The Effect of Computer Software Use Verses Traditional Teaching Methods in
Ethnically and Linguistically Diverse Students Acquisition of
Addition and Subtraction Skills

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Abstract
The purpose of this study was to assemble data which can be used to ascertain the effects of computer software when used in conjunction with traditional teaching methods versus using only traditional teaching methods of first graders’ ability to acquire addition and subtraction skills for one- and two-digit number problems. The demographic characteristics of ethnicity and primary language are the main focus of the findings. The results of the study showed English as a primary language students in the traditional teaching methods class showed a higher gain of scores than the ESL students. However, analysis of the computer software experimental groups conversely showed there was a slightly greater gain in scores with ESL compared to the English as a primary language students. The Caucasian students showed a more dramatic growth in scores in the traditional teaching classroom and in the experimental classroom than the Hispanic, African American/Black and Asian students.

Introduction
There is a great deal of controversy surrounding the use of computers for educational assistance with young children. Even more controversy when inequities to access in technology known as the Digital Divide come into play. The digital divide usually refers to personal computers and Internet access/connectivity. Because technology is not supposed to be biased, does it bridge the discrepancies we have today?

Much controversy exists over whether computer use is harmful or beneficial to children’s development. Supporters of computer use for young children favor the ability to have individualized interactive instruction. Another consideration is the students’ computer use in the home. The proportion of U.S. households with computers reached 61.8 percent in 2003. Some children have a multitude of software that they may practice their skills with at home, while others may not have a computer at all. “Because ethnicity is often correlated with persistent poverty and low socioeconomic status, African American and Latino groups
may be less likely to have access to higher priced, newer technologies, such as the latest generation of computer and Internet access,” (Calvert et al., 2005). Something to consider is the previous experience with computer software and on-line educational programs on topics covered. This experience may have an effect on overall test results.

What is the best approach to educating our children while narrowing the digital divide with the current technology? The answer may be the integration of current teaching methods with computer-based instruction as an enhancement.

According to Clements and Natasi (1993), computer-based instruction works best when it is made an integral part of instruction. The key to finding the best approach to educating our children is to discover a balance between computer use and other activities. Technological learning tools may help increase learning potential and when used as a supplement may be more effective in working with current educational and societal criteria.

The steps involved to solve the dilemma of the best approach using computer technology must be investigated. By having a better understanding of the varied needs of the children and knowing the benefits and detriments of technology may help one arrive at an educated solution. There is a shortage of quantifiable research done with young children (elementary and younger). The researcher strongly believes information concerning young children and computer software use is critical for parents and educators. Therefore, the question concerning the effect of computer software use in conjunction with traditional teaching methods on first graders' ability to acquire addition and subtraction skills for one- and two-digit number problems without regrouping shows the software helped strengthen student achievement. The various groups showed an increase from pretest to post-test scores.

Statement of the Problem

The problem to be dealt with in this study is to determine if the use of children’s software affects the acquisition of math concepts with first grade students compared to the use of traditional teaching methods alone with emphasis on ethnicity and primary language.

Research Questions

The research study attempted to determine if there is a measurable difference between traditional teaching methods used alone and the use of these methods with computer software.

Limitations of the study

The following limitations applied to this study: testing was limited to two different classrooms at two local schools in Corpus Christi, Texas. Results cannot be generalized to other grade levels or the general population. The teaching styles used in the two classrooms may not have been similar enough to provide accurate information. Half of the computer software did not arrive for the beginning of the study so that students were in two groups of partners for the first three days.
Literature Review

Parker (2005) stated the following: Technology has been heralded as a critical learning tool and as a potential source of equity and increased civic participation for groups and individuals that have not had equal access to learning and economic opportunities. Technology provides the potential for youth, in particular, to create and to participate in civil society in ways that have been unheard of to date. At the same time, extensive research has shown that patterns of technology use resemble patterns of involvement in science and engineering — women and minorities are less involved in all aspects of technology (Pg. 1).

According to Haugland and Wright (1997), computers may be influential in enhancing young children's potential and facilitate learning. When used appropriately, computer software is a valuable resource that can enrich young children’s growth and development. The steps involved to solve the dilemma of the best approach using computer technology must be investigated. There is a great deal of information to consider pertaining to young children and computer technology. Mathematics is one area of education that can be strongly affected with computer technology. “Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students’ learning,” (National Council for Teachers of Mathematics, 2000).

Technology can offer supplementary ways to learn. Children who have unique learning styles can benefit from computer use as the technology reveals their hidden strengths. Children can approach learning from a variety of perspectives at the computer (Clements, 1999).

“Developmental computer experiences fit young children’s style of learning because they provide children participatory learning experiences, are intrinsically motivating and tend to be holistic learning experiences,” (Haugland and Wright, 1997, p.10).

