COMPUTER-ASSISTED INSTRUCTION IN LITERACY SKILLS FOR KINDERGARTEN

STUDENTS AND PERCEPTIONS OF ADMINISTRATORS AND TEACHERS

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Dissertation Prepared for the Degree of

DOCTOR OF EDUCATION

UNIVERSITY OF NORTH TEXAS

May 2007

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Larson, Susan Hatlestad, <u>Computer-assisted instruction in literacy skills for kindergarten students and perceptions of administrators and teachers</u>. Doctor of Education (Educational Administration), May 2007, 155 pp., 86 tables, references, 37 titles.

The perceptions of administrators and teachers of a computer-assisted instructional program in literacy skills were collected by a survey. The survey participants were kindergarten teachers and administrators from four elementary schools in the same, fast-growing, suburban school district in Texas.

Literacy assessments were given to all kindergarten students in the district in the fall, winter, and spring of the 2005-2006 school year. This study included a quasi-experimental research design to determine if students using the computer-assisted instructional program improved more on the district literacy assessments than students who did not use the program. The treatment group members were the 449 kindergarten students of the survey participants. The treatment group worked in The Imagination Station program for a nine-week trial period. The control group members were 1385 kindergarten students from thirteen other schools in the same school district.

The study found that teachers and administrators perceived that their students' improvement in literacy skills after using the program was good. The quasi-experimental portion of the study found that there was a statistical difference between the treatment and control groups on the composite literacy assessment score. The group membership variable could explain 1.4% of the variance in the students' literacy assessment scores. Based on the small effect size, there was no practical difference between the groups.

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CHAPTER 1

INTRODUCTION

Computer-assisted instruction (CAI) is being used to teach a variety of skills and subjects within the school setting. This study utilized The Imagination Station® Internet-based supplemental reading instruction and intervention program (Imagination Station, Inc., Richardson TX, www1.istation.com). This is computer-assisted instructional program, designed to teach literacy and reading skills to pre-kindergarten through third grade students.

Purpose

One purpose of the study was to determine the perceptions of teachers and administrators regarding the use of CAI to teach literacy skills to kindergarten students who used The Imagination Station program. A second purpose of the study was to find if there was significant improvement in literacy assessment scores for kindergarten students who used CAI compared with students who did not use CAI. The third purpose of the study was to compare teacher and administrator perceptions with the students' actual improvement in literacy and reading skills.

Background

Influence of External Factors

Instructional software is aggressively marketed and touted in advertisements as being a means of increasing student achievement. Manufacturers promise remarkable results when their instructional software is used in a school setting. Increased use of

technology in instruction is a growing trend in public schools. School administrators and teachers need to have researched based information that will enable them to make appropriate decisions about the use of (CAI). School personnel will want instructional software that integrates best instructional practices with up to date technologies to enable students to master learning objectives.

Best instructional practices in literacy and reading include (a) phonemic awareness instruction, (b) phonics instruction, (c) fluency instruction, (d) vocabulary instruction, and (e) text comprehension instruction (Armbruster, Lehr, and Osborn, 2001). The National Reading Panel (2000) found that guided oral reading is an effective method of incorporating all of these best practices in reading instruction. The panel also found that although increased independent, silent reading correlated with higher reading achievement, there is not evidence to support that it is the cause of higher reading achievement. Struggling readers need feedback to improve. Intuitively, CAI programs that give students immediate feedback would be more helpful to struggling readers than silent, sustained reading.

CAI cannot be evaluated independently from the instructional content within the program and CAI is not a teaching method (The National Reading Panel, 2000). Therefore, this study evaluated 1 software package to determine the opinions of administrators and teachers about the effects of CAI on literacy skills and reading achievement and how that program affected student achievement. Allington (2002) states that "Good teachers, effective teachers, manage to produce better achievement regardless of which curriculum materials, pedagogical approach, or reading program is

selected" (p. 1). However, in addition to a highly qualified teacher, a CAI program could reinforce, supplement, and enhance direct instruction by the teacher.

Reading software packages are being developed that incorporate best instructional practices in the reading field. It is important that these best instructional practices are appropriately integrated with the computer application. Rings, 1994, found that the CAI programs that successfully foster critical reading skills are those that combine high levels of interactivity with encouraging the use of reading strategies most often used by effective readers. Rings also identified the capacity to read in a real context, as another aspect of CAI programs that contribute to the development of critical reading skills. Some CAI programs include the capability to print hard copies of the reading materials. Students are then able to bring home copies of what they are reading in CAI so they can also read to their parents. At the same time, students can use the hard copies of CAI materials to read directly to their teacher.

CAI is not meant to replace a reading teacher. CAI can provide the opportunity for a student to work at his or her own pace. CAI is effective at providing practice in skills in which a student may be weak. Some CAI software packages provide feedback to the teacher in the form of reports on individual students. The reading teacher is then able to focus on areas identified by the computer program in which the student needs additional instruction or re-teaching. The ability to print hard copies of all reading materials and have the opportunity to read in a real context is a major asset of The Imagination Station software.

The scope and sequence of any instructional program is an essential element in determining its success. Students must be able to build on previous knowledge and

skills as they move on to new objectives in a logical sequence. There are instructional programs that have been developed that have a logical scope and sequence built into the instruction. Ediger (1998) distinguished between logical and psychological sequence. In a psychological sequence, a learner orders his or her own activities to meet his or her own individual learning needs. A logical sequence is ordered by the teacher, or curriculum document, to best meet the needs of the majority of students. A CAI program that combines both a logical and psychological sequence would be preferable to a program that consists of learning activities in lock-step order that must be mastered before the student is allowed to move on to the next learning activity. The Imagination Station is an internet-based, CAI program that allows for an individualized approach to learning by creating varied and alternative pathways in the instructional sequence. The inclusion of a psychological sequence, within the logical sequence inherent in The Imagination Station, gives this CAI program the ability to individualize student learning.

Influence of Internal Factors

Problems that surface in schools are the availability of computer software and hardware to make CAI possible. Most educators acknowledge the current crisis in school finance. Funding for computer hardware and software may be an issue over which schools have little control.

How technology is utilized in instructional settings may be determined by the friendliness of a particular software package toward teachers and students. Whether or not an instructional program is purchased may depend on pricing and value. How

software is used, and if it is used at all, is determined by the teacher in the classroom or computer lab.

The school culture and its support of technology will have a significant influence on the success of CAI. The principal must support a program of computer-assisted instruction in reading if it is to become a reality in a school. The principal may make budgetary decisions in isolation for his or her campus. The school district's leadership must also be supportive of CAI by purchasing computer hardware and software for the schools. The allocation of resources determines the feasibility of augmenting reading instruction with computer software programs in reading.

In the district in which this study was carried out, Title I schools receive additional funds for reading improvement. Resources beyond the standard per pupil allotment are allocated to the schools with the most students needing remediation. With finite, financial resources, district decision makers need evidence of the value of a particular instructional reading software package before purchasing it.

Some research studies have found CAI did not improve reading achievement (Nauss, 2002; Campbell, 2000; Ritchie, 1999). It is important to know if a CAI program in reading has a positive, significant impact on the reading achievement of all students or just on a subgroup of students. This knowledge would allow decision makers to purchase the CAI program specifically for the students it would benefit. It would not be cost effective to purchase a program for students who did not need it. Knowing the profile of a student who would benefit from a particular CAI program may allow a school district to target individual students who would benefit from remediation through CAI. The profile of students who would benefit from CAI would allow an at-risk student to

receive enhanced instruction with a CAI program in reading, even if the student attended a school where the majority of students would not benefit from such an intervention.

Teachers may embrace CAI or may fear it. If the CAI were to replace reading specialists at a lower cost, then those groups of teachers may oppose it. Classroom teachers may tend to view CAI more favorably because it would allow them to individualize instruction for the many students in their classroom. Classroom teachers do not have the luxury of working individually with every student on a daily basis for reading instruction. Students could receive individualized instruction from a CAI program even on days the teacher was unable to reach every student.

Problem Statement

Do teachers and administrators perceive that computer-assisted instruction using The Imagination Station reading software improves the literacy skills of kindergarten students? The null hypothesis is that teachers and administrators perceive that computer-assisted instruction using The Imagination Station reading software does not improve the literacy skills of kindergarten students.

Is there significant improvement in the literacy achievement scores for kindergarten students who used The Imagination Station reading software compared with kindergarten students who did not use the program? The null hypothesis is that there is no significant improvement in the literacy achievement scores for kindergarten students who used The Imagination Station reading software compared with students who did not use the program.

Are teacher and administrator perceptions of CAI indicative of the success of the software? Included in the summary, which is found in Chapter 5 of the study, is a comparison of the perceptions of administrators and teachers of computer-assisted instruction, using The Imagination Station, to the actual change in literacy assessment scores made by students who used The Imagination Station. The perceptions of the educators who used CAI with The Imagination Station program will be evaluated to see if they correspond to the actual results of the statistical analysis of the change scores of the treatment group compared to the change scores of the control group. The study will address 7 research questions.

Research Questions

1. Do teachers and administrators perceive that computer-assisted instruction, using The Imagination Station, improves the letter identification skills of kindergarten students?

2. Do teachers and administrators perceive that computer-assisted instruction, using The Imagination Station, improves the letter sound skills of kindergarten students?

3. Do teachers and administrators perceive that computer-assisted instruction, using The Imagination Station, improves the concepts about print (C.A.P.) skills of kindergarten students?

4. Do teachers and administrators perceive that computer-assisted instruction, using The Imagination Station, improves the phonemic awareness skills of kindergarten students?

5. Do teachers and administrators perceive that computer-assisted instruction, using The Imagination Station, improves the diagnostic reading assessment (DRA) score of kindergarten students?

6. Do teachers and administrators perceive that computer-assisted instruction, using The Imagination Station, improves the overall literacy skills of kindergarten students?

7. Is there a significant difference in the improvement in literacy assessment scores of kindergarten students who used The Imagination Station compared to the improvement in literacy assessment scores of kindergarten students who did not use The Imagination Station?

Professional Significance

Why Study is Valuable

An instructional reading software program of interest to this author is produced by i-station incorporated. The National Reading Panel (2000) found that success in phonological awareness and letter knowledge are 2 of the best predictors of success in early reading. The Imagination Station is a program of particular interest to this researcher because it teaches important literacy skills, including phonological awareness and letter knowledge. There are fees for the training, which is required of the teachers who implement the program with their students. When compared to the allotted amount of money per pupil for instruction, the cost of this instructional software would first appear to be prohibitive. However, if the instructional software allows at-risk students to significantly increase their reading achievement, then the program could

prove to be extremely cost effective. The cost of specialized reading instruction, such as Reading Recovery and dyslexia therapy, is thousands of dollars per year for each student that is served through these programs. The expense to a school district of retaining a student for an extra year of instruction is also thousands of dollars. If The Imagination Station prevents the need for retention or specialized reading instruction, then it would be cost effective. If The Imagination Station does not significantly improve literacy skills, then it is a needless expense.

Professional Value

Computer-assisted instruction allows those who have learning differences to learn at an individual pace. This may allow the at-risk reader to make adequate individual progress and catch up to his or her peers. The analysis of the effectiveness of an instructional software program is a critical responsibility of school officials who make budgetary decisions. This study provides guidance to those responsible for the instruction of students in deciding if the educational value of this program justifies the cost of the software and the training.

Overview of Methodology

During the 2005-2006 school year, there were 18 elementary schools in the suburban school district in which this research study took place. Data from the literacy assessments of all kindergarten students in each of the district's 18 elementary schools were collected and analyzed. Four of the 18 elementary campuses participated in a pilot study of The Imagination Station software with their kindergarten students. The

portion of this research study that involved teacher and administrator perceptions of CAI in literacy skills for kindergarten students was conducted in those 4 schools using a survey as the data collection instrument. The administrators and teachers in the 4 schools who gave consent to be participants in the study had the use of The Imagination Station with their kindergarten students for 10 weeks. The students utilized The Imagination Station program at times when the whole class was not receiving direct literacy instruction from the teacher. The students used the program during literacy centers, rest time, and independent reading time while in the classroom. Teachers also had the option of having all their students work in the program simultaneously in a computer lab.

The participating teachers and administrators completed a survey on their perceptions of the effects of The Imagination Station (IS) program on the literacy skills of kindergarten students. The survey also elicited perceptions of the teachers and administrators concerning the user friendliness of the program for students and teachers. The survey assessed how teachers and administrators perceived the impact of the IS program on the literacy skills of kindergarten students who were below grade level, on grade level, and above grade level in their literacy skills. The study determined if teachers and administrators perceived that The Imagination Station program was of greater benefit to the students in a particular achievement subgroup.

All students in the district were given literacy assessments in the fall, mid-year, and at the end of the year. The treatment with The Imagination Station occurred between the mid-year and end of year assessments. Five of the literacy assessments were given at the mid-year and at the end of the year. The mid-year assessments were

done before the treatment so they were used as the pre-test scores. The end of year

assessments were completed right after the treatment so they were used as the post-

test scores. The change scores were calculated by subtracting the pre-test scores from

the post-test scores. The change scores for these 5 assessments were used to

compare the improvement on the literacy assessments of the students from the 4

schools that used The Imagination Station program to the students attending 13 other

elementary schools in the same district that did not use the program.

One additional school in the same district, coded as School 18, used The

Imagination Station throughout the entire school year. Because students in School 18

had used the program for several months before the mid-year assessments, it was not

included in the comparison of change scores on the 5 literacy assessments. School 18

was also not included in the portion of the study that determined teacher and

administrator perceptions of CAI in literacy skills for kindergarten students.

In Chapter 5, teacher and administrator perceptions of CAI in literacy skills for

kindergarten students are discussed in light of the actual change scores on the 6

literacy assessments taken by both the treatment and control groups.

Delimitations of the Study

Since the study was carried out in elementary schools that were all in the same

district, the socio-economic status of the students may not vary widely. However, there

are differences in socio-economic levels within each school and between schools. All

the schools that used the program are located in a very fast-growing, suburban district.

The vast majority of the families are middle class. There is a difference in the

percentage of students receiving free and reduced lunch at each of the schools. However, since the study involved a relatively homogeneous socio-economic group, the findings may not be readily extrapolated to low-income schools. The vast majority of the teacher and administrator participants in the study are Caucasian females. The school district has an abundance of technology hardware and software. The findings of the study may not be extrapolated to school situations where there are not computers available for student use. The conclusions of the study may not be useful in districts where teachers do not have adequate training in technology.

Definitions of Key Terms

- Alphabetic knowledge – the ability to recognize, name, and write letters (Texas Education Agency (TEA), 1997).

- At-risk student – a student at risk of failing to master learning objectives for his or her grade level.

- Comprehension – understanding the meaning of everything that is read, including words, sentences, and stories. To get meaning from written text (TEA, 2000). "Comprehension is the reason for reading. If readers can read the words but do not understand what they are reading, they are not really reading" (Armbruster et al., 2001, p.51). "Reading comprehension involves the ability to construct meaning from and to respond to text, using background knowledge as well as printed information" (Au, Carroll, Scheu, 1997, p. 5).

- Computer-assisted instruction – a system of educational instruction performed by computer. Instruction that involves using computer software and hardware.

- Fluency – "The ability to read a text accurately and quickly" (Armbruster et al., 2001, p.27). "The ability to read a text quickly, accurately, and with proper expression" (National Reading Panel, 2000, p. 3-1).

- Grapheme – "The smallest part of *written* language that represents a phoneme in the spelling of a word. A grapheme can be just 1 letter or several letters" (Armbruster et al., 2001, p. 10).

- Integrated learning system – an ILS is a network, a combination of instruction and management systems that runs on microcomputers connected to a larger computer and offers a combination of drill and practice, tutorial, simulation, problem solving, and tool courseware integrated into a total curriculum support package. It is capable of maintaining detailed records on individual student assignments and performance data and supplying printouts of this information to teachers

- Interactive - Students actively participate and interact with the computer software. The interaction between the student and the program provides individualized instruction, practice, feedback, and reinforcement.

- Likert scale - "Asks individuals to check their level of agreement (e.g., strongly agree, agree, undecided, disagree, or strongly disagree) with various statements" (Gall, Borg, Gall, 1996, p. 273).

- Literacy center - Literacy activities in which children participate independently, or in small groups, that strengthen their literacy and reading skills.

- Logical sequence - Instructional sequence which is determined and pre-planned by the teacher (Ediger, 1998).

- Onsets - Part of spoken language that is smaller than a syllable, but larger than a phoneme. An onset is the initial consonant(s) sound of a syllable (Armbruster et al., 2001).

- Oral vocabulary - "Words we use in speaking or recognize in listening" (Armbruster et al., 2001, p.38).

- Per pupil spending - Amount of money spent per pupil for 1 school year of education.

- Phonemes - "The smallest part of spoken language that makes a difference in the meaning of words…Sometimes 1 phoneme is represented by more than 1 letter" (Armbruster et al., 2001 p. 10).

- Phonemic awareness - A subcategory of phonological awareness involving the identifying and manipulating of individual sounds in words. "The ability to notice, think about, and work with the individual sounds in spoken words" (Armbruster et al., 2001, p. 8). The understanding that speech itself is composed of a series of individual sounds and that spoken words can be segmented (Strickland, 1998). Learning how to divide spoken words into individual sounds and blend spoken sounds into words (Texas Education Agency, 1997)

- Phonics - "The understanding that there is a predictable relationships between phonemes (the sounds of *spoken* language) and graphemes (the letters and spellings that represent those sounds in *written* language)" (Armbruster et al., 2001, p. 10).

- Phonological awareness - "Phonological awareness is a broad term that includes phonemic awareness. In addition to phonemes, phonological awareness activities can involve work with rhymes, words, syllables, and onsets and rimes"

(Armbruster et al., 2001, p. 10). It encompasses awareness of rhyming, alliteration, and intonation.

- Psychological sequence - Instructional sequence where the learner determines and orders his or her own learning activities (Ediger, 1998).

- Reading vocabulary - "Words we recognize or use in print" (Armbruster et al., 2001, p. 38).

- Rime - Part of spoken language that is smaller than a syllable, but larger than a phoneme. A rime is the part of a syllable that contains the vowel and all that follows it (Armbruster et al., 2001).

- Syllable - "A word part that contains a vowel or, in spoken language, a vowel sound" (Armbruster et al., 2001, p. 10).

- Vocabulary - Words we must know to communicate effectively (Armbruster et al., 2001).

CHAPTER 2

REVIEW OF THE LITERATURE

Several studies have attempted to determine if computer-assisted instruction (CAI) in literacy skills and reading will increase the literacy and reading achievement of students. This chapter will explain the search process in reviewing the literature on CAI and then examine theoretical and empirical studies in the field.

Search Process

The following review was developed through a systematic search. "Computer-assisted instruction" was the first broad search of the literature. Following that, "computer-assisted instruction in reading" was the topic searched. "Reading instruction" was the third broad topic searched. "Reading instruction with computers" was the fourth topic used in the search process. Another attempt to find relative literature was made using a limited search of "reading," "kindergarten," and "computer." Most of the prior research was found by searching digital dissertations since much of the research on this topic has been in the last 10 years.

Theoretical Literature and Conceptual Framework

Several theories have been developed to explain how children acquire the ability to read and read well. Allington (2002) states that good teaching is active modeling and demonstration of the strategies used by good readers. He believes that more time-on-task and greater use of open-ended conversation about what is read has positive impact on reading achievement.

