

Bowling Green State University, University of Colorado

**The TouchMath Program
and It's Effect on the
Performance of First Graders**

Presented by

Lyn Strand, MA

Subjects

Experimental and control groups of first grade children were established. Those children in Group I, the experimental group, were from two different schools. The total population of Group I was 59 first graders, with 37 students from School A and 22 students from School B. Children came from primarily middle income families with approximately 95% of the group being Caucasian. Three teachers were involved with this group.

Group II, the control group, was composed of 61 first grade children from one large school. Three different teachers taught these children. Again, this group was primarily from middle income families with 95% of their population being Caucasian.

Procedures

At the beginning of the school year, Group I teachers were instructed at length on the use of the TouchMath system in their classrooms. All children in their classrooms were exposed to the touch method in addition to their standard Addison Wesley text book series.

Group II teachers taught their first grade children mathematics in the same manner they previously taught their students. These teachers also used the Addison Wesley text book series.

At the termination of the school year, children in both Group I and Group II were administered a one page math worksheet. The worksheet was composed of sixteen math problems of varying degrees of difficulty. Two problems involving the same operation were grouped together for statistical analysis. Thus, eight comparative scores were obtained, the ninth score being the total results. Operations involved on the worksheet were as follows: single digit addition, single digit addition (long column), double digit addition, double digit addition with regrouping, single digit subtraction, two digit subtraction of a single digit, and double digit subtraction with regrouping. Although several operations tested were more difficult than expected for first grade performance, extremes in performance of mathematical computation could then be assessed.

As instructed, the teachers told the children they would probably not be able to answer all of the problems on the worksheet. The children were asked to do their best and complete as many problems as they were able. Rods and number lines were not permitted during testing. There was no time limit for completion of the worksheet.

Results

Table I presents a comparison of performance on the eight different types of mathematical operations included on the worksheet. Percentage scores are indicated for each group and a comparison of overall results of performance are included.

Results indicated Group I responded more accurately to all types of computational problems included on the worksheet. Overall, Group I responded with 80% accuracy to the problems presented on the assessment worksheet while Group II was accurate with 44% of their responses.

With the exception of the simple addition problems (numbers 1 and 2 on the worksheet), Chi Square analysis (Table 2) revealed Group I performed significantly better than Group II for all other types of computational problems.

TABLE 1. Comparison of performance in percentages

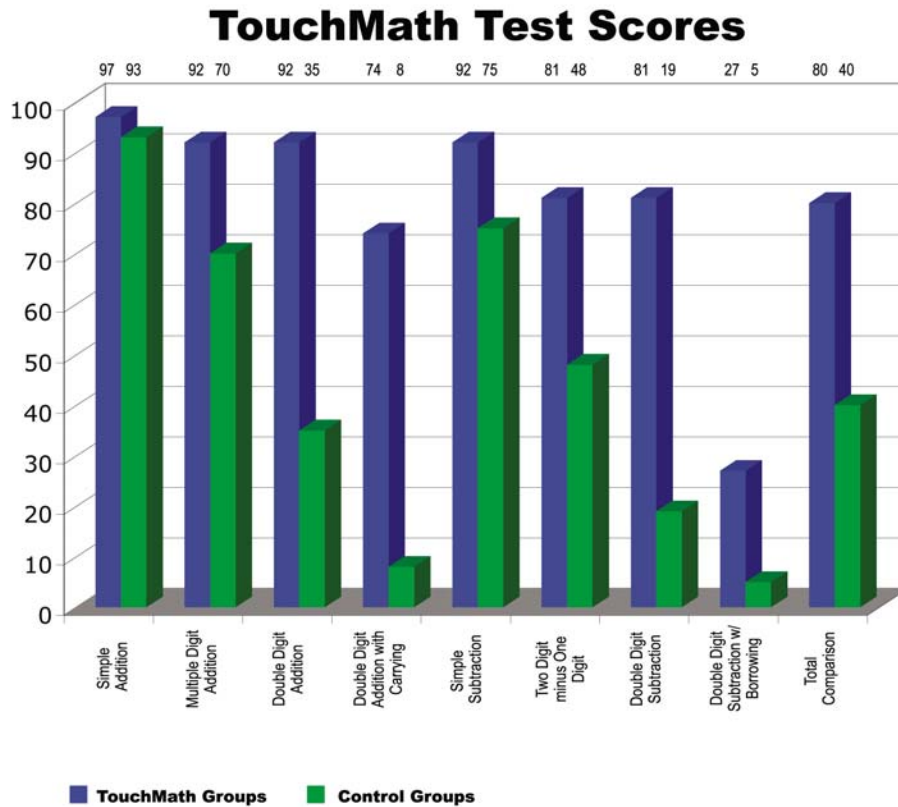


Table 2. Chi square data using the formula $\left(\chi^2 = \frac{N (BC-AD)^2}{ABCD} \right)$