Walsh (2000) states Howard Gardener’s Theory of Multiple Intelligence explains that students have many ways of knowing and demonstrating what they have learned. Teachers need to have several methods for engagement available because students learn for many different reasons. Variability in the way children learn is aided by technology. This flexibility can support all learners’ interests when the teacher varies the content and teaching materials. In addition, new technologies can augment and simplify the teacher’s ability to provide students with timely, personalized and varied attention (Meyer and Rose, 2000). Differences in learning styles may be more visible at the computer because children have the freedom to follow diverse paths. (Wright, 1994) “Technology education could be the most likely curriculum to tap into the multiple intelligences of children and awaken the genius in them all,” (Baylor, 2000, p.4). Baylor further states technology education offers many opportunities to children to become aware and take advantage of their own identity whether it involves Gardner’s Multiple Intelligence Theory or other theories. “This flexibility is particularly valuable with special children, as the computer seems to reveal their hidden strengths,” (Clements, 1999, p.3).

Computers have tremendous potential to benefit young children as they incorporate their learning styles when used in developmentally appropriate ways. Moreover, computers have a unique potential to provide scaffolding opportunities. This enables children to
explore and master tasks that may not have been possible without a computer (Haugland and Wright, 1997).

Computers also offer teachers options for adjusting instruction to special needs. Easily distracted students may be able to focus more intently on computer tasks. Children who have organizational difficulties can benefit from the limits imposed by a computer environment (NCTM, 2000).

Using computers as a tool allows children to focus on decision making and problem solving. The children can learn mathematics more thoroughly with computers when used to foster understanding. More time for conceptualizing and modeling are allowed with technology because routine procedures are done quickly and accurately. Computers can provide a means of looking at mathematical ideas from multiple perspectives, but technology should not be used as a replacement for the basic understandings and intuitions necessary for mathematics learning (NCTM, 2000). In a study by Mevarech and Rich (1985), 3rd-, 4th-, and 5th-grade disadvantaged students who participated in computer-assisted math instruction indicated higher mathematical self-concepts and obtained higher scores on mathematics achievement tests than did children in classes without computer assistance.

The effective use of math technology depends on the classroom teacher. Just like any teaching tool, technology can be used effectively or not, and should not be used to replace the math teacher. Students using the computer often appear to be working independent of the teacher. In reality, the teacher plays an important role and makes decisions that affect students’ learning. The teacher must decide when and how technology is used in the classroom. In addition, the teacher has an opportunity to observe the students working and reflecting in ways that may otherwise often difficult to observe. Technology also aids in assessment. Teachers can observe the processes used by students as well as the results (NCTM, 2000). Classroom technology use depends closely on the adequate teacher training and keeping programs current. This is to ensure teacher confidence and full benefits for the students. “Teachers with few computer skills see computer technology as the enemy, fearing that the technology will hurt, rather than help their students. Teachers left out of the loop ultimately do not use computers effectively. Clearly, the level of teacher preparedness is correlated with the amount of their professional computer training,” (Van Buren, 2002).

Method

Collection and Presentation of Data

This study involved organized and informed research that was used to collect and diagnose data in reference to children delegated in two groups of study. The data is presented in both table and written form.

Sample

This research study included two groups of first grade students. The first group (control group) was composed of twenty students which were randomly selected from a fine arts magnet school in Corpus Christi, Texas. The second group (experimental group) was composed of twenty students from a first grade classroom at the Early Childhood Development Center at Texas A&M University Corpus Christi.
Instruments Used

The instrument used as a pre-test (See Appendix B) with all students in the study was a researcher-created mathematics addition and subtraction instrument to help determine students' prior knowledge of addition and subtraction. The post-test instrument (See Appendix C) was comprised of twenty similar first grade addition and subtraction problems. A jury of experts consisting of an early childhood specialist, University math educator, and five Corpus Christi Independent School District first grade teachers reviewed the pre- and post-tests and offered suggestions for improvement. The suggested changes were made thus, providing a greater chance of reliability and validity of the testing instruments. Destination Math™ course I designed for grades K-1 was the software used with the experimental group in this study.

Description of Instruments

The researcher-created addition and subtraction mathematics pre-test was an instrument used to assess students' prior knowledge of addition and subtraction. The pre-test was used to assess beginning students' understanding of how numbers are used for amounts. Twenty simple addition and subtraction problems were given with similar guidelines as the Corpus Christi Independent School District Real World Performance Standards for First grade. The problems on the pretest required sums no higher that twelve.

The Content Standard I (CS) for first grade math by the Corpus Christi Independent School District Real World Performance Standard requires students show an understanding that numbers are used to stand for amounts and solve simple addition and subtraction problems. Performance Standard 4 (PS) under CSI requires students add and subtract with one or two digit numbers. The post-test was comprised of twenty simple addition and subtraction problems based on these standards were given to assess these skills up to the sum of twelve.

Computer Software

The Destination Math series used in the study was correlated to state standards.