According to Rings (1994), Using constructivist-learning strategies in a computer application exposes 3 facets of CAI that promote improvement in critical reading skills. Rings identifies a high level of interactivity, the encouragement of using strategies that have been proven to be effective for critical reading, and reading in a real context as 3 aspects of CAI that support the attainment of critical reading skills.

Another factor that determines the quality of reading instructional technology is the scope and sequence inherent in the software. Ediger (1998) states that" learners need to experience sequence or order in activities and experiences" (p. 138). Ediger goes on to distinguish between a logical sequence, which is teacher determined, and a psychological sequence in which the learner orders his or her own activities. Ediger points out "Quality sequence guides students to relate new objectives to be achieved with those already acquired" (p.140). The conclusion of Hall et al.'s review of 17 studies of computer-assisted instruction for students with reading disabilities was that "those CAI programs providing systematic instruction with effective correction procedures contributed most to increasing reading skills" (p.7).

Empirical Research on Computer-Assisted Instruction

Support for Computer-Assisted Instruction

The results from a small-scale study on the Waterford Early Reading Program (WERP) indicate that after a 12 week period, students' reading achievement significantly increased (Camacho, 2002). There were only 20 students from the same first grade class in the study. The after-treatment assessment was made using the Waterford Computer Adaptive Reading Test. The small sample size, lack of control

group, and the assessment by the same company that produced the instructional software, are factors that might cause one to question the validity of the findings.

A previous study that examined the Waterford Early Reading Program used a much larger sample size and a control group, which contributes to greater reliability of the results. The study by Gingold (2000) examined the computer-based emergent reading program and compared its impact on kindergartners' recognition of alphabet letters and understanding of concepts about print, to traditional classroom instruction. The null hypothesis was rejected for both letter recognition and concepts about print. There was a positive, significant difference in the kindergartners' abilities to recognize letters and understand print concepts when Waterford Early Reading Program was used. There were 71 kindergarten students in the treatment group, which received the CAI with Waterford Early Reading Program, and 68 kindergarten students in the control group.

Dunn (2002) conducted a study to determine if the reading comprehension of at-risk ninth grade students who used CAI would improve. Traditional reading instruction with a control group was compared with computer-assisted reading instruction with an experimental group. There were 78 students in the control group who did not receive CAI and 63 students in the experimental group who received CAI. Dunn described this as a small sample size. The subjects were not randomly assigned to the experimental and control groups. ANOVA for repeated measures was used for the statistical analysis, with the treatment and control groups as 1 factor and gender as a second factor. "The Illinois School Report Card (1999) indicates that the racial and ethnic background of the research site was 100% African-American" (p. 41). The experimental

group, which received the computer-assisted instruction treatment, used Scholastic's READ 180 program and the Autoskills Academy of Reading program. Dunn found that both groups improved in reading comprehension from the pretest to the posttest. However, the experimental group improved significantly more than the control group. Dunn also found that female subjects improved more than male subjects in both the experimental and control groups.

A study at the University of Minnesota compared the relationship between the amount of time students received Chapter I supplemental reading instruction and reading achievement gains. Three models of instructional service delivery were used. The 3 models were (a) the supplemental teacher, (b) the educational assistant, and (c) the computer-assisted instructional program. There was no significant relationship between the amounts of time allocated for Chapter I supplemental reading instruction and reading achievement gains, except in the case of the Chapter I supplemental teacher service delivery model, where the relationship was significant and negative. However, without using allocated time as a criterion, the computer-assisted instructional program produced significant gains in reading achievement (Heath, 2000). Considering that the supplemental teacher would be the most expensive service delivery model, (assuming that computer hardware was already in place and was not part of the cost factor), it is surprising that the supplemental teacher model showed negative significance. What is not addressed in the study is the class size for the supplemental teacher model and the quality of the teachers that were part of that service delivery model.

Hall, Hughes, and Filbert (2000) researched the literature on CAI in reading with learning disabled (LD) students. They evaluated the type of computer and reading instruction used in 17 different studies. Hall et al. (2000) found that the CAI programs which utilized effective teaching practices showed a significant difference favoring the CAI treatment. Hall et al. established that students with learning disabilities in reading did not get enough practice in reading and often practiced less than their peers who were non-disabled. The challenge for teachers of students with learning disabilities in reading is to provide more time on reading tasks that include focused instruction. Students in 13 of the 17 studies analyzed by Hall et al. showed improvement when using CAI in reading comprehension and decoding. None of the research authors in the literature reviewed by Hall et al. (2000) recommended replacing focused reading instruction by the teacher with CAI. The authors recommended using CAI in reading applications with LD students, which supplemented and enhanced reading instruction by the teacher. Hall et al. found that corrective feedback is more effective for LD students than only notification if an answer was right or wrong.

One frustrating aspect of instructing students with learning disabilities in reading is that they must make greater yearly progress than their non-disabled peers in order to catch up. Rebar (2001) pointed out that these students often receive less instructional time in reading than non-disabled students given resource restraints. Computer-assisted instruction (CAI) is a way that these students may be able to catch up due to the self-paced feature of CAI. Rebar's study found that CAI produced as good or better outcomes than traditional supplementary instruction.

Tincup (2003) also studied a group of students with reading disabilities. When the group means of the CAI treatment group and the control group were compared, the treatment group showed greater improvement in reading achievement than the control group on 4 of 9 subtests. However, there was only 1 measure that showed a significant difference between the treatment and control groups in their pretest minus posttest scores. The treatment group demonstrated significantly more improvement in their change scores than the control group on the WJ-R Basic Reading test. The study only covered 4 weeks, with the 8 member treatment group receiving 4 half-hour sessions per week. The control group also had 8 members. The small sample size makes it difficult to use this study to make predictions about achievement in any other situation.

A slightly larger sample size was used in a study designed to investigate how CAI affected reading fluency in second graders. The study by Ringenberg (2005) compared the improvement in reading fluency of 33 students in 2, second grade classrooms, who independently used computer-assisted and monitored reading practice, to 32 students in 2 other second grade classrooms who used traditional, unassisted, and unmonitored reading practice. The computer-assisted students were able to choose whether the computer would pronounce certain words or read all the words in an electronic book. The control group students read independently from print copies of leveled little books. Leveled little books are created to practice reading skills at a specific reading level. The little leveled books consist of 1, complete story per book at a specific level of reading achievement. The first phase of the study lasted for 10 weeks. During a second, 10 week period, the group using print copies switched to the

computer-assisted instruction. The original computer-assisted group switched to reading print copies independently without monitoring.

Ringenberg (2005) found that both groups made significantly more progress during the computer-assisted intervention. The group that began with the computer-assisted intervention continued to make progress during the second, 10 week period when they were not monitored and used the print copies of leveled books. One of the important distinctions made by Ringenberg's study is that all ability groups made more progress in reading fluency while receiving the computer-assisted reading intervention. However, Ringenberg found that students in the high ability group made the least amount of progress, while students in the low ability group made the most progress. Michael Ringenberg designed the software used in the computer-assisted reading practice.

Ringenberg (2005) found that the CAI group that received monitored reading practice using a computer made more progress than the control group that read the little leveled books independently. One possible explanation for this finding, apart from the computer treatment itself, may be that the treatment group was monitored while practicing reading on the computer. Perhaps another reason that the treatment group in Ringenberg's study made more progress than the control group is that they also received immediate feedback from the computer on word pronunciations. Frequent and immediate feedback to the learner is an important factor in learning. The National Reading Panel (2000) found that students could become more fluent readers when they receive monitoring or feedback from a teacher while repeatedly reading texts.

One of the interesting findings in Ringenberg's study (2005) was that the control group, which read the little leveled books independently, also made progress in reading fluency. Using reading materials with texts on the reader's instructional level that are composed to target a specific reading skill may be the reason that both the treatment and control groups made progress in their reading fluency. Heibert (2003) addresses the characteristics of text used for fluency practice and discusses the texts available to teachers that support improvements in fluency. Heibert also examines several studies where texts for repeated reading differ. Heibert found that "When students have opportunities to read texts in which high-frequency words and words with common and consistent patterns account for large percentages of the unique words in text, their fluency benefits" (p. 5).

Heibert (2003) also points out that "After the middle of grade one, literature continues to dominate the materials that are used for reading instruction after the mid-point of grade one" (p. 6). Heibert is speaking about the trend to use authentic literature for reading instruction that was not written specifically to target a certain reading achievement level. If leveled texts that target specific reading skills are the best way for students to increase reading fluency and reading achievement, then using a literature based approach to reading instruction may not be the best instructional strategy. Heibert goes on to state, "The experiences with students in this study and other studies suggest that difficult texts do little to support children who are slow readers in becoming more fluent with the high-frequency words and the monosyllabic words that have common, consistent patterns" (p. 15).

Heibert (2003) found that students reading texts specifically written for a certain reading level had higher gains in fluency than students who read a literature anthology. Heibert's conclusions may help explain why even the control group in Ringenberg's study (2005) made progress in fluency while reading little leveled books. The little leveled books were written specifically to target skills at the instructional level of the learner. Heibert's conclusions about the best texts for fluency instruction help explain why CAI programs are often successful in assisting students to improve their reading fluency. CAI programs can reinforce fluency and other reading skills at the instructional level of each learner by using their specifically written texts that target certain reading skills.

CAI was used in a study by Tozcu (1998) with 56 intermediate level students studying English for the first time. Tozcu utilized the New Lexis program, which was vocabulary software prepared by John McVicker to teach second language learners high frequency words in English. The 56 subjects came from different language backgrounds. "The data were analyzed using repeated measures ANOVAs using group (treatment vs. control) and time (pretest vs. posttest) using group as the independent variable with repeated measures on time" (p. 113). Although both groups increased in vocabulary knowledge, the gains made by the treatment group were significantly greater that the gains made by the control group.

In a narrow study by Adamson (1997), 14 students were used as subjects to test the effects of software developed for the study called The Short-A Sound. 13 of the 14 students showed measurable reading gains, although there were no tests for statistical significance or a control group that determined if the gains could have occurred without

the program. Adamson states, "Low readers relied more on the computer to learn to read target words. Ten of the 13 students who showed gains had been identified as low readers" (p. 99).

Another study by Nuno (2005) was also somewhat narrow in scope. Nuno evaluated several software programs, including his own software program entitled Zoo Phonics. Nuno tested his software in 2 kindergarten classes, which each had 30 students. Nuno states, "Zoo Phonics (Nuno, 1999) … was created to help limited English speakers master the curriculum as they learn English" (p.1). The students in classroom A received the treatment with Zoo Phonics over a 3 month period while the students in classroom B received phonics instruction in the classroom. Nuno states, "The results suggest that students who were exposed to Zoo Phonics gained more knowledge of the sound and name of the letters than students that were given the conventional phonics approach" (p. 16). Nuno used a T-test to determine a significant difference between the treatment and control group. Since the study did not control for teacher effects, it is difficult to know if the greater gains for the students in the treatment classroom were due to a more effective teacher or the software program.

Non-Support for Computer-Assisted Instruction

Nauss (2002), Campbell (2000), and Ritchie (1999) all conducted studies that did not find computer-assisted instruction to improve reading achievement. Ritchie's case study used 6 students, who were all from the same sixth grade classroom, to investigate a CAI program called Reading Investigations (Computer Curriculum Corporation, 1993). The students in Ritchie's case study worked for 15 minutes in the CAI program for 6

weeks. The students were assessed for growth in reading achievement. The small sample size prohibited the use of statistical analysis. Ritchie states, "…this CAI program was not as effective overall since not all of the students made gains in reading comprehension using this program" (p. 108).

Campbell (2002) studied whether CAI in reading using Computer Curriculum Corporation's SuccessMaker software program would affect critical thinking skills. Campbell's study included 525 fourth grade students and 537 fifth grade students from 13 different schools in the same school district. The students at 7 of the schools received the CAI treatment for 10 to 20 minutes daily throughout the school year. The students at the 6 other schools did not receive the CAI treatment using the SuccessMaker curriculum software program. All students throughout the district in grades 3 through 11 were assessed with the Stanford Achievement Test, 9th edition (SAT9). Campbell states, "The Reading Comprehension subtest was used to measure reading critical thinking skills" (p. 45). Campbell found "In the comparison of fifth grade pairs, there were no significant differences for 3 of the 4 matched groups" (p. 60). In fact, Campbell found that there was a negative significant difference between School 2 and School 6 in the study. Campbell found "the non-CAI school showing a gain and the CAI school showing a decrease in the mean critical thinking score" (p. 61). In the same study, Campbell assessed whether reading achievement was affected by the CAI treatment. "A comparison of means for students in both fourth and fifth grade school pairs showed no significant differences in reading achievement" (p. 61).

Campbell (2002) did determine that there were some significant differences in the change in critical thinking skills as assessed by the SAT9 for some ability groups.

The ability groups were assigned according to the students' scores on the 1998 OLSAT School Ability Index (SAI). Campbell grouped students together by high, mid-range, and low scores on the SAI. Students in the high ability groups in both the fourth and fifth grades did not show more improvement using CAI than the students in the control group. However, "Students in the fourth grade with mid-range and low SAI scores that received CAI did show more improvement over students in the control group" (p. 61). The findings were somewhat different for the fifth grade students. Only the mid-range ability groups showed more improvement for the CAI treatment group than the control group, which did not receive the CAI treatment.

Nauss' study on the Waterford Early Reading Program (WERP) had different findings than the other studies on WERP discussed in this paper. All the subjects in Nauss' study were first grade students in 25 classrooms in Hendry County, Florida. Nauss found that first grade students in the 10 classrooms that used the WERP showed no significant difference in comprehension on the Stanford 9 compared to first grade students in the 15 classrooms who did not use-WERP. "Additionally, WERP students showed no significant difference in reading performance on the STAR" (p.40). One difference in the study by Nauss from those done by Gingold (2000) and Camacho (2002) is that Nauss used an assessment that was independent from the instructional program to determine reading achievement. When the Stanford 9 was used as the post-assessment, as opposed to the Waterford Computer Adaptive Reading Test, no significant increase in reading achievement was found for the treatment group.

Another study, which compared improvement in reading rate and reading comprehension between a group using CAI in reading and a group using independent,

silent reading, found no significant difference in the composite means of the comprehension and reading rate scores (Sorrell, 2003). The design of Sorrell's study was similar to the study by Ringenberg (2005). Although Sorrell had a smaller sample size of only 12 students, she also used a counterbalanced treatment design. The students read for 4 weeks under 1 condition and then switched to the other treatment. The 12 students ranged in grade level from second to fifth grade and were all from the same elementary school in a rural area. Sorrell had the students read Accelerated Reader material using the Kurzweil 3000 program. Unlike Ringenberg, Sorrell found that computerized presentation proved no more effective than traditional remedial reading instruction for students who are identified as weak readers by their teachers. The small sample size in this study may result in the unreliable statistical findings.

Sorrell (2003) cited several studies that found text written on a computer screen, without speech synthesis, has no more or less impact on improving reading comprehension than reading text written on paper. Teachers may perceive that text printed on paper is superior to text alone on a computer screen because the paper copy is more portable and easier to take home. Conversely, as technology has advanced, computer screen text may be just as portable and easy to access at home as text printed on paper. Sorrell's study evaluated the difference in presentation of reading materials in print versus presentation of reading materials on the computer screen. In the study, neither the computer program for accessing the reading materials or the independent reading of print materials provided sequenced instructional strategies designed to increase reading achievement. The difference in the presentation of the reading material pertained to only how the print was displayed. The computer program

offered the additional modality of pronouncing words for the reader, which the independent reading of the printed materials did not provide. However, there was no real difference in instructional strategy or sequence between the 2 treatments.

Perez (1998) studied a population of 790 elementary students in first through sixth grade. The purpose was to determine the impact of several variables on achievement in math and reading of ESOL and Non-ESOL students who used a computer-based integrated learning system (ILS). The subjects in the study used the ILS for 10 minutes a day in math and 10 minutes a day in reading, "The amount of time students used the ILS for reading and math was the best single predictor of gains in math and reading for both ESOL and Non-ESOL students" (p. 38). A study by Jarrell (2000) produced confusing results. Females scored significantly better with unlimited computer access, and significantly poorer with limited access. Males were the opposite. The study included 120 sixth and 120 seventh grade students. Jarrell suggests further research to explore the differences in achievement due to gender.

When researching the effects of CAI, the researcher must use an instructional program. Studies to evaluate CAI are therefore also evaluating the particular program that is used. Rehmann (2005) conducted research on the effect of Earobics Step 1 on the phonological awareness skills of 66 kindergarten and first grade students from a Title I elementary school. The students were randomly assigned to either an experimental or control group. Pre-test measures determined that there were not significant differences in phonological awareness in the experimental and control groups. The experimental group received the intervention with Earobics Step 1 for 10 weeks in a computer lab while the control group remained in the classroom for

traditional instruction. After the 10 week period, the students were assessed for gains in

phonological awareness. After the first 10 week period, the students switched

treatments and the experimental group remained in the classroom, while the control

group received intervention with Earobics Step 1. Following the second, 10 week

period, the students were once again assessed.

Rehmann (2005) found that there were no statistically significant differences

between the experimental and control groups during either intervention period in their

gain scores for phonological awareness. Although both groups made progress in their

phonological awareness skills, the Earobics Step 1 software did not produce a

statistically significant difference in the improvement of phonological awareness skills.

Rehmann (2005) also conducted teacher interviews to gain a qualitative analysis

of the intervention. Teachers reported difficulty in monitoring and utilizing the program.

The teachers in Rehmann's study also reported that some students had to be

supervised quite closely in the computer lab because they found it rewarding to give

incorrect responses due to the interesting graphic displays that were generated by the

program as feedback to the students. One teacher stated that the reports that could be

downloaded from the program on student progress were difficult to use and so she only

downloaded the reports once, instead of monthly as requested. Another teacher

reported that the data on the reports did not have any meaning.

Another study by Bauserman (2003), which also assessed the effects of CAI on

phonological awareness, used Level A in PLATO's Beginning Reading for the Real

World software for the treatment group. Bauserman also studied the effectiveness of

this CAI program in increasing kindergarten students' knowledge of print concepts and

reading comprehension. The kindergarten subjects in the study came from 2 elementary schools in the same large city school district. There were 4 kindergarten classes in each school. All the subjects from the control group came from one school and all the subjects from the experimental group came from the second school, which had a reading grant to implement the PLATO technology. All non-special education students had a permission letter sent home to participate in the study. The control group school had 48 participants and the experimental group school had 60 participants.

The school district in Bauserman's study had an unusual framework for their kindergarten program. Parents of students could choose whether to send their child to a full-time kindergarten program or a half-time kindergarten program. The 2 schools had a different structure for their half-time programs. The control group school had a traditional schedule of half-day kindergarten where the students attended Monday through Friday, either in the morning or in the afternoon. The half-time kindergarten schedule at the experimental group school had students attending 2 full days each week and 1 half-day each week. Children in the half-time model outnumbered children in the full-time model 59 to 49.

Bauserman's CAI intervention took place over an 8 week period. The students in the treatment group averaged 12 sessions on the computer program. Over the 8 week intervention period, the average time spent on the program by the treatment group was 6 hours. The control and experimental groups were given pre-tests and post-tests to determine their change scores on assessments for phonological awareness, concepts about print, and reading comprehension.

Because the students in the treatment and control groups also had differences in the type of kindergarten program they attended, Bauserman (2003) measured the effect of the difference in kindergarten program. "Analysis of variance (ANOVA) for type of kindergarten program were performed on change scores … Full-day programs were found to be associated with statistically significant higher scores on several of the assessment measures used: CAP, PAT, and WJPC" (p. 114). Since the type of kindergarten program made a difference in the scores, Bauserman used the independent variable of type of kindergarten program in the statistical analysis to determine the effects of CAI. The statistical analysis "showed no significance for the main effects of CAI or the type of kindergarten program on any of the assessment instruments" (p. 121).