No. of Problem	Type of Operation	Chi Value	Significance
1 and 2	Single digit addition	$\chi^2 = 1.7954$	no
3 and 4	Single digit addition (long column)	$\chi^2 = 19.3769$	yes
5 and 6	Double digit addition	$\chi^2 = 86.162$	yes

7 and 8	Double digit addition with regrouping	$\chi^2 = 108.00$	yes
9 and 10	Single digit subtraction	$\chi^2 = 11.73$	yes
11 and 12	Double digit subtraction of single digit	$\chi^2 = 28.688$	yes
13 and 14	Double digit subtraction	$\chi^2 = 92.977$	yes
15 and 16	Double digit subtraction with regrouping	$\chi^2 = 22.674$	yes

Discussion

The first two problems on the worksheet involved single digit addition. On these simple addition problems there was no significant difference in performance between the two groups. This was an expected result as most children are able to add two numbers by the end of their first grade experience. What was not anticipated was the significant difference in performance on the single digit subtraction problems. While 92% of Group 1 answered these problems correctly, only 75% of Group II answered correctly. Many children have difficulty with the subtraction process initially; however, Group I children appeared to have considerable facility and skill in completing this operation. Because Group I scores on simple addition and simple subtraction did not differ significantly (97% correct and 92% correct respectively), it is assumed that these operations are at approximately the same level of difficulty for this group. This does not appear to be the case with Group II. While 7% of this group missed the simple addition problems, 25% of the group erred on the simple subtraction problems.

The first eight addition problems presented on the assessment worksheet, involved four operations and ranged from the most simple to the most difficult performance level. A wide range in scoring was noted for Group II. Scores on the addition problems spiraled from 93% correct to 8% correct; a range in performance of 85%. Group I scores on the four types of addition operations ranged from 97% to 74% correct. A difference of 23% was recorded—a far smaller “spread” in computational competency.

Disregarding the last subtraction problems involving regrouping, scores in Group I on the subtraction problems ranged from 92% to 81% correct: a difference of 11 percentage points. Group II, however, had great difficulty with these problems as indicated by their range in scores: 75% to 19% correct. The range in performance on the subtraction problems for this group was 56 percentage points.

Problems 15 and 16 involving subtraction with regrouping were by far the most difficult for both groups. School A in Group I did not teach this operation to their students while School B did teach this process. Likewise Group II did not expose their students to regrouping, as indicated by their low performance

Because of the nature of TouchMath (rapid performance and easy to grasp) teachers reported they were able to expose several types of operations during the school year where their students could apply and practice their newly learned skills. Thus Group I was relatively familiar with the operations of double digit addition and subtraction, as their percentage of correct responses indicated. Apparently, children in Group II did not have the opportunity for exposure to advanced operations because their performance was significantly lower than that of Group I. These scores reflect more 'typical' performance of first grade children. Because math facts are difficult for many children to master, arithmetic lessons are spent in drill and worksheet completion. This author feels such valuable time is often futilely spent. According to developmental theorists (i.e. Bruner, Piaget, etc.) when children are ready to understand how numbers relate to one another, they will make the transition from having to use concrete external aids (i.e. fingers, counters, numberlines) to committing the basic facts to memory. However, developmentally until children are ready for such a transition they need a reliable strategy to help solve basic mathematic computations.

Often children select strategies that are tedious or inaccurate. The TouchMath program is designed to keep children dealing with the numeral itself, as opposed to external manipulatives.

This research paired two schools selected because of their similarity in socioeconomic backgrounds and compared results of computational competencies at the end of the first grade year. Because only Group I was pre-tested at the beginning of the school year it is difficult to determine the difference in rate of improvement of the Group II classroom by the end of the year. At the time of the pre-test the average number of correct answers on a worksheet of sixteen problems was 1.2 correct responses for Group I. We can conjecture that even if no one in Group II was able to respond to a single problem on the worksheet, the rate of growth for Group I would still be measurably greater than that of Group II (Figure 2).

