STUDENT	PRE-TEST MACH, 2001	POST -TEST FEBRUARY, 2002	GAINS/LOSSES
D.F.	1.4	2.6	+1.2
E.D.	1.5	2.4	+.9
J.S.	1.8	2.4	+.6
J.W.	-	2.4	-
L.G.	1.8	2.3	+.5
E.M.	2.0	3.2	+1.2
K.L.	2.2	4.9	+2.7
M.L.	1.4	2.0	+.6
B.H.	-	4.1	-
K.B.	1.7	1.9	+.2
K.M.	4.2	5.0	+.8
K.W.	3.3	4.6	+1.3
E.C.	3.6	4.9	+1.3
A.I.	K.9	1.4	+.5
STUDENT	PRE TEST MARCH 2001	POST TEST FEBRUARY 2002	GAINS/LOSSES
D.D.	-	5.4	-

A.C.	K.0	3.6	+3.6
C.S.	3.0	3.8	+8
N.I.	5.8	6.5	+7
B.C.	1.7	2.2	+5
T.W.	-	1.9	-
A.S.	2.7	3.2	+5
D.R.	K.0	K.8	+8
R.C.	-	1.1	-
E.L.	K.6	1.1	+5
A.A.	1.2	1.7	+5
R.P.	K.5	1.2	+7
K.E.	K.0	1.1	+1.1
J.I.	2.0	4.2	2.2
J.B.	2.7	2.7	0
K.M.	1.3	1.4	+1
R.C.	-	1.7	-
J.D.	3.2	4.1	+9
L.M.	2.7	4.6	+1.9

CONTROL GROUP

NAME	PRE-TEST	POST-TEST	GAINS/LOSSES
	MARCH, 2001	FEBRUARY, 2002	

A.B.	2.4	4.4	+2.0
D.J.	3.4	5.0	+1.6
K.W.	3.0	4.2	+1.2
K.P.	1.6	2.1	+.5
F.G.	1.4	1.9	+.5
C.L.	3.2	3.6	+.4
J.K.	-	3.6	-
V.T.	3.5	5.2	+1.7
P.G.	3.5	3.6	+.1
K.G.	5.4	5.0	-.4
D.L.	3.2	5.2	+2.0
B.G.	4.7	5.6	+.9
B.K.	3.9	4.9	+1.0
J.S.	4.6	5.2	+.6
A.C.	3.9	4.4	+.5
K.G.	2.6	3.5	+.9
A.L.	3.6	4.1	+.5
A.B.	-	2.2	-
R.L.	-	3.2	-
STUDENT	PRE TEST	POST TEST	GAINS/LOSSES
	MARCH 2001	FEBRUARY 2002	
T.M.	2.6	3.9	+1.3

W.C.	1.0	1.5	+.5
A.M.	2.8	3.0	+.2
V.B.	5.0	4.4	-.6
N.D.	1.5	1.7	+.2
N.P.	1.4	2.5	1.1
B.B.	3.2	4.1	+.9

The following table reflects the gains and losses of the Fast ForWord Group and the Control Group as a whole.

	Pretest Mean	Post Test Mean	Difference +/-
Fast ForWord Group	1.97	2.99	+1.02
Control Group	2.92	3.76	+.84