Although Bauserman (2003) found no significant main effect for CAI or for the kind of kindergarten program, she determined that there was a significant result for 1 reading comprehension assessment. "The univariate results … showed significance for the WJPC for the interaction of group and full-day program" (p. 123). Bauserman states, "These results demonstrated children in full-day kindergarten programs with CAI demonstrated the greatest gains of all other groups" (p. 123).

In addition to investigating the effects of CAI using the PLATO program on phonological awareness, concepts about print, and reading comprehension, Bauserman also asked teachers in the experimental school to give their opinions about CAI. "They unanimously agreed that CAI was beneficial to students, especially low performing students" (p. 136). However, the teachers in the study had reservations about CAI in general and specific complaints about the PLATO program. Reservations centered

around the availability of a variety of CAI programs, the loss of class time when students were using CAI, reliability problems and servers that were slow or not running. Complaints about the PLATO program that teachers reported to Bauserman were related to their perception that the program was not user friendly for kindergarten students. Teachers reported that several layers of screens were needed to access the program, which made it difficult for kindergarten students. "There were no verbal instructions telling students how to navigate through these screens. For kindergarten children, these steps were impossible to navigate, thus requiring the help of an adult" (p. 117).

A qualitative, 18 month study by Williams (1999) explored the use of Writing to Read (IBM, 1986) by first grade students for learning to read and write. Williams found that the perspective of teachers was that the use of Writing to Read (WTR) diminished in importance over time.

> Teachers reported that the repetitive nature of the software programs and the duration of each lesson were too difficult and fixed for young children to attend to every day. Teachers found ways to avoid putting themselves or their students through what they called mundane experiences in Computer. (Williams, 1999, p. 94)

The perspective of the teachers concerning the value of WTR diminished over a period of time to the degree that 1 teacher in Williams' study reported she discontinued bringing her students to the lab to use WTR. Furthermore, the same teacher reported that the students did not miss going to the lab. "She believed that her students had experienced all that was available from the lab" (Williams, 1999, p. 93). Williams also found that the teachers did not look for alternative ways to use the computers and the

software during the 18 months of the study. "Their option was to replace computer with a classroom activity" (Williams, 1999, p. 95).

Williams (1999) also considered the children's' perspectives of CAI using WTR. The study concluded that the findings from documentation of student experiences and dialog with students "indicated increased competencies in computer literacies as much or more than an increase in language literacy competencies" (p. 127). The students in the study perceived the CAI using WTR as a workplace, experimentation, and reading and writing. However, Williams found that "Students did not necessarily associate their reading as part of the WTR activity" (p. 143). The students reported that they could do what the computer said to do and could find ways to do other things. Rehmann (2005) also found that students sometimes do not follow a CAI program correctly because the graphics or sounds accompanying incorrect responses are rewarding to them. Williams described the students' use of the WTR program, stating, "They managed to find numerous spaces in their work to experiment" (1999, p. 127).

Williams (1999) noted that because the WTR program often required one, specific response from learners, the students' reading and writing experiences were geared only to finding the correct match. "Learning to read and write with a computer application did not guarantee engagement with print language literacies" (Williams, 1999, p. 128). Williams makes a broad assumption that computer applications in general do not provide learners adequate involvement with literacy. It would seem that a more appropriate finding from this qualitative research would be that the WTR program did not guarantee engagement with print language literacies. In further describing CAI using the WTR program, Williams states, "Children could perceive

success in the lab in terms of their competence in computer literacy rather than in terms of their competence as readers and writers" (1999, p. 128).

Williams discovered through qualitative research that the perspectives of the teachers and students in the study differed from the official claims and purposes for WTR. In the summary chapter of the study, Williams states, "Multiple perspectives reinforced the fact that WTR in itself could not teach children to read and write" (1999, p. 131). Williams discovered the importance of a learning sequence that is directed by the learner. Ediger (1998) distinguished between a logical sequence and a psychological sequence in instruction. A logical sequence is ordered by the teacher, curriculum document, or CAI program to best meet the needs of the majority of students. In a psychological sequence, a learner orders his or her own activities to meet his or her own individual learning needs. Williams' findings support the need for a psychological sequence in the instructional framework of an effective CAI program. Williams (1999) found that "In contrast to notions of a curriculum that shapes or controls what is learned, student experiences in this study supported the premise that student learning is situated and directed by an emic or insider perspective" (p. 131).

The Writing to Read (WTR) program may have lost favor with the teachers in the study by Williams (1999) due to the fact students were forced to find a correct response instead of being re-taught by the program when they chose an incorrect response. The program used a logical sequence that was not dependent on student mastery of the literacy concepts, but was rather driven by the student matching responses to questions. As stated in Chapter 1, how software is used, and if it is used at all, is determined by the teacher in the classroom or computer lab. "Teachers ultimately

determined the influence WTR would have in their instructional day over time. Eventually they came to view the program as supplemental and even expendable" (Williams, 1999, p. 131).

A research study to determine the effectiveness of CAI in reading using the Lexia Phonics computer software program was conducted by Kutz (2005). Kutz utilized a quantitative approach, using the Dynamic Indicators of Basic Literacy Skills (DIBELS) as a pretest and posttest, to determine whether the program made a significant difference in the reading achievement of kindergarten and first grade students over a 12 week period. "The pretest was administered during September, 2004. The posttest was administered during December, 2004" (Kutz, 205, p. 56). All students in the study were from the same suburban school district in southeaster Pennsylvania during the 2004-2005 school year. The majority of the subjects were Caucasian students from middle-class families. The student participants were selected because their teachers volunteered their class to take part in the study.

Kutz (2005) also incorporated a qualitative approach in the study, which revealed the teachers' opinions of the Lexia Phonics program. Due to the fact the teachers were self-selected to use the Lexia Phonics software program with their students, it is possible that the opinions expressed in the qualitative portion of the study may not be accurately extrapolated to reflect the opinions of all kindergarten and first grade teachers. The classroom teachers and instructional aides were "…trained to use the Lexia Phonics computer program within a computer lab setting by the computer technology teachers within the district" (Kutz, 2005, p. 55).

The kindergarten students in the study by Kutz (2005) included students from 3 full-day kindergarten classes in 3 elementary school buildings. The classes were split to each include members of the treatment and control groups. The treatment group included 29 kindergarten students and the control group was comprised of 26 kindergarten students. The treatment and control groups together included 18 kindergarten Title I students. The students in the treatment group used the Lexia Phonics software program for 2, 30-minute sessions each week during the 12 week study. The students in the control did not use the Lexia Phonics software program.

Considering the benefit of letter recognition for kindergarten students, Kutz (2005) found no significant difference at the $p < .05$ level between the control group and the treatment group. Concerning the benefit of initial sound fluency for kindergarten students, Kutz found that there was no significant difference at the $p < .05$ level between the control group and the treatment group. In summary, Kutz found that there was no significant main effect of the Lexia Phonics software program on letter recognition or initial sound fluency of kindergarten students, as measured by change scores on the DIBELS, on either the treatment or control group.

The first grade students in the study by Kutz (2005) came from 3 first grade classrooms in 2 elementary school buildings. The treatment group included 70 first grade students and the control group was comprised of 68 first grade students. The treatment and control groups together included 35 first grade, Title I students and 2 first grade students from a self-contained, learning support classroom. The students in the treatment group used the Lexia Phonics software program for 2, 30-minute sessions

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each week during the 12 week study. The students in the control did not use the Lexia Phonics software program.

The third research question in the study by Kutz (2005) addressed the benefit of phoneme segmentation fluency for first grade students. The means of the pretest and posttest did differ significantly from each other, indicating, "Lexia Phonics was beneficial for phoneme segmentation fluency (PSF) in first grade students" (p. 69). However, the control group also received benefit from the classroom instruction. "The Levene's test for Equality of Variances indicated variances for the control group and the treatment group did differ significantly from each other" (Kutz, 205, p. 66). Using ANOVA, Kutz found "that there was no significant main effect for the treatment group or the control group" (2005, p. 66). Kutz also found that there was no significant main effect on the benefit of nonsense word fluency for the treatment group or the control group.

The 3 kindergarten teachers who were interviewed in the qualitative portion of the research study conducted by Kutz (2005) were generally pleased with the Lexia Phonics program and had no specific complaints about it. One of the 3 kindergarten teachers felt that students who were weaker in language arts would benefit from using the program for a longer time. Two of the 3 kindergarten teachers "felt their classroom instruction was just as beneficial or more beneficial for students than exposure to the Lexia Phonics CAI" (p. 92). The 3 first grade teachers who were interviewed by Kutz were also generally pleased with the Lexia Phonics program. The first grade teachers all agreed that the program might be more motivational if it were more game-like when practicing reading skills. Finally, student surveys indicated that the majority of both

kindergarten and first grade students felt the program helped them to learn reading skills and that they enjoyed using Lexia Phonics.

The Imagination Station® Internet-based supplemental reading instruction and intervention program (Imagination Station, Inc., Richardson TX, www1.istation.com) has been utilized in several school districts throughout the United States. "The imagination Station from istation.com delivers interactive, standards-based instruction to pre-K through third grade students. Designed to augment classroom instruction, the program continually assesses student performance, adapting the curriculum to individual learning needs" (T & L Editors, 2003, p.1). Since the software has a high level of interactivity, it meets the first criteria described by Rings as supporting the development of critical reading. All the stories used in The Imagination Station software can be printed in a hard copy for students. This fulfills another of Rings' criteria for the support of critical reading skills, which is that reading should have a "real context." The instruction, feedback, and re-teaching in the software is logical and sequential. The software continually spirals students through reading objectives, providing additional time on a particular objective for those who need it. The software systematically reviews objectives to ensure mastery. Ediger, Hall, and other researchers would, therefore, probably find that The Imagination Station is a vehicle for improving reading achievement for all students, and particularly for students with reading disabilities.

The Florida Center for Reading Research (FCRR) (2006) prepared a report that reviewed The Imagination Station. The FCRR reported on 2 studies conducted in the 2003-2004 school year that evaluated the effectiveness of The Imagination Station program. In the first study, Shippenburg University collaborated with the Chambersburg

Area School District. In the fall, data on letter naming fluency, initial sound fluency, phoneme segmentation fluency, and nonsense word fluency were collected on 550 kindergarten students using the Dynamic Indicators of Basic Early Literacy Skills (DIBELS). Nine kindergarten classrooms with 180 students who were currently using The Imagination Station were assigned to the treatment group. The control group consisted of 384 kindergarten students who were not using The Imagination Station. The experimental, treatment group made significant improvements relative to the control group, p < .05. However, according to the Florida Center for Reading Research (FCRR), the results cannot be interpreted to mean the program caused the entire difference since the students were not randomly assigned to the control and experimental groups.

The FCRR (2006) reported on a second study that was also carried out in the 2003-2004 school year in the Fort Worth Independent School District in Texas. The FCRR states "The impact of The Imagination Station activities on student reading achievement was assessed using an experimental design that compared test scores of 2 matched, randomly assigned groups of students: (a) The Imagination Station students and (b) students in alternative interventions" (2006, p. 3). Assessment of students revealed that The Imagination Station had a positive impact on the students' basic reading skills. The FCRR reported that the percentage of students making gains on the Texas Primary Reading Inventory (TPRI) was greater for The Imagination Station students than those students in the alternative intervention group in all categories except 1. "The Imagination Station group improved similarly to the alternative intervention group from beginning to end of year scores for percentage of students who

met the comprehension criteria" (FCRR, p. 4). The students were also assessed with Stanford 10 (SAT 10) reading scores. "During the first year of implementation, no significant impact was observed on overall reading ability as measured by the SAT 10" (FCRR, 2006, p. 4).

Conclusions

Further study is needed to assess the impact of CAI on literacy skills and reading achievement. It is only possible to study one instructional software program at a time because the effectiveness of CAI is dependent on the quality of instruction embedded within each program. It is not possible to make general conclusion about the efficacy of CAI without regard to the computer-assisted instructional program that is being used. The quality of the instructional sequence, appropriate feedback, individualization of instruction, and user friendliness are all factors that will affect the quality of a CAI program and therefore also affect student learning while using CAI.

Teachers have generally indicated they believe CAI is most beneficial for low-performing students. Studies that include large sample groups and are conducted for longer periods will enhance the knowledge base in the area of the effect of CAI on literacy skills and reading achievement. In the next chapter, the methods used to study computer-assisted instruction in literacy skills for kindergarten students, using The Imagination Station software, will be discussed.

CHAPTER 3

METHODOLOGY

In the previous chapter, prior studies on the effectiveness of computer-assisted instruction in reading and literacy skills are analyzed and discussed. This chapter explains the methods, which were used in carrying out this research. The study's perspective, context, participants, instruments for data collection, procedures, and process of data analysis, and validity will be discussed. The factors jeopardizing internal and external validity of the research are addressed. The methodology should be capable of being reproduced in schools of similar size and socio-economic status. This is assuming that hardware and software are readily available to make a similar study possible.

The General Perspective

The general perspective of the research study is quantitative. The researcher used a survey to determine the perceptions of teachers and administrators regarding computer-assisted instruction (CAI) in reading and literacy skills for kindergarten students. The survey is found in appendix A. The researcher assigned numerical values to the data collected to allow for statistical analysis of the participants' responses. The research type for this part of the study is descriptive research because it reports the frequencies, averages, and percentages of responses in order to describe the perceptions of the study participants (Glatthorn, 1998).

The researcher also compared the change in literacy assessment scores of students who used The Imagination Station® Internet-based supplemental reading

instruction and intervention program (Imagination Station, Inc., Richardson TX, www1.istation.com) to the scores of students who did not use the program. The research type for this part of the study is quasi-experimental because students were not randomly assigned to the treatment and control groups to determine if the software made a significant difference in the literacy scores of the students (Glatthorn, 1998).

The Research Context

Alton, Bradley, Carsten, and Drew (fictitious names) are elementary schools in the same, fast-growing, suburban district. The fictitious names correspond to school numbers 1, 2, 3 and 4 in the data. The schools were in operation for 7 years, 5 years, 19 years, and 1 year, respectively. These schools had access to The Imagination Station instructional program in reading for 10 weeks. Kindergarten teachers and administrators in these 4 schools were participants in the portion of the research study that used a survey to determine their perceptions of computer-assisted instruction in literacy skills for kindergarten students.

Although this school district was considered a rural district 15 years ago, it is located near a very large city in Texas. Due to population growth and shift, the district is now considered suburban. All the elementary schools involved in the study served students in kindergarten through fifth grade. During the 2005-2006 school year, in which the study took place, there were 18 elementary schools in the district. Literacy assessment data were obtained from all kindergarten students in each of the18 elementary schools in the district. School number 18 was eliminated from the study because they used the program all year rather than just during the pilot test.

During the 2005-2006 school year, Alton enrolled about 807 students, Bradley enrolled about 519 students, Carsten enrolled about 625 students, and Drew enrolled about 837 students. The student populations are ethnically diverse with students from several Asian, Hispanic, African American, Middle-Eastern, and European cultures. Data were not collected concerning the ethnicity of individual students. However, Table 1 shows the percentage of students which belong to the subgroups recognized in the Academic Excellence Indicator System (AEIS) report of the Texas Education Agency (TEA) for the 2005-2006 school year.

Table 1

AEIS Subgroup Population Percentages

	Alton	Bradley	Carsten	Drew
African American	8.5%	20.2%	6.1%	16.2%
Hispanic	15.2%	23.3%	13.4%	14.3%
White	67.1%	51.0%	76.7%	60.3%
American Indian/Native Alaskan	0.4%	0.4%	0.8%	1.4%
Asian/Pacific Islander	8.9%	5.2%	3.0%	7.8%
Economically Disadvantaged	13.9%	32.6%	13.4%	12.3%

The 4 schools where teachers and administrators were research participants varied on the percentage of students receiving free and reduced lunch. At Bradley Elementary, a larger percentage of students received free or reduced lunch than at the other 3 schools. Some of the apartments in the Bradley attendance zone were federally subsidized. Each classroom, in all 4 schools, had 3 student computers as well as a

teacher computer. In addition, there were computer labs in each of the schools to which all classrooms had access.

Principals who consented to be participants in the study had The Imagination Station program provided for kindergarten students on their campus. Teachers who consented to be participants in the study had The Imagination Station program provided for the students in their classrooms.

The Research Participants

The research participants were kindergarten teachers and administrators from the 4 elementary schools described in the research context. The administrators included principals and assistant principals who gave consent to be participants. There were 28 participants in the descriptive research portion of the study, which used a survey developed by the researcher to capture the perceptions of teachers and administrators of computer-assisted instruction in literacy skills for kindergarten students. Demographics for the participants were collected from the survey. The teachers and administrator participants were all females. The ethnicity of the teacher and administrator survey participants was not included in the data. However, the vast majority of the survey participants were Caucasian.

Instruments Used in Data Collection

Survey

The descriptive research portion of the study utilized a survey developed by the researcher to obtain the perceptions of the administrators and teachers concerning the

effects of CAI using The Imagination Station program on the literacy skills of kindergarten students. The purpose of the survey was to describe the perceptions of teachers and administrators concerning the effect of The Imagination Station program on the literacy skills of their kindergarten students. The survey was also designed to determine if teachers and administrators perceived that The Imagination Station program was more beneficial for students who were above grade level, at grade level, or below grade level in their literacy skills.

The survey was divided into 4 sections of questions. Within each section, questions were grouped together if they pertained to the same literacy skill. A pattern of 4 questions regarding improvement in a single aspect of literacy was used in the first 5 groups of questions on Section I of the survey. The first question in each group asked about the participant's perception of the improvement in the students' skills in a particular aspect of literacy. The second question in each group asked about the participant's perception of the improvement in skills that above-grade level students made in that same aspect of literacy. The third question in each group asked about the participant's perception of the improvement in skills that on-grade level students' made in the same facet of literacy. The fourth and last question in each group asked about the participant's perception of the improvement in skills that below-grade level students achieved in the particular literacy element being investigated. Participants rated their impressions of their students' improvement as excellent, good, fair, or no improvement.

The first 4 questions on the survey asked participants to describe their perceptions of the improvement in their students' letter identification skills after using The Imagination Station. Questions 5 through 8 on the survey asked participants to

describe their perceptions of the improvement in their students' letter sound skills after using The Imagination Station. Questions 9 through 12 asked participants to describe their perceptions of the improvement in their students' concepts about print (CAP) skills after using The Imagination Station. Questions 13 through 16 asked participants to describe their perceptions of the improvement in their students' phonemic awareness skills after using The Imagination Station. Questions 17 through 20 asked participants to describe their perceptions of the improvement in their students' Diagnostic Reading Assessment (DRA) after using The Imagination Station. Question 21 was a general, summary question that asked participants to describe their perceptions of the improvement in their students' literacy skills after using The Imagination Station. Participants rated their perceptions of improvement as excellent, good, fair, or no improvement, which corresponded to the Likert scale of 4, 3, 2, and 1, respectively.

Section II of the survey was composed of Questions 22 through 29. The first group of questions in Section II, numbered 22 through 25, related to how often students used the program. The second group of questions in Section II, numbered 26 through 29, asked participants to describe how often they printed or used the reports and books generated by the program. The last group of questions in Section II, numbered 30 through 32, asked participants about how frequently students were eager to use the program, how frequently the students could use the program independently, and how frequently the program was easy to use for the teacher. Participants rated their perceptions of frequency as 4 to 5 days a week, 3 days a week, 1 to 2 days a week, or 0 days a week, which corresponded to the Likert scale of 4, 3, 2, and 1, respectively.

