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**A Quantitative and Qualitative
Study of a High-Performing
Elementary School in
Mathematics**

**Does TouchMath Contribute to
Overall Mathematics Achievement?**

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Abstract

The research described in this paper summarizes a study of a randomly chosen, high-performing elementary school, as indicated by standardized mathematics scores, and teachers' perceived beliefs that the use of the TouchMath program contributes to overall mathematics achievement. Responses from the questionnaire interviews indicated that teachers use TouchMath in their daily instruction throughout the year. In addition, veteran teachers have used TouchMath for a number of years, and provide scaffolds for novice teachers to acquire those teaching skills. Even though other methods and programs have been used, adjacent to the TouchMath program, teachers tend to place a high importance on the effectiveness of TouchMath as a supplemental program with learners of all performance levels.

I. Rationale for the Study

In today's educational arena, emphasis is placed upon quantitative data and standardized scores as potential indicators of overall mathematics achievement. Many supplemental programs, total curriculum kits, and curricular aids are on the market to enhance and support student achievement. TouchMath, by Innovative Learning Concepts, Inc., is one such program. TouchMath provides scaffolding and supplemental support for private and public school teachers, students, and those participating in home-school education. After a review of the literature, it was determined that little research has been published demonstrating the effects of TouchMath on a large population. The goal of the researchers was to determine what effects, if any, TouchMath would have on the achievement of second and third grade students in mathematics. The researchers investigated perceptions of teachers with regard to their beliefs about TouchMath's contribution to a school's overall mathematics achievement. Therefore, it was determined that teachers from a high-achieving elementary school that uses TouchMath would be interviewed.

II. Introduction to TouchMath

The TouchMath program (Innovative Learning Concepts, Inc.) utilizes TouchPoints on each numeral to represent the corresponding number (or amount). When children touch and count the TouchPoints on each numeral, they are able to tap into auditory, visual and kinesthetic knowledge. This action provides the young child with a sense of quantity that relates to each symbol. Also, it affords them multiple pathways of computing with numbers. For example, children can solve problems such as $2 + 3$ by counting the total number of TouchPoints to determine the answer. Literally, children can compute as high as they can count. The TouchNumerals are shown in the box below.



Much mathematical power is in the hands of children when they learn the basics of TouchNumerals. Here is an overview of how they work. The TouchNumerals 1 through 5 have a corresponding number of TouchPoints positioned on each numeral. The TouchNumerals 6 through 9 have TouchPoints with circles around them to indicate two. These points are touched and counted twice. For example, the 6 is counted “one, two” (touching the first TouchPoint twice), “three, four” (touching the second TouchPoint twice), and “five, six” (touching the third TouchPoint twice).

III. Selection of the Subjects

The researchers randomly selected one school system from each of the regions across the United States. This was accomplished by throwing a dart at an enlarged map of the continental United States. Wherever the dart landed, the researchers noted the closest city, and placed the name of that school system on a piece of paper. In order to select one school system, for qualitative study, a second randomization occurred when one school system was chosen as the focus, by drawing a system name from the list. Within that system, the highest performing school was selected for study, using standardized elementary mathematics achievement data, available from the Internet. It was decided to focus on one school, since this study will most probably serve as a pilot study for future research. It was further determined if this randomly selected school used TouchMath. After contacting Innovative Learning Concepts, Inc., it was verified that this school was in the database, as having purchased materials. If the school did not use TouchMath, the plan was to determine if the second highest-performing school used TouchMath. This process was not necessary, since the first school chosen used TouchMath.

The school system randomly chosen was from the state of Georgia. The total school system population was over 34,000. The randomly selected school was pre-kindergarten through grade five, with 725 students. The student-teacher ratio was 16 to 1. Student ethnicity consisted of 40% nonwhite and 60% white.

IV. Quantitative Data

Quantitative data was retrieved from the State of Georgia's Office of Student Achievement, specifically the 2002-2003 "Annual Report Card on K-12 Public Schools". The researchers decided to focus on grades two and three, since TouchMath scaffolds foundational mathematics concepts and processes. Grades two and three seemed appropriate to study, since this would give students an opportunity to both learn and employ TouchMath skills during the standardized achievement assessments. Both the second and third grades employed the use of the Criterion-Reference Competency Test (CRCT), which is the standardized achievement test for the state of Georgia.

Table 1 shows the results of the second and third grade CRCT mathematics scores for the selected school. Notice that only 11% and 13% of the second and third grade students fell below the average. Combining the average and above average categories, the 88% of the second grade students had successful scores, according to state standards; whereas, 86% of the third grade students scored at or above the average level.