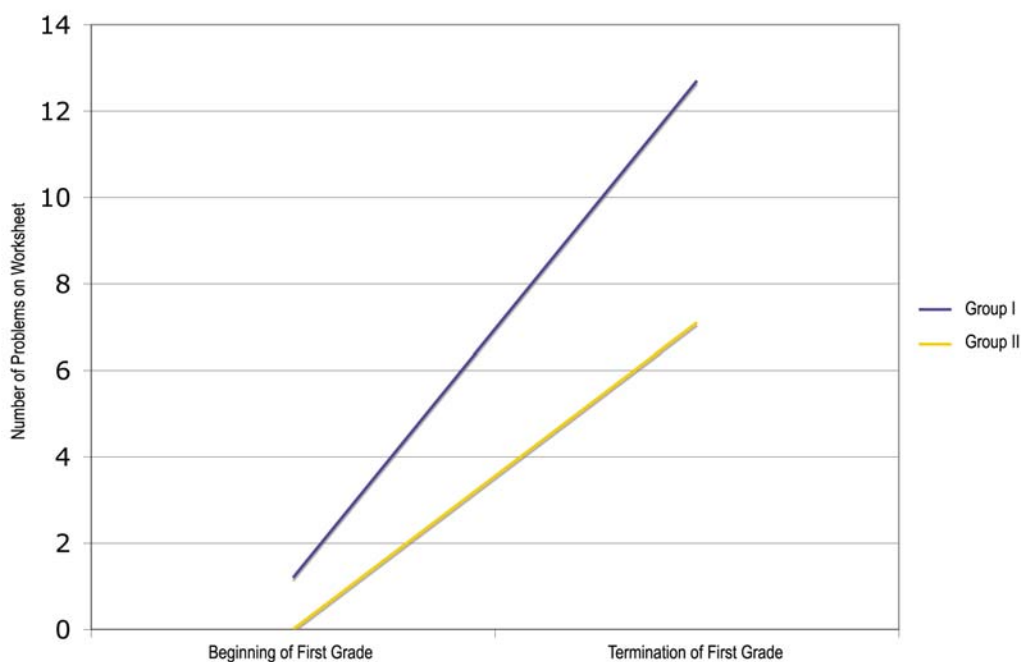


Figure 2. Rate of growth from beginning of school year till end (Sept-May)

Figure 2 is hypothetical and indicates that the maximum possible difference between the computational performances of Group I and Group II at the beginning of the school year-- 1.2 correct responses. At the end of the school year Group I responded correctly to 12.7 out of 16 of the problems on the worksheet, increasing their yearly performance by 11.5 problems. Giving Group II the benefit of conjecturing they had no correct responses on the worksheet initially, they were able to correctly compute on an average 7.1 out of 16 of the problems at the termination of the school year. Thus, the maximum gain in computational performance was 7.1 problems for Group II. In summation, Figure 2 suggests that the rate of improvement for the TouchMath group was much greater than for the traditional math group.

In reviewing the results of this study it becomes obvious that Group I, the TouchMath group, performed far more capably on all of the problems presented on the worksheet. Because Group I was taught the touch method it appears likely that such a method greatly improved the children's performance on both basic and more advanced operations. Their performance exceeded basic first grade standards for expected computational skills. Children were reported to enjoy math and problem solving. Teachers indicated a positive response and considerable enthusiasm toward a subject many children regarded as 'difficult' or even 'boring.' Teachers involved in this project reported that those students having difficulty in several of the basic subjects looked upon math time as a chance for success. Using TouchMath the teachers reported there was little to no failure in their classrooms.

It should be noted that the children who possessed a 'natural' understanding for numbers disbanded the touch system shortly after it was introduced. They continued to reason their answers and memorize their facts. Most children utilized the system on a need-basis-only as they learned the basic numeric combinations. When these children did not know a particular answer to a problem they used the touchpoints to derive that answer. For example, they might have easily recognized that '3 plus 3 is 6,' but needed to use the touchpoints on a problem such as '6 + 8.' There was also a small group of children who used the touch system exclusively throughout the school year. These students were undoubtedly the same children who would have resorted to fingers or stick drawing when trying to compute a problem. They are children needing more experience with concrete learning before transitioning to the abstract. Ironically, when these same children were asked what subject they liked best the great majority responded "math." Pleased with the positive feelings and attitudes of the students, the teachers in Group I, the TouchMath group, expressed a desire to continue introducing basic mathematic operations to their students using the touch approach.