In Section III of the survey, the first group of questions, numbered 33 through 35, asked participants to describe their agreement that the training they received was beneficial, that their computer skills were sufficient to use the program effectively, and that their students' computer skills were sufficient use the program effectively. Participants rated their perceptions as strongly agree, agree, agree somewhat, and do not agree, which corresponded to the Likert scale of 4, 3, 2, and 1, respectively. The second group of questions in Section III, numbered 36 and 37, asked participants to rate their computer skills and their students' computer skills as excellent, good, fair, or poor, which corresponded to the Likert scale of 4, 3, 2, and 1, respectively.

In Section IV of the survey, Questions 38 through 42 were designed to gather demographic information about the participants. The participants were asked their job category, school, years of experience, gender, and age.

Literacy Assessments

The quasi-experimental portion of the research study utilized the district literacy assessments, administered by all kindergarten teachers in the district, to collect data. The teachers administered the district literacy assessments in the fall, winter, and spring. The literacy assessments included (a) letter identification with a range of scores from 0-54 (a and g are presented in 2 different fonts), (b) letter sound identification with a range of scores from 0-26, (c) concepts about print (C.A.P.) with a range of scores from 0-14, (d) phonemic awareness with a range of scores from 0-30, (e) listening comprehension with a range of scores from 0-8, and (f) a diagnostic reading assessment (DRA) with a range of scores from 0-44.

Procedures Used

The Assistant Superintendent for Curriculum and Instruction and the principals of the 4 schools granted access to the educational sites. All teachers and administrators were volunteers who gave informed consent to participate in the study. Participants received a survey at the end of the school year, which included information about the research study. The signature required on the survey indicated that the participant was giving informed consent to take part in the research study. The survey used a 4 point Likert scale to assess the perceptions of administrators and teachers of the effectiveness of CAI using The Imagination Station program.

To increase the validity of the survey used to determine teacher and administrator perceptions of CAI, the participants in the study came from 4 different schools. All teachers in the district used computers for instruction in core subjects throughout the year. There was no novelty effect of using CAI in this district, because other CAI programs were already being used.

The company that developed and owns The Imagination Station provided the software for the study. Company employees provided training for the study participants on the use of the program. The participants voluntarily attended the training and were able to receive 3 hours of staff development credit in technology if they completed the training. Participants were able to choose between 2 training dates. The training was provided for 3 hours after school at the Alton campus and the Carsten campus.

Data Analysis

Survey

For the descriptive portion of the study which used a survey to collect data, descriptive statistics were used to describe and analyze the participant responses to the survey. The data were displayed in a frequency distribution table. Both the percentage, and actual number, of participants with the same answer were reported within the table.

Having the data displayed in the frequency distribution table allowed for a preliminary description of the findings. The categories on the Likert scale were given numerical values from 1 to 4. Computing quantitative measures of the distribution of scores enhanced the description of the distribution (Hinkle, Wiersma, Jurs, 1998). Measures of central tendency, including the mean, median, and mode, were calculated for the responses of the participants on each question. Measures of variation, the range, mean deviation, variance, and standard deviation, were calculated for the responses of the participants on each question. Statistical analysis was performed using the statistical package for the social sciences (SPSS) in order to analyze and compare the responses of the participants.

Literacy Assessments

For the quasi-experimental portion of the study, the data from the district literacy assessments were analyzed to determine if the treatment using The Imagination Station made a significant difference in the literacy assessment scores of the treatment group. Statistical analysis was performed using the statistical package for the social sciences

(SPSS) in order to analyze the differences in the treatment and control groups on the district literacy assessments.

Univariate analysis was used to describe and summarize the means, standard deviation, variation, and range of values for the average *z* scores on the literacy assessments of the treatment and control groups. Bivariate analysis was used to create correlation tables to further analyze the data. A repeated measures ANOVA was used to compare the means of the average *z* scores on the literacy assessments for the treatment and control groups of students.

Validity

Internal Validity

According to Campbell and Stanley (1963), internal validity means that the researcher can conclude that the treatment made a difference in the specific experiment, which was conducted. Campbell and Stanley (1963) identify 8 challenges to internal validity which include (a) history, (b) maturation, (c) testing, (d) instrumentation, (e) statistical regression, (f) biases, (g) experimental mortality, and (h) selection-maturation interaction.

Campbell and Stanley (1963) define history as events that also took place during the experimental treatment. In educational research where students are in different schools with different teachers, it is impossible to control the other events that are taking place during the treatment. It would be impossible to say with certainty that unknown variables did not affect the results of the experiment. Students not only have different experiences at school, but they also have a different history at home. One of the

schools in the treatment group of this study was a Title I school. Students in this school may have experienced a different history both at school and at home than students in a non-Title I school.

Maturation is defined by Campbell and Stanley (1963) as the processes that occur as a result of the passage of time. It is impossible to say with certainty in educational research that a treatment made the entire difference in a change when both groups are maturing. This variable is particularly important when studying kindergarten students, as in this research study. Kindergarten students enter school with varied levels of maturity and grow in maturity throughout the year at varied rates as well.

Testing itself can affect the scores of the next test (Campbell and Stanley, 1963). In this research study there were 3 sets of assessments given to each student. The tests themselves and how they were administered may have affected the outcome of the next set of assessments.

Instrumentation refers to the instrument that is used to measure the results of a research study (Campbell and Stanley, 1963). In the descriptive portion of this research study, the researcher developed the survey. The design did not allow for statistical testing because the sample size turned out to be too small at 28 participants. There were also too many questions in relationship to the number of participants who completed the survey.

Statistical regression, as defined by Campbell and Stanley (1963) is "operating where groups have been selected on the basis of their extreme scores (p. 5). In this research study, it did not make a difference in the finding when outliers were excluded from the data. Campbell and Stanley state that biases result from the selection of

comparison groups. This study of computer-assisted instruction using The Imagination Station program had to rely on which schools and teachers volunteered to use the program. The fact that there was not random assignment to the treatment and control groups creates less reliability in the findings. One possible theory could be put forward that the volunteers could have been from schools where the students were generally below their peers in other schools in literacy skills, which would create differences in the means of the control and treatment groups from the beginning.

Experimental mortality is the loss of subjects or participants during the course of an experiment (Campbell and Stanley, 1963). In this research study, there were several students who were present in the fall, but not in the spring or winter. There were also several students who were present in the spring, but not in the fall or winter. Only the students who were present for the entire year were included in the data. However, it is impossible to say how the students who were lost from the data may have affected the outcome of the experiment.

Campbell and Stanley (1963) define selection maturation interaction as when the interaction of selection and maturation in multi-group, quasi-experimental designs "might be mistaken for, the effect of the experimental variable" (p. 5). This is a threat to internal validity in this research because of the non-random selection and the yearlong maturation of the students. It would be difficult to say if the experimental treatment had more effect than these 2 variables on the outcome of the experiment.

External Validity

Campbell and Stanley (1963) describe external validity as generalizability to

other populations. Campbell and Stanley also use the word, *"representativeness" (p.5)* to describe external validity and define 4 threats to external validity.

The first threat to external validity described by Campbell and Stanley (1963) is the reactive or interaction effect of testing. Whether subjects are sensitized or desensitized to the experimental variable by the testing is a threat to external validity. In this research study the interaction effect of testing is not a threat to external validity. Both the control and treatment groups all were given the same tests at about the same time. It is possible that individual subjects in the treatment group could have been sensitized or desensitized by testing, but due to the large sample size, this was not a concern for this study.

The interaction effects of selection biases and the experimental variable is another threat to external validity identified by Campbell and Stanley (1963). This research was conducted in an affluent school district. It may not be possible to repeat the results in a district of differing economic status.

Campbell and Stanley (1963) also identified the reactive effects of experimental arrangements as a threat to external validity. A well known experiment found that workers in a factory increased production simply because they were being observed and not because of the experimental condition. The experimental arrangement was not a threat to external validity for this study. All students had access to computers, whether they were in the control group or experimental group. There was no novelty effect of the computer use itself, because all students in the district use computers on a regular basis. Students in both the experimental and control groups were assessed with the same instruments with the same frequency. In this research, there was not a

unique arrangement that would have caused the subjects to behave differently or score differently on the literacy assessments.

The last threat to external validity identified by Campbell and Stanley (1963) was multiple treatment interface. This could be considered a threat to the external validity of this research because teachers used several literacy treatments in their literacy instruction. The Imagination Station was a treatment that was unique to the treatment group. However, it is not known what unique treatments both groups may have received in addition to the computer-assisted instruction with this program.

Summary of the Methodology

The perspective of the research study is quantitative. Descriptive research and quasi-experimental design were the 2 general research approaches, or types, that were used for the study. The data collected from the survey were intended to describe the perceptions of teachers and administrators regarding the use of computer-assisted instruction, using The Imagination Station, to teach literacy skills to kindergarten students. The data collected from the literacy assessment scores of kindergarten students in the district were intended to evaluate the effectiveness of the software. In the next chapter, the results of the study will be revealed.

CHAPTER 4

RESULTS

The results of this study were calculated and analyzed using the Statistics

Package for Social Sciences (SPSS).

Survey Results

The median and the mode are 2 measures of central tendency that are important

to the analysis of the research findings in this summarization. The mean is another

measure of central tendency that is used for comparisons of the responses to questions

that are closely related. The standard deviation, the variation, and the mathematical

mean of the participant responses are not practical means of describing the perceptions

of the participants. If half of the participants described the improvement in a facet of

their students' literacy skills as excellent and the other half of the participants perceived

no improvement in those same skills, it would not be logical to assume that the

perception of the participants concerning the improvement of literacy skills in that

particular area was fair or good. For this reason, the mathematical mean was not often

used to help describe the participants' perceptions about the level of improvement of

their students' literacy skills after using The Imagination Station.

The means of the participant responses are used to underscore the participant's

perceptions of the difference in improvement of skills for above-grade level, on-grade

level, and below-grade level students in a single area of literacy. The percentages of

participants that responded with the same selection on the Likert scale and the

frequency of responses at that level on the Likert scale are used to describe the

perceptions of the participants of the computer-assisted instruction delivered by The

Imagination Station on the improvement of their kindergarten students' literacy skills.

Letter Identification

Question 1 of the survey asked the participants how they perceived the

improvement of their students' skills in letter identification after using The Imagination

Station. Question 1 does not address whether the students were above, at, or below

grade level. Table 2 describes the Question 1 results.

Table 2

Improvement in Letter Identification Skills

N		Mean	Median	Mode
Valid	Missing			
27	1	2.85	3.00	3

Analysis of the data in Table 2 revealed that the median and the mode of the

participant responses were both 3, which indicated the participants generally perceived

that their students' improvement in letter identification skills after using The Imagination

Station was good. Table 3 further quantified the response to Question 1 by showing

37% of the participants responded with a 3 on the Likert scale. An additional 33.3% of

the participants responded with a 4 on the Likert scale. Ten of the participants rated the

improvement in letter identification skills of their students as good and 9 participants

rated the improvement in letter identification skills of their students as excellent. The

percentage of participants who responded with either a 3 or 4 on the Likert scale was

70.3%, which indicated a large majority of participants perceived their students'

improvement in letter identification skills after using The Imagination Station to be good

or excellent.

Table 3

Improvement in Letter Identification Skills

Likert Scale	Response	Frequency	Percent
1	None	5	18.5
2	Fair	3	11.1
3	Good	10	37.0
4	Excellent	9	33.3

Note: One participant did not answer this question. Percent based on responses
received.

Question 2 of the survey asked the participants how they perceived the

improvement of their above-grade level students' skills in letter identification after using

The Imagination Station. Table 4 describes the Question 2 results. Analysis of the data

in Table 4 revealed that the median was a 2 on the Likert scale, which indicated a

perception of fair improvement for above-grade level students in letter identification

skills. The mode was a 1 on the Likert scale, which indicated a perception of no

improvement for above-grade level students in letter identification skills. The mean was

2.26, which was closer to the median than the mode. If both the median and the mean

were taken into consideration, it would indicate that the participants perceived fair improvement in their above-grade level students' letter identification skills.

Table 4

Improvement in Letter Identification Skills for Above-Grade Level Students

N		Mean	Median	Mode
Valid	Missing			
27	1	2.26	2.00	1

Table 5 further quantified the response to Question 2 and showed that although 44.4% of participants perceived no improvement in letter identification skills for their above-grade level students, 48.1% perceived good or excellent improvement in letter identification skills for their above-grade level students. Only 7.4% of participants perceived fair improvement in their above-grade level students' letter identification skills, which was the median response. The participants were polarized in their perceptions of the improvement of their above-grade level students in letter identification skills after they used The Imagination Station.

The mean response of the participants on Question 2 was 2.26, which was less than the mean response of the participants on Question 1, which was 2.85. This difference might suggest that participants perceived that students who were already above grade level improved less in their letter identification skills than did all students in general. The perception that the letter identification skills of above-grade level students did not improve as much as the letter identification skills of on-grade level and below-grade level students will be explored at greater length in the summary in Chapter 5.

Table 5

Improvement in Letter Identification Skills for Above-Grade Level Students

Likert Scale	Response	Frequency	Percent
1	None	12	44.4
2	Fair	2	7.4
3	Good	7	25.9
4	Excellent	6	22.2

Note: One participant did not answer this question. Percent based on responses received.

Question 3 of the survey asked the participants how they perceived the improvement of their on-grade level students' skills in letter identification after using The Imagination Station. Table 6 describes the Question 3 results. Table 6 revealed that the median was a 3 on the Likert scale, which would indicate a perception of good improvement. However, there were multiple modes of 1, 2, and 3 on the Likert scale for Question 3, which indicated that the participants did not agree about their perception of the improvement of on-grade level students in letter identification skills after using The Imagination Station. Seven participants each chose the Likert scale response of 2, 3, and 4. Six participants choose the Likert scale response of 1. Although the median response was a 3 on the Likert scale, the even distribution of the participants' responses leaves only the mean as a reliable measure of central tendency for this particular question. The mean was response was 2.56, which indicated a perception of

between fair and good improvement in letter identification skills for on-grade level students.

Table 6

Improvement in Letter Identification Skills for On-Grade Level Students

N		Mean	Median	Mode
Valid	Missing			
27	1	2.56	3.00	2(a)

Note: (a) Multiple modes exist. The smallest value is shown.

Table 7 further quantified the response to Question 3 by showing that slightly less than 50% of the participants responded with a 1 or 2 on the Likert scale and slightly more than 50% of participants responded with a 3 or 4 on the Likert scale. Table 7 contributed to the conclusion that there was little agreement among the participants about the improvement of letter identification skills for on-grade level students by showing the percentages of participants choosing each response was nearly equal.

The multiple modes indicated that the median was not as reliable of a measure of central tendency for the responses to this question as it was for other questions. The mean of 2.56 provided a mathematical average to describe the participants' perceptions of their on-grade level students' improvement in letter identification skills. As stated previously, the mean is not always a logical way to describe participant responses. However, the mean of 2.56 might imply that the participants perceived the improvement of their on-grade level students in letter identification skills to be greater than the

improvement of their above-grade level students in the same skills, where the mean

was only 2.26.

Table 7

Improvement in Letter Identification Skills for On-Grade Level Students

Likert Scale	Response	Frequency	Percent
1	None	6	22.2
2	Fair	7	25.9
3	Good	7	25.9
4	Excellent	7	25.9

Note: One participant did not answer this question. Percent based on responses received.

Question 4 of the survey asked the participants how they perceived the

improvement of their below-grade level students' skills in letter identification after using

The Imagination Station. Table 8 describes the Question 4 results.

Table 8

Improvement in Letter Identification Skills for Below-Grade Level Students

N		Mean	Median	Mode
Valid	Missing			
27	1	3.19	3.00	3

Analysis of the data in Table 8 revealed that the median and the mode were both 3 on the Likert scale, which indicated the participants perceived good improvement on letter identification skills for below-grade level students. The mean of the participant responses was 3.19, which was slightly higher than either the median or the mode.

Table 9 further quantified the response to Question 4 by showing that 85.1% pf the participants responded with a 3 or 4 on the Likert scale, which indicated the participants perceived good or excellent improvement on letter identification skills for below-grade level students. The percentage of participants that chose a 4 on the Likert scale was 40.7%, which indicated a perception of excellent improvement in letter identification skills for below-grade level students.

Table 9

Improvement in Letter Identification Skills for Below-Grade Level Students

Likert Scale	Response	Frequency	Percent
1	None	2	7.4
2	Fair	2	7.4
3	Good	12	44.4
4	Excellent	11	40.7

Note: One participant did not answer this question. Percent based on responses received.

The mean of the participant responses for Question 4 was 3.19, which was slightly higher than either the median or the mode. The mean of 3.19 standing al1

would indicate the perception of participants was that below-grade level students had better than good improvement in letter identification skills after using The Imagination Station. However, the mean is more properly used to compare the participant responses for above-grade level, on-grade level, and below-grade level students. The means for the 3 groups were 2.26, 2.56, and 3.19 respectively.

The mean results for the leveled groups indicated that participants perceived greater improvement in letter identification skills for below-grade level students than the other 2 groups. The mean results also indicated that the participants perceived greater improvement in letter identification skills for on-grade level students than above-grade level students. The perception of improvement of skills appeared to be inversely related to the relative grade level of the student. Participants perceived that students already achieving at above grade level improved the least and those students already achieving below grade level improved the most after using The Imagination Station.

Letter Sound Identification

Question 5 of the survey asked the participants how they perceived the improvement of their students' skills in letter sound identification after using The Imagination Station. Question 5 does not address whether the students were above, on, or below grade level. Table 10 describes the Question 5 results. Table 10 revealed that the median and the mode were both 3 on the Likert scale, which indicated a perception of good improvement. The mean was 2.96, which is mathematically very close to the median and the mode. Because all 3 measures of central tendency are

nearly equal, it can be stated with some reliability that the participants' perception of the improvement of their students' skills in letter sound identification was good.

Table 10

Improvement in Letter Sound Identification Skills

N		Mean	Median	Mode
Valid	Missing			
26	2	2.96	3.00	3

Table 11 further quantified the response to Question 5 by showing 80.7% of the participants responded with a 3 or 4 on the Likert scale, which indicated a perception of good to excellent improvement in letter sound identification skills for all students.

Table 11

Improvement in Letter Sound Identification Skills

Likert Scale	Response	Frequency	Percent
1	None	3	11.5
2	Fair	2	7.7
3	Good	14	53.8
4	Excellent	7	26.9

Note: Two participants did not answer this question. Percent based on responses received.

Question 6 of the survey asked the participants how they perceived the improvement of their above-grade level students' skills in letter sound identification after using The Imagination Station. Table 12 describes the Question 6 results. Table 12 revealed that the median was a 2 on the Likert scale, which would have indicated a perception of fair improvement. The mode was a 1 on the Likert scale, which would have indicated a perception of no improvement. The mean of the participant responses was 2.26.

Table 12

Improvement in Letter Sound Identification Skills for Above-Grade Level Students

N		Mean	Median	Mode
Valid	Missing			
27	1	2.26	2.00	1

Table 13 further quantified the response to Question 6 by showing 51.8% of the participants responded with a 1 or 2 on the Likert scale and 48.1% of the participants responded with a 3 or 4 on the Likert scale. The responses were polarized. Approximately half of the participants perceived there was no improvement, or only fair improvement, in letter sound identification skills for above-grade level students. The other half of the participants perceived there was good to excellent improvement in letter sound identification skills for above-grade level students. The results show that there is no pattern of agreement among the participants concerning the benefits of the program for improving the letter sound skills of above-grade level students.