Data Collection

All the groups of first grade students were given the researcher-created pre-test as a means of assessing each student's previous knowledge of the mathematics skills. The pre-test was given and scored by the researcher. The teachers reviewed the scored pre-tests. All students in the study were exposed to traditional first grade methods of teaching. These include teacher modeling, paper-pencil worksheets and the use of manipulatives. Students from the control group were exposed to traditional methods only. Students at the Early Childhood Development Center at Texas A&M University-Corpus Christi were exposed to an educational age-appropriate mathematics computer program for twenty minutes each day during their mathematics time for two weeks. Both groups were allowed the same amount of time for mathematics learning. And were given the posttest at the end of the two-week lessons and the post-test was administered by and scored by the researcher. The scores were input into the Statistical Package for the Social Sciences
(SPSS 11.0) computer program. This program performed an analysis of the data on all products. On the basis of these scores, the researcher determined the effect of computer software use in conjunction with traditional teaching methods on first graders’ ability to acquire addition and subtraction skills for one- and two-digit number problems without regrouping.

Findings

A description of the demographic characteristics of the samples including ethnicity and primary language were utilized to determined answers to research questions. Tables display the difference in the scores between the pre- and post-tests for the groups and the frequency of the demographic groups.

Study results showed the English as a primary language students in the traditional teaching methods class showed a much higher gain of scores than the English as a Second Language students when acquiring addition and subtraction skills for one- and two-digit number problems without regrouping as seen in Table I. Students who had English as a second language (ESL) scores remained the same on the post-test showing no change as seen in Table I.

| TABLE I |
|---------------------------------|-------|-------|-------|-------|
| Traditional Teaching            | Frequency | Percent | Pretest Mean | Posttest Mean |
| English                         | 18    | 90    | 47.78        | 65.00        |
| ESL                             | 2     | 10    | 32.50        | 32.50        |

Analysis of the computer software experimental groups went in the other direction. The results showed there was a slightly greater gain in scores with the English as a second language compared to the English as a primary language students in the classroom when acquiring addition and subtraction skills for one- and two-digit number problems without regrouping as seen in Table II. It is interesting to note the traditional teaching classroom had one fourth the amount of ESL students compared to experimental group.

| TABLE II |
|---------------------------------|-------|-------|-------|-------|
| Experimental Group              | Frequency | Percent | Pretest Mean | Posttest Mean |
| English                         | 12    | 60    | 59.17        | 66.25        |
| ESL                             | 8     | 40    | 58.75        | 68.13        |

When analyzing the effect of ethnicity, Caucasian students showed a more
dramatic growth in scores in the traditional classroom than the Hispanic and Asian students as seen in Table III.

<table>
<thead>
<tr>
<th>Traditional Teaching</th>
<th>Frequency</th>
<th>Percent</th>
<th>Pretest Mean</th>
<th>Posttest Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>4</td>
<td>20</td>
<td>50.00</td>
<td>82.50</td>
</tr>
<tr>
<td>Hispanic</td>
<td>15</td>
<td>75</td>
<td>42.33</td>
<td>54.00</td>
</tr>
<tr>
<td>Asian</td>
<td>1</td>
<td>5</td>
<td>90.00</td>
<td>95.00</td>
</tr>
</tbody>
</table>

The analyzation of the data revealed that in the experimental classroom, when the question of ethnicity affecting the acquisition of addition and subtraction skills when using computer software, the most dramatic growth of scores was with the Caucasian students compared to the Hispanic and African American students as seen in Table IV.

<table>
<thead>
<tr>
<th>Experimental Group</th>
<th>Frequency</th>
<th>Percent</th>
<th>Pretest Mean</th>
<th>Posttest Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>2</td>
<td>10</td>
<td>47.50</td>
<td>72.50</td>
</tr>
<tr>
<td>Hispanic</td>
<td>17</td>
<td>85</td>
<td>60.00</td>
<td>65.88</td>
</tr>
<tr>
<td>African American/Black</td>
<td>1</td>
<td>5</td>
<td>65.00</td>
<td>75.00</td>
</tr>
</tbody>
</table>

The results from the study showed the demographic factors of ethnicity and language spoken in the home were considered in the traditional teaching classroom and when using computer software in the classroom. The use of computer software may help bridge the gap between ethnicity and primary language, especially starting with the very young. As with teaching strategy, it will require equal amounts of exposure and consideration of the students’ needs.

Recommendations for Further Study
1. It is recommended that additional studies be conducted with different math topics and with different age groups to better understand the effects of computer software use.
2. It is further recommended that additional instruction time would provide a better understanding of the effect of computer software in the classroom. For the addition and subtraction skills the researcher recommends six weeks of software use on the concepts.
3. Finally, to further understand the individual students’ needs, time spent on each skill may be explored.

This two-week study was just a glimpse of the effect of computer software when
used in an elementary classroom. There is much more parents, teachers, and administrators must learn about implementing educational technology to enrich students’ acquisition of mathematical concepts. Hopefully, this study will encourage further research of young children and computer software use in an educational setting so that we may provide the best learning environment possible for them.
References