Table 1			
CRCT Scores for the Selected School: Mathematics			
	Below Average	Average	Above Average
Second Grade	11%	49%	39%
Third Grade	13%	57%	29%

V. Qualitative Data

In order to receive permission to e-mail the teaching faculty, the researchers communicated with the principal of the selected school. The e-mail consisted of five questions, which were to be answered and returned via e-mail. In the paragraphs that follow each question are sample teacher responses, as well as a discussion of the overall findings from each question.

Questionnaire:

- 1. How long have you used TouchMath?*
- 2. How often do you use TouchMath? What is the duration of each use of it? (example: daily, 30 minutes)*
- 3. Do you use TouchMath for all or part of your students? If only some students use TouchMath, which ones do use it?*
- 4. Have students using TouchMath benefited in learning overall math skills and processes? Describe.*
- 5. What are the strengths of the TouchMath program?*

Discussion of each question:

- 1. How long have you used TouchMath?*

Utilization of the TouchMath program from the teacher survey ranged from 1 to 14 years in a variety of settings. Teachers used the system in whole class instruction, as well as enrichment and remedial classes. Some of the teachers reported using TouchMath over the years with the different grade levels they taught. These consisted of classes in pre-kindergarten through third grade.

2. *How often do you use TouchMath? What is the duration of each use of it? (example: daily, 30 minutes)*

The times varied in amounts used for teaching TouchMath. The least amount of teaching time was “twice a week for 10 minutes each.” It is interesting to note that the pre-kindergarten and kindergarten teachers were the ones who used TouchMath the least, and in smaller increments of time. This could be supported by developmental theorists, who would recommend daily use in small amounts of time, due to attention spans of very young children. Typical responses to this question indicated that teachers used TouchMath from 15-30 minutes a day, with 30 minutes being the longest period of time spent on TouchMath tasks. Some teachers noted that once they have taught their students TouchMath skills, the students utilize these skills without further instruction. An example response to support this premise was, “I introduce TouchMath at the beginning of the year as one technique to learning math facts.”

3. *Do you use TouchMath for all or part of your students? If only some students use TouchMath, which ones do use it?*

Although all students were reported as having the opportunity to learn TouchMath, some teachers focused on particular groups of students they thought would benefit the most from its use. Categories of students listed as benefiting the most included: regular education students, resource students (both enrichment and remedial), nonverbal students, and those students reluctant to learn mathematics, or who have experienced failure and/or mathematics anxiety.

4. *Have students using TouchMath benefited in learning overall math skills and processes? Describe.*

Without exception, the teachers in this study reported that they have relied upon TouchMath to fill in the gaps for students who would not do well using traditional mathematics programs. The highlighted benefits and enhanced learning outcomes included all of the following:

- a. Teachers perceived that students were better at one-to-one counting. They attributed this phenomena to the use of TouchPoints and utilization of visual cues.
- b. They also noted that the computation exercises are step-by-step and provide scaffolding for even the slowest of learners.
- c. Teachers reported that TouchMath enhances error-free answers to addition and subtraction with and without regrouping problems, and leads to mastery of basic addition and subtraction facts.
- d. Overall mathematics comprehension appears elevated.

5. *What are the strengths of the TouchMath program?*

The teachers in this study reported that the program is beneficial to their students due to the visual and kinesthetic nature of the TouchPoints, the use of effective visual aids, small incrementation of step-by-step procedures, concrete perception of math skills, and using TouchNumerals and computation statements as remedial and enrichment tools. One teacher noted, “I think the biggest strength is that it provides the children with a concrete perception of math skills that can tend to be a little abstract for their age level. It can serve as a remedial tool, or serve as an enrichment tool for students who are ready to move on. It seems to provide a constant or point of recognition for students as they progress through the skills, making math a little less scary.”

VI. Discussion

This study found that teachers in a high-performing elementary school perceive that TouchMath plays a significant role in mathematical understanding. The program is used consistently throughout the grades, and provides a scaffold for learners across the continuum of remedial, regular education, and enrichment students. Teachers seem to believe that TouchMath allows students to learn more mathematics, understand it more fully, and compute more accurately when they are taught how to use TouchPoints. Teachers in this school have used TouchMath for enough years to know that it can be a powerful program regardless of student achievement level or age level.

As with most research, this study brings forth some further queries. Further study is needed to determine grade level effects. Questions for further study might include:

- a. What are the mathematics achievement differences in using TouchMath across different grade levels? For example, do first grade students benefit more than third graders, when introduced to TouchMath concepts or strategies?
- b. What is the optimal amount of classroom time for using TouchMath? Does it matter if a teacher uses TouchMath strategies daily for 30 minutes, as compared to 10 minutes?

Whatever the answers to these future research questions, the present research indicates that TouchMath contributes to students' overall achievement in mathematics.