Table 13

Improvement in Letter Sound Identification Skills for Above-Grade Level Students

Likert Scale	Response	Frequency	Percent
1	None	10	37.0
2	Fair	4	14.8
3	Good	9	33.3
4	Excellent	4	14.8

Note: One participant did not answer this question. Percent based on responses received.

Question 7 of the survey asked participants how they perceived the improvement of their on-grade level students' skills in letter sound identification after using The Imagination Station. Table 14 revealed that the median and the mode were both a 3 on the Likert scale, which indicated a perception of good improvement.

Table 14

Improvement in Letter Sound Identification Skills for On-Grade Level Students

N		Mean	Median	Mode
Valid	Missing			
27	1	2.74	3.00	3

Table 15 further quantified the response to Question 7 by showing 59.2% of the participants responded with a 3 or 4 on the Likert scale, which indicated that over half of

the participants perceived the improvement in letter sound identification skills for on-grade level students to be good or excellent.

Table 15

Improvement in Letter Sound Identification Skills for On-Grade Level Students

Likert Scale	Response	Frequency	Percent
1	None	3	11.1
2	Fair	8	29.6
3	Good	9	33.3
4	Excellent	7	25.9

Note: One participant did not answer this question. Percent based on responses received.

The mean of the responses for Question 7 was 2.74, which indicated that participants may have perceived more improvement in letter sound identification skills for their on-grade level students than they did for the above-grade level students where the mean response was only 2.26.

Question 8 of the survey asked the participants how they perceived the improvement of their below-grade level students' skills in letter sound identification after using The Imagination Station. Table 16 describes the Question 8 results. Table 16 revealed that the median and the mode were both a 3 on the Likert scale, which indicated a perception of good improvement. The mean of the participant responses was 3.04, which gave an additional level of confidence that the perception of the

participants was that there was good improvement in their below-grade level students'

letter sound identification skills after using The Imagination Station.

Table 16

Improvement in Letter Sound Identification Skills for Below-Grade Level Students

N		Mean	Median	Mode
Valid	Missing			
26	2	3.04	3.00	3

Table 17 further quantified the response to Question 8 by showing 80.8%

of participants responded with a 3 or 4 on the Likert scale, which indicated a perception

of good or excellent improvement in letter identification skills for below-grade level

students.

The mean of the participant responses was 3.04, which indicated that the

participants perceived the improvement in below-grade level students' letter sound skills

to be good. Comparison of the means for above-grade level, on-grade level, and

below-grade level students, which were 2.26, 2.74, and 3.04 respectively, indicated that

teachers and administrators perceived that improvement in letter sound identification

skills, after using The Imagination Station, increased inversely with the present learning

level of the student.

Table 17

Improvement in Letter Sound Identification Skills for Below-Grade Level Students

Likert Scale	Response	Frequency	Percent
1	None	4	15.4
2	Fair	1	3.8
3	Good	11	42.3
4	Excellent	10	38.5

Note: Two participants did not answer this question. Percent based on responses received.

Concepts about Print

Question 9 of the survey asked the participants how they perceived the improvement of their students' skills in concepts about print after using The Imagination Station*.* Question 9 does not address whether students were above grade level, on grade level, or below grade level. Table 18 describes the Question 9 results.

Table 18 revealed that the median and the mode were both a 3 on the Likert scale, which indicated that the participants perceived the improvement of their students' skills in concepts about print after using The Imagination Station was good. The mean was also 3.00, which means all 3 measures of central tendency indicated that the participants perceived the improvement of their students' skills in concepts about print after using The Imagination Station was good.

Table 18

Improvement in Concepts about Print Skills

N		Mean	Median	Mode
Valid	Missing			
27	1	3.00	3.00	3

Table 19 further quantified the response to Question 9 by showing 77.8% of

participants responded with a 3 or 4 on the Likert scale, which indicated the participants

perceived the improvement of their students' skills in concepts about print after using

The Imagination Station was good or excellent.

Table 19

Improvement in Concepts about Print Skills

Likert Scale	Response	Frequency	Percent
1	None	1	3.7
2	Fair	5	18.5
3	Good	14	51.9
4	Excellent	7	25.9

Note: One participant did not answer this question. Percent based on responses
received.

Question 10 of the survey asked the participants how they perceived the

improvement of their above-grade level students' skills in concepts about print after

using The Imagination Station. Table 20 describes the Question 10 results. Table 20

revealed that the median and the mode were both a 3 on the Likert scale, which

indicated the participants perceived the improvement of their above-grade level

students' skills in concepts about print was good. The mean of the participant

responses was 2.52.

Table 20

Improvement in Concepts about Print Skills for Above-Grade Level Students

N		Mean	Median	Mode
Valid	Missing			
27	1	2.52	3.00	3

Table 21 further quantified the response to Question 10 by showing 40.7% of

participants responded with a 3 on the Likert scale, which indicated those participants

perceived the improvement of their above-grade level students' skills in concepts about

print was good after using The Imagination Station. 66.6% of the participants

responded with either a 2 or 3 on the Likert scale, which indicated a majority of

participants perceived that the improvement of their above-grade level students' skills in

concepts about print was fair or good after using the program. 44.4% of participants

responded with a 1 or 2 on the Likert scale, which indicates that many participants

perceived no improvement or fair improvement on this skill for above-grade level

students. The responses were somewhat evenly distributed when compared to

responses for many of the other questions.

Table 21

Improvement in Concepts about Print Skills for Above-Grade Level Students

Likert Scale	Response	Frequency	Percent
1	None	5	18.5
2	Fair	7	25.9
3	Good	11	40.7
4	Excellent	4	14.8

Note: One participant did not answer this question. Percent based on responses received.

Question 11 of the survey asked the participants how they perceived the improvement of their on-grade level students' skills in concepts about print after using The Imagination Station. Table 22 describes the Question 11 results. Table 22 revealed that the median and the mode were both a 3 on the Likert scale, which indicates the participants perceived good improvement in this skill for on-grade level students. The mean of the participant responses was 2.70.

Table 22

Improvement in Concepts about Print Skills for On-Grade Level Students

N		Mean	Median	Mode
Valid	Missing			
27	1	2.81	3.00	3

Table 23 further quantified the response to Question 11 by showing 44.4% of participants responded with a 3 on the Likert scale, which indicated that group of participants perceived good improvement in their on-grade level students' skills in concepts about print. 92.5% of participants responded with a 2, 3, or 4 on the Likert scale, which indicated the large majority of participants perceived fair, good or excellent improvement in their on-grade level students' skills in concepts about print.

Table 23

Improvement in Concepts about Print Skills for On-Grade Level Students

Likert Scale	Response	Frequency	Percent
1	None	2	7.4
2	Fair	7	25.9
3	Good	12	44.4
4	Excellent	6	22.2

Note: One participant did not answer this question. Percent based on responses received.

Question 12 of the survey asked the participants how they perceived the improvement of their below-grade level students' skills in concepts about print after using The Imagination Station. Table 24 describes the Question 12 results. Table 24 revealed that the median and the mode were both a 3 on the Likert scale, which indicated that the participants perceived good improvement in their below-grade level students' skills in concepts about print.

Table 24

Improvement in Concepts about Print Skills for Below-Grade Level Students

N		Mean	Median	Mode
Valid	Missing			
27	1	3.15	3.00	3

Table 25 further quantified the response to Question 12 by showing 85.1% of participants responded with a 3 or 4 on the Likert scale, which indicated a large majority of participants perceived that improvement in their below-grade level students' skills in concepts about print was good or excellent. The mean of the responses was 3.15.

Table 25

Improvement in Concepts about Print Skills for Below-Grade Level Student

Likert Scale	Response	Frequency	Percent
1	None	3	11.1
2	Fair	1	3.7
3	Good	12	44.4
4	Excellent	11	40.7

Note: One participant did not answer this question. Percent based on responses received.

The mean of the participant responses was 3.15, which strengthened the conclusion that the participants perceived the improvement in below-grade level

students' concepts about print skills to be good. Comparison of the means for above-grade level, on-grade level, and below-grade level students, which were 2.52, 2.70, and 3.15 respectively, indicated that teachers and administrators perceived that improvement in concepts about print skills, after using The Imagination Station, increased inversely with the present learning level of the student.

Phonemic Awareness

Question 13 of the survey asked participants how they perceived the improvement of their students' skills in phonemic awareness after using The Imagination Station. Question 13 does not address whether students were above, on, or below grade level. Table 26 describes the Question 13 results. Table 26 revealed that the median and the mode were both a 3 on the Likert scale, which indicated the participants perceived that their students' improvement in phonemic awareness skills after using The Imagination Station was good. The mean response was a 3.08, which gave additional confidence that the median and the mode were accurate measures of central tendency for this question.

Table 26

Improvement in Phonemic Awareness Skills

N		Mean	Median	Mode
Valid	Missing			
26	2	3.08	3.00	3

Table 27 further quantified the response to Question 13 by showing 53.8% of participants responded with a 3 on the Likert scale, which indicated the majority of participants perceived that their students' improvement in phonemic awareness was good. Table 27 showed that 84.6% of the participants responded with a 3 or 4 on the Likert scale, which indicates a large majority of participants perceived that their students' improvement in phonemic awareness skills after using The Imagination Station was good to excellent.

Table 27

Improvement in Phonemic Awareness Skills

Likert Scale	Response	Frequency	Percent
1	None	2	7.7
2	Fair	2	7.7
3	Good	14	53.8
4	Excellent	8	30.8

Note: Two participants did not answer this question. Percent based on responses received.

Question 14 of the survey asked the participants how they perceived the improvement of their above-grade level students' skills in phonemic awareness after using The Imagination Station. Table 28 describes the Question 14 results. Table 28 revealed that the median and mode were both a 3 on the Likert scale, which indicated

the participants perceived that the improvement of their above-grade level students' skills in phonemic awareness was good.

Table 28

Improvement in Phonemic Awareness Skills for Above-Grade Level Students

N		Mean	Median	Mode
Valid	Missing			
27	1	2.41	3.00	3

Table 29 further quantified the response to Question 14 by showing 59.2% of the participants responded with a 2 or 3 on the Likert scale, which indicated the majority of participants perceived that the improvement of their above-grade level students' skills in phonemic awareness was fair or good.

Table 29

Improvement in Phonemic Awareness Skills for Above-Grade Level Students

Likert Scale	Response	Frequency	Percent
1	None	7	25.9
2	Fair	6	22.2
3	Good	10	37.0
4	Excellent	4	14.8

Note: One participant did not answer this question. Percent based on responses received.

Question 15 of the survey asked the participants how they perceived the improvement of their on-grade level students' skills in phonemic awareness after using The Imagination Station. Table 30 describes the Question 15 results. Table 30 revealed that the median and the mode were both a 3 on the Likert scale, which indicated participants perceived that the improvement in their on-grade level students' skills in phonemic awareness was good.

Table 30

Improvement in Phonemic Awareness Skills for On-Grade Level Students

N		Mean	Median	Mode
Valid	Missing			
27	1	2.78	3.00	3

Table 31 further quantified the response to Question 15 by showing 40.7% of participants responded with a 3 on the Likert scale, which indicated the participants perceived the improvement in their on-grade level students' phonemic awareness skills was good. 92.5% of participants responded with a 2, 3, or 4 on the Likert scale, which indicated the vast majority of the participants perceived the improvement in their on-grade level students' phonemic awareness skills ranged from fair to excellent. The mean of the participant responses was 2.78. Compared with the mean response of 2.41 for above-grade level students, it appeared that participants perceived that on-grade level students showed slightly more improvement in their phonemic awareness skills after using The Imagination Station than their above-grade level peers.

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Table 31

Improvement in Phonemic Awareness Skills for On-Grade Level Students

Likert Scale	Response	Frequency	Percent
1	None	2	7.4
2	Fair	8	29.6
3	Good	11	40.7
4	Excellent	6	22.2

Note: One participant did not answer this question. Percent based on responses received.

Question 16 of the survey asked the participants how they perceived the improvement of their below-grade level students' skills in phonemic awareness after using The Imagination Station. Table 32 describes the Question 16 results. Table 32 revealed that the median and the mode were both a 3 on the Likert scale, which indicated the participants perceived the improvement as good.

Table 32

Improvement in Phonemic Awareness Skills for Below-Grade Level Students

N		Mean	Median	Mode
Valid	Missing			
27	1	3.11	3.00	3

Table 33 further quantifies the response to Question 16 by showing 48.1% participants responded with a 3 on the Likert scale, which indicates nearly half of the participants perceived that the improvement of their below-grade level students in phonemic awareness skills was good. 85.1% of the participants responded with a 3 or 4 on the Likert scale, which indicated that a large majority of participants perceived the improvement of their below-grade level students' skills in phonemic awareness to be good or excellent.

Table 33

Improvement in Phonemic Awareness Skills for Below-Grade Level Students

Likert Scale	Response	Frequency	Percent
1	None	3	11.1
2	Fair	1	3.7
3	Good	13	48.1
4	Excellent	10	37.0

Note: One participant did not answer this question. Percent based on responses received.

The mean of the participant responses was 3.11, which strengthened the conclusion that the participants perceived the improvement in below-grade level students' phonemic skills to be good to excellent. Comparison of the means for above-grade level, on-grade level, and below-grade level students, which were 2.41, 2.78, and 3.11 respectively, indicated that teachers and administrators perceived that

improvement in phonemic awareness skills, after using The Imagination Station,

increased inversely with the present learning level of the student.

Diagnostic Reading Assessments

Question 17 of the survey asked the participants how they perceived the

improvement of their students' reading skills, as measured by the Diagnostic Reading

Assessment (DRA), after using The Imagination Station. Question 17 does not address

whether students were above, on, or below grade level. Table 34 describes the

Question 17 results. Table 34 revealed that the median and the mode were both a 3 on

the Likert scale, which indicated the participants perceived their student's improvement

in reading skills after using The Imagination Station to be good. The Mean response

was 2.89, which is close in value to the other 2 measures of central tendency.

Table 34

Improvement in Diagnostic Reading Assessments

N		Mean	Median	Mode
Valid	Missing			
27	1	2.89	3.00	3

Table 35 further quantified the response to Question 17 by showing 48.1% of the

participants responded with a 3 on the Likert scale, which indicated that nearly half of

the participants perceived the improvement of their students' skills in reading as good.

74% of participants perceived the improvement of their students' skills in reading ad

good or excellent.

Table 35

Improvement in Diagnostic Reading Assessments

Likert Scale	Response	Frequency	Percent
1	None	3	11.1
2	Fair	4	14.8
3	Good	13	48.1
4	Excellent	7	25.9

Note: One participant did not answer this question. Percent based on responses received.

Question 18 of the survey asked the participants how they perceived the improvement of their above-grade level students' reading skills, as measured by the Diagnostic Reading Assessment (DRA), after using The Imagination Station. Table 36 describes the Question 18 results. Table 36 revealed that the median and the mode were both a 3 on the Likert scale, which indicates the participants generally perceived the improvement of their above-grade level students in reading skills as good.

Table 36

Improvement in Diagnostic Reading Assessments for Above-Grade Level Students

N		Mean	Median	Mode
Valid	Missing			
27	1	2.48	3.00	3

Table 37 further quantified the response to Question 18 by showing 40.7% of participants responded with a 3 on the Likert scale, which represented a perception of good improvement in reading skills for students who were already above grade level. The participant responses for Question 18 were fairly scattered, so no meaningful conclusion can be drawn regarding the participants' perception of the improvement of their above-grade level students' skills in reading after using The Imagination Station. The mean of the participant responses was only 2.48, which demonstrates the participants perceived that the improvement in reading skills for students who were already above grade level was between fair and good after using the program.

Table 37

Improvement in Diagnostic Reading Assessments for Above-Grade Level Students

Likert Scale	Response	Frequency	Percent
1	None	6	22.2
2	Fair	6	22.2
3	Good	11	40.7
4	Excellent	4	14.8

Note: One participant did not answer this question. Percent based on responses received.

Question 19 of the survey asked the participants how they perceived the improvement of their on-grade level students' reading skills, as measured by the Diagnostic Reading Assessment (DRA), after using The Imagination Station. Table 38

describes the Question 19 results. Table 38 revealed that the median and the mode were both a 3 on the Likert scale, which indicated that the participants perceived the improvement of their on-grade level students' skills in reading was good.

The mean of the participant responses for Question 19 was 2.89, which adds confidence to the conclusion that the participants generally perceived the improvement of their on-grade level students' skills in reading was good. The mean of the responses from Question 18, which asked participants for their perception of the improvement in reading skills of their above-grade level students, was 2.48. These findings appeared to follow the trend of the participant responses for each category of literacy assessments. The participants perceived that on-grade level students made more improvement in reading skills after using The Imagination Station than their already above-grade level peers.

Table 38

Improvement in Diagnostic Reading Assessments for On-Grade Level Students

N		Mean	Median	Mode
Valid	Missing			
27	1	2.89	3.00	3

Table 39 further quantified the response to Question 19 by showing 44.4% of participants responded with a 3 on the Likert scale, which indicated those participants perceived good improvement of their on-grade level students' skills in reading. 92.5% of participants responded with a 2, 3, or 4 on the Likert scale, which demonstrated that

a large majority of participants perceived the improvement of their on-grade level students' skills in reading ranged from fair to excellent.

Table 39

Improvement in Diagnostic Reading Assessments for On-Grade Level Students

Likert Scale	Response	Frequency	Percent
1	None	2	7.4
2	Fair	6	22.2
3	Good	12	44.4
4	Excellent	7	25.9

Note: One participant did not answer this question. Percent based on responses received.

Question 20 of the survey asked the participants how they perceived the improvement of their below-grade level students' reading skills, as measured by the Diagnostic Reading Assessment (DRA), after using The Imagination Station. Table 40 describes the Question 20 results. Table 40 revealed that the median and the mode were both a 3 on the Likert scale, which indicated the participants perceived the improvement of their below-grade level students' skills in reading after using The Imagination Station was good. The mean for the participant responses to Question 20 was 3.07, which corroborates that the median and the mode were meaningful measures of central tendency.

Table 40

Improvement in Diagnostic Reading Assessments for Below-Grade Level Students

N		Mean	Median	Mode
Valid	Missing			
27	1	3.07	3.00	3

Table 41 further quantified the response to Question 20 by showing 44.4% of participants responded with a 3 on the Likert scale, which corresponds to the perception of the participants that the improvement of their below-grade level students' skills in reading was good. 81.4% of participants responded with a 3 or 4 on the Likert scale, which means a large majority of participants perceived good or excellent improvement in their below-grade level students' reading skills after using The Imagination Station.

Table 41

Improvement in Diagnostic Reading Assessments for Below-Grade Level Students

Likert Scale	Response	Frequency	Percent
1	None	3	11.1
2	Fair	2	7.4
3	Good	12	44.4
4	Excellent	10	37.0

Note: One participant did not answer this question. Percent based on responses received.

Question 21 of the survey asked the participants how they perceived the improvement of their students' skills in literacy after using The Imagination Station. This question provided a measure of the overall perception of teachers and administrators of their students' improvement in all of the literacy skills combined. This question did not differentiate between above-grade level, on-grade level, or below-grade level students.

Table 42 describes the Question 21 results. Table 42 revealed that the median and the mode were both a 3 on the Likert scale, which indicated the participants perceived their students' improvement in literacy and reading skills after using The Imagination Station was good. The mean of the participant responses was 3.07, which gives further confidence that the perception of the participants was that the improvement of all their students' skills in literacy was good after using The Imagination Station.

Table 42

Improvement in Literacy Skills of Students after Using The Imagination Station

N		Mean	Median	Mode
Valid	Missing			
27	1	3.07	3.00	3

Table 43 further quantified the response to Question 21 by showing 44.4% of participants responded with a 3 on the Likert scale, which indicated a perception of good improvement. 77.7% of participants responded with a 3 or 4 on the Likert scale,

which indicated that a large majority of participants perceived the improvement of their students' skills in literacy after using The Imagination Station was good or excellent.

Table 43

Improvement in Literacy Skills of Students after Using The Imagination Station

Likert Scale	Response	Frequency	Percent
1	None	1	3.7
2	Fair	5	18.5
3	Good	12	44.4
4	Excellent	9	33.3

Note: One participant did not answer this question. Percent based on responses received.

Question 21 asked participants for a general perception of all students' improvement on all literacy assessments. The mean of the participant responses for Question 21 was 3.07. This mean is closest to the mean for the participant responses regarding below-grade level students on all the literacy assessments. The participants consistently perceived greater improvement for below-grade level students than for on-grade level students, or above-grade level students, for each individual literacy assessment. In Chapter 5, possible reasons for the closeness of the mean for the perceived improvement of all students and the mean for the perceived improvement of

below-grade level students on all of the individual literacy assessments will be discussed and interpreted.

Frequency of Use

Questions 22 through 25 of the survey asked how many days a week teachers had their students use The Imagination Station.

Question 22 of the survey asked how many days a week the participants' students used The Imagination Station program for a 30-minute session. Three days a week was the recommended minimum number of 30-minute sessions per week. Question 22 does not differentiate between above-grade level, on-grade level, or below-grade level students. Table 44 describes the Question 22 results.

Table 44

Days per Week Students Used The Imagination Station

N		Mean	Median	Mode
Valid	Missing			
25	3	2.68	3.00	2(a)

Note: Multiple modes exist. The smallest value is shown

Analysis of the data in Table 44 revealed multiple modes of the values of 2 and 3 on the Likert scale, which corresponds to 1-2 days a week and 3 days a week respectively. The multiple mode result indicated the same number of participants did not use the program for the recommended minimum amount of time as those who did

use the program 3 days a week. The median score was a 3 on the Likert scale, which

indicated 3 days a week.

Table 45 further quantifies the response to Question 22 by showing there were

no participants who chose a 1 on the Likert scale, which means that all participants had

their students use the program for at least 1, 30-minute a week. Table 45 also revealed

that only 12% of participants used The Imagination Station with their students 4 or 5

days a week. Only 44% of participants used the program for the recommended

minimum of 3 days a week. Another 44% of participants only used The Imagination

Station program with their students 1 or 2 days a week during the pilot study period.

Table 45

Days per Week Students Used The Imagination Station

Likert Scale	Response	Frequency	Percent
1	0 Days	0	0.0
2	1-2 Days	11	44.0
3	3 Days	11	44.0
4	4-5 Days	3	12.0

Note: Three participants did not answer this question. Percent based on responses
received.

Question 23 of the survey asked how many days a week the participant's above-

grade level students used The Imagination Station program for a 30-minute session.

Table 46 describes the Question 23 results.

Table 46

Days per Week Above-Grade Level Students Used The Imagination Station

N		Mean	Median	Mode
Valid	Missing			
24	4	2.63	2.50	2

Analysis of the data in Table 46 revealed that the mode was a 2 on the Likert

scale, which indicated that participants perceived that their above-grade level students

used the program only 1-2 days a week. The median was a 2.50 on the Likert scale,

which indicated that half of the treatment group's above-grade level students used the

program less than the recommended minimum 3, 30-minute sessions per week. The

mean of the participant responses was 2.63, which also confirms that less than the

mathematical average of the above-grade level students used the program for the

recommended 3, 30-minute sessions per week.

Table 47 further quantified the response to Question 23 by showing that 50% of

participants responded with a 2 on the Likert scale, which indicated only 1-2 days of use

per week. Another 50% of the participants responded with a 3 or 4 on the Likert scale,

which indicated only half of the above-grade level students used the program for at least

the recommenced minimum sessions per week.

Table 47

Days per Week Above-Grade Level Students Used The Imagination Station

Likert Scale	Response	Frequency	Percent
1	0 Days	0	0.0
2	1-2 Days	12	50.0
3	3 Days	9	37.5
4	4-5 Days	3	12.5

Note: Four participants did not answer this question. Percent based on responses received.

Question 24 of the survey asked how many days a week the participants' on-grade level students used The Imagination Station program for a 30-minute session. Table 48 describes the Question 24 results.

Table 48

Days per Week On-Grade Level Students Used The Imagination Station

N		Mean	Median	Mode
Valid	Missing			
24	4	2.71	3.00	3

Table 48 revealed that the median and mode were both a 3 on the Likert scale, which indicated the participants perceived their on-grade level students used the program for the recommended minimum of 3, 30-minute sessions per week. Table 49

showed that 41.7% of participants did not use the program with their on-grade level

students for the recommended minimum amount per week.

Table 49

Days per Week On-Grade Level Students Used The Imagination Station

Likert Scale	Response	Frequency	Percent
1	0 Days	0	0.0
2	1-2 Days	10	41.7
3	3 Days	11	45.8
4	4-5 Days	3	12.5

Note: Four participants did not answer this question. Percent based on responses received.

Question 25 of the survey asked how many days a week the participant's below-

grade level students used The Imagination Station program for a 30-minute session.

Table 50 describes the Question 25 results.

Table 50

Days per Week Below-Grade Level Students Used The Imagination Station

N		Mean	Median	Mode
Valid	Missing			
25	3	3.08	3.00	3

Analysis of the data in Table 50 revealed that the median and mode were both a 3 on the Likert scale, which indicated the participants perceived that their below-grade level students used the program for the recommended 3, 30-minutes sessions per week. Table 51 further quantified the response to Question 25 by showing 44% of participants perceived that their below-grade level students used the program for the recommended minimum of 3, 30-minute sessions per week. 76% of participants perceived that their below-grade level students used the program at least the recommended amount of time of 3, 30-minutes sessions per week.

Table 51

Days per Week Below-Grade Level Students Used The Imagination Station

Likert Scale	Response	Frequency	Percent
1	0 Days	0	0.0
2	1-2 Days	6	24.0
3	3 Days	11	44.0
4	4-5 Days	8	32.0

Note: Three participants did not answer this question. Percent based on responses received.

The means of the participant responses indicating how many days a week their above-grade level, on-grade level, and below-grade level students used The Imagination Station program for a 30-minute session were 2.63, 2.71, and 3.08 respectively. Comparison of the means for above-grade level, on-grade level, and

below-grade level student use of the program indicated that teachers and administrators perceived that days per week of using the program increased inversely with the present learning level of the student.

Student Reports and Books in Print

Questions 26 through 29 of the survey asked participants how often they used the student reports and printed books generated by The Imagination Station program. Question 26 of the survey asked the participants how many days per week they printed individual student reports. Table 52 describes the Question 26 results.

Table 52

Days per Week of Printing Student Reports

N		Mean	Median	Mode
Valid	Missing			
23	5	1.57	2.00	1(a)

Note: Multiple modes exist. The smallest value is shown

Analysis of the data in Table 52 revealed that the median response was a 2 on the Likert scale, which indicated the participants printed individual student progress reports 1-2 days a week. However, multiple modes existed with the same number of participants responding with a 1 and 2 on the Likert scale, which indicated just as many participants did not print any reports as those who printed them only 1-2 days a week. The mean of the participant responses was 1.57.

Table 53 further quantified the response to Question 26 by showing 47.8% pf participants never printed any student reports and another 47,8% pf the participants only printed the reports 1-2 days a week. Five participants who did not answer this question are likely administrators who were not as likely to print student reports, as the teacher participants would be, since they could use them to guide instruction.

Table 53

Days per Week of Printing Student Reports

Likert Scale	Response	Frequency	Percent
1	0 Days	11	47.8
2	1-2 Days	11	47.8
3	3 Days	1	4.3
4	4-5 Days	0	0.0

Note: Five participants did not answer this question. Percent based on responses received.

Question 27 of the survey asked the participants how many days per week they used the individual student reports generated by The Imagination Station program to facilitate instruction during guided reading. Table 54 revealed that the mode of the participant responses was a 1 on the Likert scale, which indicated that participants never used the student reports. The 5 participants who did not answer this question were likely administrators who were not as likely to use student reports to facilitate

instruction in guided reading, as the teacher participants would be, since the teachers would be the ones doing the guiding reading instruction.

Table 54

Days per Week of Using Student Reports to Guide Instruction

N		Mean	Median	Mode
Valid	Missing			
23	5	1.74	2.00	1

Table 55 further quantified the response to Question 27 by showing 47.8% of participants never used student reports to guide instruction.

Table 55

Days per Week of Using Student Reports to Guide Instruction

Likert Scale	Response	Frequency	Percent
1	0 Days	11	47.8
2	1-2 Days	8	34.8
3	3 Days	3	13.0
4	4-5 Days	1	4.3

Note: Five participants did not answer this question. Percent based on responses received.

Question 28 of the survey asked the participants how many days per week they printed books generated by The Imagination Station program. Table 56 describes the Question 28 results.

Table 56

Days per Week of Printing Books

N		Mean	Median	Mode
Valid	Missing			
24	4	1.25	1.00	1

Table 56 revealed that the median and mode were both a 1 on the Likert scale. Table 57 further quantified the response to Question 28 by showing that 79.2% never printed leveled books from the program.

Table 57

Days per Week of Printing Books

Likert Scale	Response	Frequency	Percent
1	0 Days	19	79.2
2	1-2 Days	4	16.7
3	3 Days	1	4.2
4	4-5 Days	0	0.0

Note: Four participants did not answer this question. Percent based on responses received.

Question 29 of the survey asked participants how many days per week they used the books they printed from The Imagination Station program. Table 58 describes the Question 29 results.

Table 58

Frequency of Using Books Printed from The Imagination Station

N		Mean	Median	Mode
Valid	Missing			
24	4	1.33	1.00	1

Table 59 further quantified the response to Question 29 by showing 79.2% of participants never used a leveled book generated by The Imagination station. This corresponds to the 79.2% of participants who never printed a book from the program.

Table 59

Frequency of Using Books Printed from The Imagination Station

Likert Scale	Response	Frequency	Percent
1	0 Days	19	79.2
2	1-2 Days	3	12.5
3	3 Days	1	4.2
4	4-5 Days	1	4.2

Note: Four participants did not answer this question. Percent based on responses received.

User Friendliness

Questions 30 through 32 of the survey were concerned with whether or not the program was user friendly for both the student and the teacher. Question 30 of the survey asked participants how often students eager to use The Imagination Station. The choices were always, most of the time, some of the time, and never. Table 60 describes the Question 30 results. Table 60 revealed that the median and the mode were both a 4 on the Likert scale, which indicated that the students were always eager to use The Imagination Station program. The mean of the participant responses was 3.50, which validates that the perception of the participants that the students were close to being always eager to use The Imagination Station computer-assisted instructional program in reading.

Table 60

Amount of Time that Students Were Eager to Use The Imagination Station

N		Mean	Median	Mode
Valid	Missing			
26	2	3.50	4.00	4

Table 61 further quantified the response to Question 30 by showing 61.5% of participants responded with a 4 on the Likert scale, which indicated the students were always eager to use The Imagination Station program. 88.4% of participants responded with a 3 or 4 on the Likert scale, which indicated a large majority of participants perceived that their students were always eager to use the program or eager to use the program most of the time.

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Table 61

Amount of Time that Students Were Eager to Use The Imagination Station

Likert Scale	Response	Frequency	Percent
1	Never	0	0.0
2	Some	3	11.5
3	Most	7	26.9
4	Always	16	61.5

Note: Two participants did not answer this question. Percent based on responses

Question 31 of the survey asked the participants how often the students were able to use The Imagination Station program independently after being trained. Table 62 describes the Question 31 results.

Table 62

Independent Student Use of The Imagination Station

N		Mean	Median	Mode
Valid	Missing			
26	2	3.54	4.00	4

Analysis of the data in Table 62 revealed that the median and the mode were both a 4 on the Likert scale, which indicated that students were always able to use the program independently after initial training. Table 63 showed that 96.2% of participants

responded that students were able to use the program independently after initial training most of the time or all of time.

Table 63

Independent Student Use of The Imagination Station

Likert Scale	Response	Frequency	Percent
1	Never	0	0.0
2	Some	1	3.8
3	Most	10	38.5
4	Always	15	57.7

Note: Two participants did not answer this question. Percent based on responses

Question 32 of the survey asked the participants how often The Imagination Station program was easy to use for the teachers. Table 64 describes the Question 32 results.

Table 64

Teacher Ease of Use of The Imagination Station

N		Mean	Median	Mode
Valid	Missing			
26	2	3.65	4.00	4

Analysis of the data in Table 64 revealed that the median and mode were both a 4 on the Likert scale, which indicated the program was always easy to use for the teachers. The mean of the participant responses was 3.65, which is close to both the median and the mode. Table 65 further quantified the response to Question 32 by showing 69.2% of participants always found the program was easy to use for the teacher. 96.1% responded that the program was easy to use most of the time or always easy to use for the teacher. No participants chose a 1 on the Likert scale.

Table 65

Teacher Ease of Use of The Imagination Station

Likert Scale	Response	Frequency	Percent
1	Never	0	0.0
2	Some	1	3.8
3	Most	7	26.9
4	Always	18	69.2

Note: Two participants did not answer this question. Percent based on responses

Imagination Station Training and Computer Skills

Questions 33 of the survey asked participants their level of agreement with the statement that the 3-hour training provided by company representatives of The Imagination Station was beneficial. Table 66 describes the Question 33 results.

Table 66

Imagination Station Training Was Beneficial

N		Mean	Median	Mode
Valid	Missing			
28	0	3.50	4.00	4

Analysis of the data in Table 66 revealed that the median and mode were both 4

on the Likert scale, which indicates the participants strongly agreed that the training was

beneficial. The mean of the participant responses was 3.50. Table 67 further quantified

the response to Question 33 by showing 67.9% of participants strongly agreed that the

training was beneficial. A large majority of participants, 89.3%, responded agreed or

strongly agreed that the training was beneficial.

Table 67

Imagination Station Training Was Beneficial

Likert Scale	Response	Frequency	Percent
1	Do Not Agree	2	7.1
2	Agree Somewhat	1	3.6
3	Agree	6	21.4
4	Strongly Agree	19	67.9

Question 34 of the survey asked the participants their level of agreement with the statement that their computer skills were sufficient to use The Imagination Station program effectively. Table 68 describes the Question 34 results.

Table 68

Sufficient Personal Computer Skills of Teacher to Use Program

N		Mean	Median	Mode
Valid	Missing			
28	0	3.71	4.00	4

Analysis of the data in Table 68 revealed that the median and mode were both 4 on the Likert scale, which indicated that the participants strongly agreed that their personal computer skills were sufficient to use the program effectively. The mean of the participant responses was 3.71, which is mathematically close to both the median and the mode.

Table 69 further quantified the response to Question 34 by showing 75% of participants strongly agreed that their personal computer skills were sufficient to use the program effectively. A majority of 96.4% of participants agreed or strongly agreed that their personal computer skills were sufficient to use the program effectively. Only 1 participant agreed somewhat that her personal computer skills were sufficient to use the program effectively. All participants agreed at some level that their computer skills were sufficient to use the program effectively. The vast majority strongly agreed that their personal computer skills were sufficient to use the program effectively.

Table 69

Sufficient Personal Computer Skills of Teacher to Use Program

Likert Scale	Response	Frequency	Percent
1	Do Not Agree	0	0.0
2	Agree Somewhat	1	3.6
3	Agree	6	21.4
4	Strongly Agree	21	75.0

Question 35 of the survey asked the participants their level of agreement with the statement that their students' computer skills were sufficient to use The Imagination Station program effectively. Table 70 describes the Question 35 results.

Table 70

Sufficient Personal Computer Skills of Students to Use Program

N		Mean	Median	Mode
Valid	Missing			
28	0	3.50	4.00	4

Analysis of the data in Table 70 revealed that the median and mode were both 4 on the Likert scale, which indicated that the participants perceived that their students' computer skills were sufficient to use the program effectively. The mean of the participant responses was 3.50. Table 71 further quantified the response to Question

35 by showing 57.1% of participants strongly agreed that their students' computer skills were sufficient to use the program effectively. A large majority, which consisted of 96.4% of participants, agreed or strongly agreed that their students' computer skills were sufficient to use the program effectively.

Table 71

Sufficient Personal Computer Skills of Students to Use Program

Likert Scale	Response	Frequency	Percent
1	Do Not Agree	1	3.6
2	Agree Somewhat	0	0.0
3	Agree	6	21.4
4	Strongly Agree	21	75.0

Question 36 of the survey asked the participants to rate their personal computer skills as poor, fair, good, or excellent. Table 72 describes the Question 36 results.

Table 72

Participants Self Evaluation of Personal Computer Skills

N		Mean	Median	Mode
Valid	Missing			
28	0	3.39	3.00	3

Analysis of the data in Table 72 revealed that the median and the mode were both a 3 on the Likert scale, which indicated that participants rated their personal computer skills as good. The mean of the participant responses was 3.39. Table 73 further quantified the response to Question 36 by showing 53.6% of participants rated their personal computer skills as good. That is in comparison to 96.4%% of the participants who agreed or strongly agreed that their personal computer skills were sufficient to use The Imagination Station program effectively. This comparison implies that the program is quite user friendly for the teachers and administrators.

Table 73

Participants Self Evaluation of Personal Computer Skills

Likert Scale	Response	Frequency	Percent
1	Poor	0	0.0
2	Fair	1	3.6
3	Good	15	53.6
4	Excellent	12	42.9

Question 37 of the survey asked the participants to rate their students' personal computer skills as poor, fair, good, or excellent. Table 74 describes the Question 37 results. Analysis of the data in Table 74 revealed that the median and the mode were both a 3 on the Likert scale, which indicated that the participants perceived the students' personal computer skills were good. The mean of the participant responses was 3.11.

Table 74

Evaluation of Students' Personal Computer Skills

N		Mean	Median	Mode
Valid	Missing			
28	0	3.11	3.00	3

Table 75 further quantified the response to Question 37 by showing 67.9% of participants perceived the students' personal computer skills as good and 89.3% of participants perceived the students' personal computer skills as good or excellent.

Table 75

Evaluation of Students' Personal Computer Skills

Likert Scale	Response	Frequency	Percent
1	Poor	0	0.0
2	Fair	3	10.7
3	Good	19	67.9
4	Excellent	6	21.4

Demographics of Survey Participants

Section V of the survey asked participants demographic questions. Question 38 determined that there were 23 teachers and 5 administrators among the 28 participants in the survey. Question 39 determined the number of participants from each of the 4

schools conducting the pilot study of The Imagination Station program. Table 76

describes the Question 39 results with the distribution of participants among the 4

schools.

Table 76

Participants from Each Pilot Program School

Likert Scale	Response	Frequency	Percent
1	Alton School #1	9	32.1
2	Bradley School #2	3	10.7
3	Carsten School #3	7	25.0
4	Drew School #4	9	32.1

Question 40 of the survey asked participants to identify their years of teaching

experience. There were 5 categories on the Likert scale for Question 40. The mode

response of the participants was a 4 on the Likert scale, representing 11-20 years of

experience. However, the median score was a 3 on the Likert scale, representing 6-10

years of experience. Table 77 describes the percentages of participants in each

category of teaching experience.

Table 77

Years of Teaching Experience

Likert Scale	Response	Frequency	Percent
1	1-2	5	17.9
2	2-5	6	21.4
3	6-10	4	14.3
4	11-20	8	28.6
5	> 20	5	17.9

Question 41 of the survey asked the participants their gender. All 28 participants in the survey were female. Question 42, the last question in the survey, asked the participants their age. Table 78 describes the frequency of participants in each of the age ranges. The mode is a Likert scale score of 1, which represents ages 22 to 30. 46.4% of participants fall within this age range. The median is a 2 on the Likert scale, which represents ages 31-35. The percentage of participants who are age 35 and less is 57.1%. The percentage of participants who are age 40 and less is 67.8%.

Table 78

Age of Participants

Likert Scale	Response	Frequency	Percent
1	22-30	13	46.4
2	31-35	3	10.7
3	36-40	3	10.7
4	41-45	2	7.1
5	46-55	5	17.9
6	> 55	2	7.1

In Chapter 5, there is further summary and interpretation of the survey results. The descriptive statistics presented in Chapter 4 will be used to compare the perceptions of teachers and administrators of computer-assisted instruction using The Imagination Station program to the results of the literacy assessments. The small sample size of survey participants does not allow for further statistical analysis of the survey results.

Literacy Assessment Results

In the quasi-experimental research portion of the study, the differences in the means of the average z scores on the literacy assessments of the treatment and control

groups were considered statistically significant if the probability of the difference occurring by chance was less than 5% ($p < 0.05$).

An analysis of the assessment scores in the fall, winter, and spring found that the individual scores were highly correlated. Because the assessments were found to be testing the same construct, they were combined for analysis. Each student's fall literacy assessment scores were combined to create 1 fall literacy score for that student. Each student's winter literacy assessment scores were combined to create 1 winter literacy score for that student. Each student's spring literacy assessment scores were combined to create 1 spring literacy score for that student. The means of the raw scores were calculated. The z scores were calculated from the raw data. The means of the z scores were then calculated and used for statistical analysis.

Univariate Results

Descriptive statistics for the raw data of the fall, winter, and spring assessments are included in Tables B1, B2 and B3 which are found in the Appendix B. The z scores were calculated from the means of the fall, winter and spring assessments. Table B4, found in Appendix B, is Levene's test of equality of error variance for the z fall mean, the z winter mean, and the z spring mean values.

The means of the average z scores by school were calculated and are shown in Table 79. There were 1834 students included in the data.

Table 79

Means of Average z Scores by School

School		z_Fall_Mean	z_Winter_Mean	z_Spring_Mean
1	Mean	.0370979	.2490703	.0709749
	N	125	125	125
	Std. Deviation	.67722186	.60776283	.39173600
2	Mean	-.4894911	-.4710615	-.3982551
	N	79	79	79
	Std. Deviation	.78895885	1.12932577	.59123767
3	Mean	-.1277852	-.0914520	-.2422941
	N	86	86	86
	Std. Deviation	.69170984	.68852402	.48084227
4	Mean	-.2157881	-.0110704	-.1316292
	N	159	159	159
	Std. Deviation	.68787381	.64095184	.37667579
5	Mean	-.1666378	.1700859	.4356567
	N	99	99	99
	Std. Deviation	.65947441	.56769671	.33593863

(table continues)

Table 79 (*continued*).

School		z_Fall_Mean	z_Winter_Mean	z_Spring_Mean
6	Mean	.0571234	-.1851806	.2745720
	N	153	153	153
	Std. Deviation	.83066850	.76918801	.40090552
7	Mean	.5855489	.1913889	.4516857
	N	112	112	112
	Std. Deviation	.75658409	.71263869	.40476886
8	Mean	.0136973	.1307284	.0246890
	N	121	121	121
	Std. Deviation	.57184778	.54260834	.31951430
9	Mean	.1563595	.2443860	.0006951
	N	115	115	115
	Std. Deviation	.50834160	.45237957	.30195342
10	Mean	-.1591890	-.3104704	-.1879456
	N	80	80	80
	Std. Deviation	.67488811	.86401686	.44973513

(*table continues*)

Table 79 (*continued*).

School		z_Fall_Mean	z_Winter_Mean	z_Spring_Mean
11	Mean	-.0667074	-.0757446	-.0794096
	N	106	106	106
	Std. Deviation	.67275428	.69534374	.41844632
12	Mean	-.0810716	-.0613544	-.0415026
	N	91	91	91
	Std. Deviation	.56881929	.58565741	.36142824
13	Mean	.1119786	-.1008237	-.1556131
	N	68	68	68
	Std. Deviation	.69800587	.88468130	.69138014
14	Mean	.0182254	-.0690828	-.1189351
	N	126	126	126
	Std. Deviation	.56248069	.60439081	.28672582
15	Mean	.1658373	.2543102	.0499788
	N	128	128	128
	Std. Deviation	.58921562	.49627334	.41907477
16	Mean	.1023890	.0404066	-.0820413
	N	86	86	86
	Std. Deviation	.55178734	.55971238	.35333521

(*table continues*)

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Table 79 (*continued*).

School		z_Fall_Mean	z_Winter_Mean	z_Spring_Mean
	Mean	-.1214217	-.1720034	-.2147908
17	N	100	100	100
	Std. Deviation	.67468622	.78181823	.56102368
	Mean	-.0006825	.0016221	-.0002703
Total	N	1834	1834	1834
	Std. Deviation	.69395515	.70562589	.46946553

The means of the average *z* score by group were calculated and are shown in Table 80. The means for the treatment group were lower for each administration of literacy assessments.

Table 80

Means of Average z *Score by Group*

Group		z_Fall_Mean	z_Winter_Mean	z_Spring_Mean
1	Mean	-.1766868	-.0349780	-.1433333
	N	449	449	449
	Std. Deviation	.72386529	.78484656	.47270097
2	Mean	.0563760	.0134874	.0461090
	N	1385	1385	1385
	Std. Deviation	.67445290	.67784288	.45910548
Total	Mean	-.0006825	.0016221	-.0002703
	N	1834	1834	1834
	Std. Deviation	.69395515	.70562589	.46946553

Bivariate Results

Pearson correlations showed that the *z* scores for the individual literacy assessments were correlated. Based on the *z* score correlations, the *z* scores for the fall, winter, and spring assessments were combined to create an average *z* score for statistical analysis of the fall, winter, and spring literacy assessments.

Multivariate Results

The general linear model for the 3 assessments was used with repeated

measures ANOVA to compare the average *z* score means of the fall, winter, and spring

assessments. Repeated measures ANOVA was also used to compare the average *z*

score means of the treatment group to the average *z* score means of the control group.

Table 81 shows the within subject factors for the dependent variables.

Table 81

Within Subject Factors (Assessments)

Assessment	Dependent Variable
1	*z*_Fall_Mean
2	*z*_Winter_Mean
3	*z*_Spring_Mean

Table 82 shows the between subject factors of the groups.

Table 82

Between-Subjects Factors (Treatment Group=1, Control Group=2)

		N
Group	1	449
	2	1385

Table 83 shows the average *z* score means by treatment and control group. The number 1 identifies the treatment group and the number 2 identifies the control group.

Table 83

Average z Score Means by Group

	Group	Mean	Std. Deviation	*N*
z_Fall_Mean	1	-.1766868	.72386529	449
	2	.0563760	.67445290	1385
	Total	-.0006825	.69395515	1834
z_Winter_Mean	1	-.0349780	.78484656	449
	2	.0134874	.67784288	1385
	Total	.0016221	.70562589	1834
z_Spring_Mean	1	-.1433333	.47270097	449
	2	.0461090	.45910548	1385
	Total	-.0002703	.46946553	1834

There is a 95% level of confidence that interval shown in Table 84 contains the mean for the literacy assessments.

Table 84

Estimated Marginal Means for Assessments

Mean	Std. Error	95% Confidence Interval	
		Lower Bound	Upper Bound
-.040	.015	-.070	-.010

There is a 95% level of confidence that intervals shown in Table 85 contain the means for the treatment and control groups. Group 1 is the treatment group. Group 2 is the control group.

Table 85

Estimated Marginal Means for Groups

Group	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	-.118	.027	-.170	-.066
2	.039	.015	.009	.068

Table 86 indicates that there is a significant difference between the treatment and control groups on the composite literacy assessment score: $F (1, 1832) = 26.374$, $p = 3.112$ x 10^{-7}. Therefore, the null hypothesis that there is no difference between the treatment and control groups on the composite literacy assessment score is rejected statistically.

Table 86

Between Subject Factors Test of Significance (Treatment and Control Groups)

	SS	df	MS	F	Sig.
Contrast	8.357	1	8.357	26.374	.000
Error	580.484	1832	.317		

Note: The *F* tests the effect of Group. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

*p < .05. **p < .001.

There is statistical difference between the treatment and control groups on the composite literacy assessment score. However, there is not a practical difference between the treatment and control groups on the literacy assessments when effect size is considered. The effect size was calculated and the value of η^2 was .014. The effect size indicates that the group membership variable could explain 1.4% of the variance in the students' literacy assessment scores. Based on Cohen (1988) this would be a small effect.

The survey results and the statistical analysis of the literacy assessment scores of the control and treatment groups will be interpreted in Chapter 5.

CHAPTER 5

SUMMARY

In the previous chapter, the results of the data analysis for the survey and the literacy assessments were presented and discussed. In Chapter 5, the results are interpreted and recommendations are made for future research.

Survey and Descriptive Research

Literacy Assessments

Gingold (2002) found that computer-assisted instruction made a positive, significant difference in kindergartner's abilities to recognize alphabet letters when compared with traditional classroom instruction in reading. Participants whose students participated in the pilot study of The Imagination Station® Internet-based supplemental reading instruction and intervention program (Imagination Station, Inc., Richardson TX, www1.istation.com) perceived that the program had a more positive impact on the improvement of letter identification skills of below-grade level students than it did on the improvement of letter identification skills of on-grade level and above-grade level students. Participants generally perceived that improvement in letter identification skills, after using The Imagination Station, increased inversely with the present learning level of the student. The participants perceived that students who were already above grade level did not show as much improvement in their letter identification skills as their on-grade level and below-grade level peers.

Kutz (2005) found that there was no significant main effect of the Lexia Phonics software program on letter recognition or initial sound fluency of kindergarten students,

as measured by change scores on the DIBELS, on either the treatment or control group. Participants in this study perceived that The Imagination Station program had a more positive impact on the improvement of letter sound identification skills of below-grade level students than it did on the improvement of letter sound identification skills of on-grade level and above-grade level students. Participants generally perceived that improvement in letter sound identification skills, after using The Imagination Station, increased inversely with the present learning level of the student. The participants perceived that students who were already above grade level did not show as much improvement in their letter sound identification skills as their on-grade level and below-grade level peers.

Gingold (2002) found that computer-assisted instruction made a positive, significant difference in kindergartner's abilities to understand print concepts, when compared with traditional classroom instruction in reading. Participants perceived that The Imagination Station program had a more positive impact on the improvement of concepts about print skills of below-grade level students than it did on the improvement of concepts about print skills of on-grade level and above-grade level students. Participants generally perceived that improvement in concepts about print skills, after using The Imagination Station, increased inversely with the present learning level of the student. The participants perceived that students who were already above grade level did not show as much improvement in their concepts about print skills as their on-grade level and below-grade level peers.

Participants perceived that The Imagination Station program had a more positive impact on the improvement of phonemic awareness skills of below-grade level students

than it did on the improvement of phonemic awareness skills of on-grade level and above-grade level students. Participants generally perceived that improvement in phonemic awareness skills, after using The Imagination Station, increased inversely with the present learning level of the student. The participants perceived that students who were already above grade level did not show as much improvement in their phonemic awareness skills as their on-grade level and below-grade level peers.

Rehmann (2005) conducted research on the effect of the computer-assisted instructional program, Earobics Step 1, and found that there were no statistically significant differences between the experimental and control groups in their gain scores for phonological awareness. However, both groups made progress in their phonological awareness skills.

The Diagnostic Reading Assessment (DRA) was used to assess kindergarten students' reading skills. Participants perceived that The Imagination Station program had a more positive impact on the improvement of the reading skills of below-grade level students than it did on the improvement of reading skills of on-grade level and above-grade level students. Participants generally perceived that improvement in reading skills, after using The Imagination Station, increased inversely with the present learning level of the student. The participants perceived that students who were already above grade level did not show as much improvement in their reading skills as their on-grade level and below-grade level peers.

Bauserman (2003) studied the effectiveness of Level A in PLATO'S Beginning Reading for the Real World software in increasing kindergarten students' knowledge of print concepts and reading comprehension. Bauserman's computer-assisted instruction

treatment took place over an 8 week period. This is similar to the time interval for the pilot study of The Imagination Station. Bauserman found no significant main effect for computer-assisted instruction or the type of kindergarten program. However, Bauserman determined that kindergarten students in full-day kindergarten programs with computer-assisted instruction demonstrated greater gains than all other groups.

The participants perceived the overall improvement in literacy skills for all students as good. Participants rated the improvement in literacy skills for all students nearly the same as they rated the improvement in each literacy skill for their below-grade level students. This finding may indicate that participants were thinking most about their below-grade level students when they responded to the question about the level of improvement for all students.

In a research study by Ringenberg (2005), 33 second grade students in the treatment group used computer-assisted and monitored reading practice while 32 second grade students in the control group used unmonitored reading practice from print versions of the same little, leveled books. After 10 weeks the group that originally used print copies switched to the computer-assisted instruction and the group that used the computer-assisted instruction switched to the print copies. Ringenberg found that both groups made significantly more progress during the computer-assisted phase. An important finding in Ringenberg's study is that students in the high ability group made the least amount of progress, while students in the low ability group made the most progress.

Campbell (2002) conducted a study throughout the school year in which students at 7 schools received computer-assisted instruction in reading for 10 to 20 minutes a

day and students at 6 other schools did not receive the treatment. Campbell found no significant differences in the reading achievement of fourth and fifth grade students in either group. However, Campbell did determine that there were some significant differences between the treatment and control groups in the change in critical thinking skills for some ability groups. Campbell grouped students by high, mid-range, and low scores on the 1998 OLSAT School Ability Index. High ability students in the treatment group in both fourth and fifth grades did not show more improvement using computer-assisted instruction than the students in the control group. However, mid-range and low ability students in the treatment group did show more improvement than students in the control group. Campbell's findings correspond to the perception of the participants in this study that below-grade level students made more progress in their literacy skills using computer-assisted instruction than above-grade level students made using computer-assisted instruction.

The participants in this study consistently perceived greater improvement for below-grade level students than for on-grade level students or above-grade level students on each individual literacy assessment. This perception also correlates with Ringenberg's finding that students in the low ability group made the most progress during computer-assisted instruction in reading. The participants' perceptions in this study also agreed with Ringenberg's finding that students in the high ability group made the least amount of progress during computer-assisted instruction in reading. However, the participants in this study generally perceived that even their above-grade level students did improve somewhat in their literacy skills after using The Imagination Station.

Frequency of Sessions

The pilot study of The Imagination Station at the 4 schools in the treatment group was only 8 to 10 weeks long. A large percentage of the participants did not use the program with their students for the recommended minimum amount of time per week, which was 3, 30-minute sessions. Allington (2002) states that more time spent on reading has a positive impact on reading achievement. Perez (1998) reported in his study that, "The amount of time students used the ILS for reading and math was the best single predictor of gains in math and reading for both ESOL and Non-ESOL students" (p.38). With 44% of the participants in this study only using The Imagination Station with their students for one or two 30-minute sessions a week, it would be unlikely that the program would make a significant difference in the literacy assessment results of the treatment group students. Besides the fact that many students in the treatment group used the program less than the recommended minimum number of sessions per week, the pilot study of the program lasted only 2 months. These combined factors may have prevented a positive effect on treatment group large enough to detect. Even if the students had all used the program for the recommended three 30-minute sessions per week, the pilot study may not have been long enough to show a larger effect size.

Questions 23 through 25 differentiated whether above-grade level, on-grade level, or below-grade level students used the program more often. Participants revealed that the number of days they had their leveled students use the program, positively correlated with their perception of which students improved the most as a result of using the program. Participants perceived that their below-grade level students

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used The Imagination Station program most often and the participants also perceived that their below-grade level students made the most improvement after using the program.

Half of the above-grade level students only used the program 1 or 2 days a week during the treatment period, which was less than the recommended minimum time on task for success of the program. It is worth noting that participants perceived their above-grade level students did not make as much improvement after using The Imagination Station as their on-grade level and below-grade level students. Time on task is a factor for success in academic pursuits. It is not surprising that the participants perceived that the above-grade level students made less improvement than the on-grade level students and the below-grade level students since the above-grade level students did not have the opportunity to use the program as often as students in the other 2 sub groups.

The on-grade level students used the program more often than the above-grade level students. However, less than half of the on-grade level students used the program for the recommended minimum of 3 days a week for 30-minute sessions. Participants perceived that their on-grade level students made more improvement than their above-grade level students after using The Imagination Station. This could be explained by the fact that the on-grade level students used the program more often than the above-grade level students. However, 41.7% of the on-grade level students only used the program 1 or 2 days a week, which was less than the recommended minimum time needed for adequate results from the program.

The below-grade level students were reported to have used the program much more often than the other 2 groups. A large majority of the below-grade level students used the program for 3 to 5 days a week. The below-grade level students used the program more often than the on-grade level and above-grade level students. The below-grade level group of students was perceived by the participants to make the most progress on all literacy assessments after using The Imagination Station. The perception of improvement is positively correlated to the amount of time the students worked in The Imagination Station program.

Use of Student Progress Reports and Print Copies of Books

The Imagination Station is capable of generating progress reports for students that identify areas of weakness and mastery. The program also generated lesson plans that could be used to tutor students in the reported areas of weakness. In addition, teachers were able to print hard copies of all the leveled books that were part of the program. The little, leveled books within the program were all written to target specific objectives in reading. Heibert (2003) found that students reading texts specifically written for a certain reading level had higher gains in fluency than students who read a literature anthology.

Nearly half of the participants never printed an individual student report. Teachers are able to use the reports generated by The Imagination Station program to determine areas of weakness and guide instruction. With such a large percentage of participants not printing any reports, it is obvious that nearly half of the teachers did not utilize the program to guide instruction.

The same percentage of participants who reported they never printed any student reports also reported never using the student reports generated by The Imagination Station to facilitate instruction during guided reading. Only 34.8% of participants reported that they used student reports to guide instruction 1 or 2 days a week.

A large percentage of the participants never printed a hard copy of a book generated by the program for students to read. The same percentage of participants never used a printed book from the program with their students. Rings (1994) identified reading in a real context as an important facet in the development of effective critical reading skills. Using print versions of the leveled books built into the teaching sequence of the program would have provided students with more opportunities for reading in a real context. Students could have read aloud to the teacher or their parents from these books. The treatment group students could have had the opportunity to read the print versions of the leveled books from the program several times to increase their reading fluency. Sorrell (2003) cited several studies that found text written on a computer screen, without speech synthesis, has no more or less impact on improving reading comprehension than reading text written on paper.

It was surprising to the researcher that so many participants did not take advantage of reproducing free, leveled books for their students to read. The fact that program features such as student reports and print copies of leveled books were not fully utilized by the participants in the pilot study of The Imagination Station might explain why the treatment group of students did not make better progress than the control group of students.

User Friendliness

A computer-assisted instructional program that students are eager to use is likely to be highly successful when the instructional objectives are well sequenced and researched based. The participants overwhelmingly perceived that their students were eager to use the program given that 61.5% of participants perceived that their students were always eager to use the program and that 88.4% of participants perceived that their students were eager to use the program most of the time or always.

Another important characteristic of an effective computer-assisted instructional program is that students are able to use the program independently. Nearly all of the participants perceived that their students were able to use The Imagination Station independently most of the time or always. Because students could easily navigate the program, teachers were free to conduct guiding reading groups with some students while other students used the computer-assisted instruction. The implication of these findings is that the students had the ability to engage successfully with the program due to its user-friendliness. This is in contrast to the findings of a qualitative study by Williams (1999). Teachers reported that the Writing to Read (WRT) program was repetitive and the durations of the fixed lessons were too long. The WRT program often required 1 specific response from the student before he or she could continue. On the contrary, The Imagination Station is web-based and the lessons evolve with the student's abilities in literacy. The student is able to progress at his or her own pace because of the various pathways built into the program which allow a psychological sequence as well as a logical sequence of instruction.

However user-friendly a computer-assisted program might be for students, if it is to be used in the classroom, it must also be user-friendly for the teacher. The vast majority of participants perceived that The Imagination Station was always easy to use or easy to use most of the time.

Imagination Station Training and Computer Skills

The success of the implementation of a computer-assisted instructional program is dependent on many factors, including the training of the teachers. Representatives from i-station.com provided 3-hour training for all participants. Close to 90% of participants agreed or strongly agreed that the training was beneficial for learning to use the program.

Both students and teachers must have some prerequisite computer skills to navigate a computer-assisted instructional program. Nearly all of participants agreed or strongly agreed that their personal computer skills were sufficient to use the program effectively. Nearly all of the participants also agreed or strongly agreed that their students' computer skills were sufficient to use the program effectively. It would be difficult to replicate this study in school districts that did not provide the abundance of technology training that the research site district provided.

Only 53.6% of participants rated their personal computer skills as good. In contrast, 96.4%% of the participants agreed or strongly agreed that their personal computer skills were sufficient to use The Imagination Station program effectively. This comparison implies that the program is quite user friendly for the teachers and administrators.

The participants strongly agreed that their students' computer skills were sufficient to use the program effectively while they rated their students' overall personal computer skills only as good. This finding indicates that The Imagination Station is user friendly because with good, but not excellent, computer skills, the students could productively use the program.

Demographics of Survey Participants

The participants in the survey consisted of 23 teachers and 5 administrators. The 4 schools that conducted a pilot program of computer-assisted instruction in reading using The Imagination Station for 10 weeks are numbers 1 through 4 in the quasi-experimental research data and the students in these 4 schools are the members of the treatment group. Although demographics for race or ethnicity were not collected by the survey, the researcher confirms that the vast majority, if not all, of the participants in the survey were Caucasian females.

Literacy Assessments and Quasi-Experimental Research

The results of the descriptive portion of this study, which utilized a survey, revealed areas that affected the reliability of the quasi-experimental portion of the study. The pilot study of the computer-assisted instructional program consisted of only 8 to 10 weeks. This may not have been long enough to detect a positive treatment effect large enough to measure. Individual teachers did not all use the program the same number of days per week with their students. Several participants did not take advantage of the program's peripherals such as student reports and print copies of books. These

differences in the application of the program create difficulties in making comparisons between the treatment and control groups.

Literacy Assessments

As in this study, Dunn (2002) used ANOVA for repeated measures for statistical analysis to compare a treatment group that received computer-assisted instruction in reading to a control group that received traditional reading instruction. Dunn's study measured improvement in reading comprehension. As in this study, Dunn did not randomly assign students to the experimental and control groups. Dunn found that the treatment group who received computer-assisted instruction in reading improved significantly more than the control group in reading comprehension.

Contrary to the research Dunn (2002) conducted, the control group in this study performed statistically better on the composite literacy assessment than the treatment group. This finding may be due to beginning differences between the groups. The treatment group started with a lower mean *z* score than the control group and had a lower mean *z* score for each of the 3 assessment factors. However, the effect of group was small so the fact that the control group in this study performed better than the treatment group on the literacy assessments has little practical significance.

Recommendations for Further Research

Length of Study

The researcher recommends a study that lasts the entire kindergarten year using The Imagination Station. There were limitations on the length of this study because the

program was only available for a trial period from i-station.com. That trial period was 45 days, or approximately 9 weeks. If the treatment group for the entire school year had used the program, the results would have greater reliability. As stated in Chapter 1, it is not possible to measure the effectiveness of computer-assisted technology apart from the individual computer-assisted instructional program being used. The instructional objectives in a computer-assisted instructional program, as well as the instructional sequence inherent in the program, will greatly affect the learning of the students.

Rings (1994), described 3 components of computer-assisted instruction that promote improvement in critical reading skills. The 3 critical components are a high level of interactivity, the encouragement of using strategies that have been proven to be effective for critical reading, and reading in a real context. The Imagination Station incorporates all of these components identified by Rings that are needed to improve critical reading skills.

The scope and sequence of instruction affects the quality of a computer-assisted instructional program in reading. Ediger (1998) pointed out that quality sequence in activities and experiences were necessary for learners to relate new learning to what they had already learned. Ediger distinguished between a logical sequence, which is teacher decided by the teacher or software program, and a psychological sequence where the learner orders his or her own activities. The Imagination Station has a logical sequence of instruction developed by reading specialists. The Imagination Station also has what Ediger would call a psychological sequence. Students are routed individually to the objectives they are ready to begin. Students also are routinely routed to re-teaching in literacy objectives where they need more reinforcement. The capability of

individualization and what Ediger calls a psychological sequence of instruction are powerful instructional advantages of The Imagination Station *program* in addition to the logical instructional sequence inherent in the software.

Design of Descriptive Study

The design of the descriptive portion of the study utilizing the survey did not lend itself to statistical analysis. The survey developed by the researcher had too many questions for the number of participants who responded to the survey. The number of participants was limited by the population of kindergarten teachers and administrators at the 4 schools in the pilot study of The Imagination Station. Some members of this limited population chose not to respond to the survey. School 2 in the data, with the fictional name of Bradley, had a lower response rate than the other schools in the study.

The descriptive study asked participants their perception of how often their students used the program. The Imagination Station program keeps track of how many sessions each student has, the duration of the sessions, and how many weeks he or she use the program. A recommendation for future research would be to use the data from the program to determine how often the survey participants' students used the program, rather than asking them what their perception was. The usage data could then be compared to the students' improvement in literacy skills. The results of this kind of study could determine the optimal length of use of the program for various student sub groups.

Design of Quasi-Experimental Research

The design of the quasi-experimental portion of the study was influenced by the access granted to the study site. It was determined that the instructional software would need to be offered to all students in a classroom to avoid parent concerns. Statistical results would have been more reliable if the researcher could have split each classroom into a treatment and control group. This would have required parent and student consent. That design was not permitted in this setting. Since the school itself engaged in the pilot study of the program, and all students were able to benefit from the use of The Imagination Station for 45 days, there was no requirement for the researcher to gain consent from parents.

The design limitations resulted in all the kindergarten students in the 4 pilot program schools to be the treatment group and all the kindergarten students in 13 other schools in the district to be the control group. Because there was not random assignment to the treatment and control groups, the experimental results are not reliable. School 2 in the treatment group had a larger economically disadvantaged population than all the other schools. This may have caused the data to be skewed. Future research should also be conducted to determine how the teacher and campus influences the group effects.

The quasi-experimental portion of this research study had a large sample size, a control group, and assessments that were not produced or administered by the company who owned the program. This is in contrast to a study by Camacho (2002). In Camacho's study, there were only 20 students from the same first grade class. The small sample size, lack of control group, and the assessment by the same company that

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produced the instructional software, are factors that would affect the validity of Camacho's results.

The researcher recommends further study of The Imagination Station that uses random assignment within each classroom to a treatment and control group. It is recommended that the study include several schools in districts of various income levels so that the study has greater external validity.

In addition, the researcher recommends, as in this study, that the assessments used to determine the literacy outcomes not be produced or administered by the company that owns the software. This will eliminate concerns of bias in the research. Nauss (2002) did a study using the Waterford Early Reading Program (WERP) and found that first grade students in 10 classrooms that used the WERP showed no significant difference in comprehension on the Stanford 9 compared to first grade students in the 15 classrooms who did not use WERP. One difference in the study using WERP by Nauss from those done by Gingold (2000) and Camacho (2002) is that Nauss used an assessment that was independent from the instructional program to determine the change in reading achievement.

A final recommendation for the quasi-experimental portion of the study is that it be started at the beginning of a school year. Several survey participants wrote in a comment on their survey that they believed the program would have had a greater impact at the beginning of the school year than during the last 10 weeks of the school year.

Conclusions

Research at the University of Minnesota by Heath (2000) compared the

relationship between the amount of time students received Chapter I supplemental

reading instruction and reading achievement gains. The 3 models of instructional

delivery that were used included (a) the supplemental teacher, (b) the educational

assistant, and (c) the computer-assisted instructional program. There was no significant

relationship between the amounts of time allocated for Chapter I supplemental reading

instruction and reading achievement gains, except in the case of the Chapter I

supplemental teacher service delivery model, where the relationship was significant and

negative. This finding appears to contradict the idea that more time-on-task has

positive impact on reading achievement Allington (2002).

Without using allocated time as a criterion, the computer-assisted instructional

program in Heath's study produced significant gains in reading achievement (Heath,

2000). Considering that the supplemental teacher would be the most expensive service

delivery model, (assuming that computer hardware is already in place), it is surprising

that this model of instruction showed negative significance. What is not addressed in

the study is the class size for the supplemental teacher model and the quality of the

teachers that were part of that service delivery model.

This researcher draws on the research of Heath (2000) to make a point about

computer-assisted instruction in literacy skills for kindergarten students. The quality of

the classroom teacher and the quality of the teacher's instruction are possibly the most

influential factors in the success of students in learning literacy skills. In Heath's study

in a Chapter I school, the computer-assisted program was more successful than the

supplementary teacher or supplementary aide. It is possible that the quality of the supplemental teacher or the classroom instructional program was not as good as the quality of the computer-assisted instructional program.

The study conducted by this researcher was carried out in an affluent school district with superior instructional support for teachers. This district has no problem recruiting exceptional teachers. This research setting may not have adequately demonstrated the effects of the computer-assisted program, which was used because the students were already receiving superior instruction. Further research needs to be conducted in more economically diverse districts using random assignment to treatment and control groups with at least a full school year for the treatment.

It is the researcher's opinion that 1 of the reasons the treatment group did not improve more than the control group is that the quality of the classroom instruction given by the teachers in both groups was excellent. If the experiment had been carried out in a district where the economic status of the students was not as high or the quality of instructional delivery was not as good, the computer-assisted instruction may have had a greater positive effect.

Williams (1999) discovered through qualitative research that the perspectives of teachers and students in his study differed from the official claims and purposes for the Writing to Read program. In the descriptive research portion of this study, the perspective of teachers and administrators was that students made good improvement in their literacy skills after using The Imagination Station. The quasi-experimental research portion of this study, which analyzed the literacy assessment scores of the treatment and control groups, did not show that there was a practical difference

between the treatment and control groups on the composite literacy assessment scores. The teacher and administrator perceptions that the program had a positive effect on the improvement in students literacy scores was not born out by the analysis of the treatment and control groups' literacy scores. However, both the treatment and control groups did improve in their literacy scores. If The Imagination Station had been used for a longer period of time it is possible that the treatment group would have shown greater improvement in their literacy scores than the control group.

APPENDIX A

SURVEY

By completing this survey, I acknowledge that I am giving informed consent to be a participant in a research study to determine the perceptions of teachers and administrators regarding computer-assisted instruction, using *The Imagination Station*, to teach literacy skills to kindergarten students. I acknowledge that *The Imagination Station* has been used with my students, for at least the last two months. This study does not involve any reasonably foreseeable risks. The approximate amount of time a potential participant will be involved in the survey is 30 minutes. I understand all my personally identifiable information will be kept confidential and secure in a locked file in the researcher's home. The researcher is a graduate student in the Educational Administration Department at the University of North Texas. If you have any questions about this research project, please call Susan Larson at 972-517-1717 or Dr. T. Colette Smith, UNT Department of Teacher Education and Administration, at 940-565-2835. This study has been approved by the University of North Texas Institutional Review Board (IRB). If you have any questions about your rights as a research participant, you may contact the UNT IRB at 940-565-3940. I understand that participation is voluntary and that refusal to participate will involve no penalty or loss of benefits or rights.

_____   _____
Signature of Participant   Date

I. The purpose of this first group of questions is to determine your perceptions of computer-assisted instruction, using *The Imagination Station* program, to teach literacy/reading skills to your kindergarten students. Each general question, which applies to all students in your classroom, is followed by three questions that target students in your classroom who are **above, on, or below grade level in their literacy/reading skills**. Please put an X in the category that best describes your perception.

		Excellent	Good	Fair	No Improvement
1	Describe your perception of the improvement in your students' letter identification skills after using the program.				
2	Describe your perception of the improvement in your **above grade level** students' letter identification skills after using the program.				
3	Describe your perception of the improvement in your **on grade level** students' letter identification skills after using the program.				
4	Describe your perception of the improvement in your **below grade level** students' letter identification skills after using the program.				

		Excellent	Good	Fair	No Improvement
5	Describe your perception of the improvement in your students' letter sound skills after using the program.				
6	Describe your perception of the improvement in your **above grade level** students' letter sound skills after using the program.				
7	Describe your perception of the improvement in your **on grade level** students' letter sound skills after using the program.				
8	Describe your perception of the improvement in your **below grade level** students' letter sound skills after using the program.				
9	Describe your perception of the improvement in your students' concepts about print (C.A.P.) skills after using the program.				
10	Describe your perception of the improvement in your **above grade level** students' concepts about print (C.A.P.) skills after using the program.				
11	Describe your perception of the improvement in your **on grade level** students' concepts about print (C.A.P.) skills after using the program.				
12	Describe your perception of the improvement in your **below grade level** students' concepts about print (C.A.P.) skills after using the program.				
13	Describe your perception of the improvement in your students' phonemic awareness skills after using the program.				
14	Describe your perception of the improvement in your **above grade level** students' phonemic awareness skills after using the program.				
15	Describe your perception of the improvement in your **on grade level** students' phonemic awareness skills after using the program.				
16	Describe your perception of the improvement in your **below grade level** students' phonemic awareness skills after using the program.				

		Excellent	Good	Fair	No Improvement
17	Describe your perception of the improvement in your students' Diagnostic Reading Assessment (DRA) level after using the program.				
18	Describe your perception of the improvement in your **above grade level** students' DRA level after using the program.				
19	Describe your perception of the improvement in your **on grade level** students' DRA level after using the program.				
20	Describe your perception of the improvement in your **below grade level** students' DRA level after using the program.				
21	Describe your perception of the improvement in your students' literacy skills after using *Imagination Station*.				

II.   The purpose of this second group of questions is to determine how you used *The Imagination Station* with your students. The first four questions concern the number of days per week your students used the program. The next four questions concern how you utilized the program. The last two questions concern your perception of user friendliness.

		4-5 Days a Week	3 Days a Week	1-2 Days a Week	0 Days a Week
22	Students used the *Imagination Station* program for 30 minutes				
23	**Above grade level** students used the *Imagination Station* program for 30 minutes				
24	**On grade level** students used the *Imagination Station* program for 30 minutes				
25	**Below grade level** students used the *Imagination Station* program for 30 minutes				
26	How often did you print individual student reports?				
27	How often did you use the individual student reports for data to facilitate instruction during guided reading?				
28	How often did you print books from the program for students?				
29	How often did you use the printed books with students?				

		Always	Most of the Time	Some-of the Time	Never
30	The students were eager to use *Imagination Station*.				
31	The students were able to use the program independently after initial training.				
32	The program was easy to use for the teacher.				

III.   The purpose of this third group of questions is to determine your perception of the training needed to use *Imagination Station*.

		Strongly Agree	Agree	Agree Somewhat	Do Not Agree
33	The three-hour training session by a company representative was beneficial for learning to use the program.				
34	My personal computer skills are sufficient to use the program effectively.				
35	The students' computer skills are sufficient to use the program effectively.				
		Excellent	Good	Fair	Poor
36	My personal computer skills are				
37	The students' personal computer skills are				

IV.   The purpose of this last group of questions is to determine the demographic information of the study
       participants. All personally identifiable information will be kept secure and confidential.

       38. My present job position is:

       _____Teacher
       _____Principal
       _____Assistant Principal
       _____Technology Facilitator or Specialist

       39. I am employed at the following school campus:

       _____Anderson
       _____Bright
       _____Rogers
       _____Ashley
       _____Christie

       40. Years of experience in education, including present year:

       _____1-2 years
       _____2-5 years
       _____6-10 years
       _____11-20 years
       _____Over 20 years

       41. What is your gender?

       _____Female
       _____Male

       42. What is your age?

       22-30_____
       31-35_____
       36-40_____
       41-45_____
       46-55_____
       Over 55_____

       Thank you for your participation in this academic research study. For your convenience a stamped,
       addressed, return-envelope is included with this survey. **Please return this survey by May 26, 2006,
       to Susan Larson at the address above.**

APPENDIX B

SUPPLEMENTAL TABLES

Table B1

Fall Literacy Assessments

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
						Statistic	Std. Error	Statistic	Std. Error
Letter ID-F	1835	0	54	42.91	12.527	-1.763	.057	2.247	.114
Letter Sounds-F	1835	0	26	16.89	8.523	-.693	.057	-.863	.114
CAP-F	1835	0	30	11.39	4.848	1.329	.057	3.975	.114
PAPI-F	1835	0	30	16.60	9.107	-.289	.057	-1.028	.114
DRA-F	1835	0	14	2.69	3.535	1.668	.057	1.965	.114
Valid N (listwise)	1835								

Table B2

Winter Literacy Assessments

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
						Statistic	Std. Error	Statistic	Std. Error
Letter ID-W	1835	0	54	50.15	5.771	-5.037	.057	29.263	.114
Letter Sounds-W	1835	0	26	23.82	4.396	-3.132	.057	11.081	.114
PAPI-W	1835	0	30	25.69	5.489	-1.521	.057	2.172	.114
DRA-W	1827	0	44	5.50	5.592	2.730	.057	9.361	.114
Listening Comp.-W	1835	0	8	5.66	1.661	-.599	.057	.141	.114
Valid N (listwise)	1827								

Table B3

Spring Literacy Assessments

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
						Statistic	Std. Error	Statistic	Std. Error
Letter ID-S	1835	9	54	51.76	2.350	-11.168	.057	159.982	.114
Letter Sounds-S	1835	0	26	25.44	2.179	-6.445	.057	50.616	.114
CAP-S	1835	1	30	16.66	6.232	1.491	.057	.559	.114
PAPI-S	1834	0	44	25.08	8.867	-1.554	.057	.999	.114
DRA-S	1831	0	44	9.03	6.967	2.007	.057	4.702	.114
Listening Comp.-S	1823	1	14	8.26	3.035	.846	.057	-.090	.115
Valid N (listwise)	1819								

Table B4

Levene's Test of Equality of Error Variances

	F	df1	df2	Sig.
z_Fall_Mean	7.515	1	1832	.006
z_Winter_Mean	7.746	1	1832	.005
z_Spring_Mean	.262	1	1832	.609

Note: Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

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