

# “DISCOVER MATH”® – AN EXCITING PROGRAM FROM THE READING FOUNDATION

by

Steve Truch, Ph.D.

The Reading Foundation is a private remedial clinic I started in Calgary in 1990. Before that, I spent 14 years in the school system as a school psychologist and junior high school teacher.

The Reading Foundation offers remedial support to students of all ages in basic reading and spelling skills, comprehension, written language and math. The latter is the topic of this paper.

Each of the major programs used at The Reading Foundation was developed by myself and selected staff members. They are continuously refined. Each program is also based on strong research and theory.

Our first version of the Discover Math Program was developed in 1992. Clinical experience keeps refining it. The latest version contains a number of features that makes the program appealing to both regular and special education teachers.

First, the program is consistent with all the major objectives of the Western Canadian Curriculum Framework from grades 1 to 9 inclusive. As such, the program can be used both in the regular classroom or as a remedial program. The Saskatchewan Rivers School Division in Prince Albert, Saskatchewan in fact, has decided to begin implementing “Discover Math” across the elementary grade levels as they are very pleased with the results they are seeing from a couple of pilot projects (results from their pilot projects are presented in Tables 2 and 3).

Secondly, the program has been field-tested in a number of settings and in a variety of ways – one-on-one instruction, small group instruction and whole-class implementation. These pilot projects occurred in a number of locations including three different summer projects in Sacramento, California. The students in Sacramento were all under-achieving minority students who made very significant math gains over the four to six week summer programs.

Thirdly, the program uses some sound teaching principles whose *primary purpose is to help students develop a deeper understanding of the logic of numbers* and their expressions as equations in various forms.

Some of the major features of the Discover Math Program include:

- ❖ Using a discovery method.
- ❖ Introducing the student to all concepts on a concrete number line with manipulatives.
- ❖ Discussing the concepts with the student in order to develop a verbal understanding.
- ❖ Helping the student internalize the concepts through a mental number line (visualizing).
- ❖ Encouraging the process of estimation for all operations.
- ❖ Helping the student apply what he has learned to problem-solving situations.
- ❖ Using a sequential and logical approach, with each new step built on the one before.

While repetition and reinforcement certainly play a role in the program, this is not a “skill and drill” approach at all, which is one of the reasons that positive outcomes have consistently been seen when the program is taught as intended.

The fact that students need to develop a deeper understanding of number concepts cannot be overstated. As a school psychologist, I constantly received referrals on students who did not “get” even basic adding and subtracting (particularly the latter and especially when regrouping was involved). When I assessed the students, I found they relied on something tangible for their counting needs, such as their fingers, for any sort of accuracy (which even then was often dubious) and on “short-cut” methods for regrouping, which always led to an incorrect answer. It was obvious that these students did not understand place value but how do you go about teaching place value in such a manner that the student *will* understand? The typical recommendation was to provide more practice for the student using tangibles such as counters, coins, etc., give them a lot of review and keep on repeating. Unfortunately, that approach usually produced very limited results. And given the sequential nature of mathematics from grade to grade, the difficulties experienced by these students only compounded from year to year. By the time they

got to grade 6, they were hopelessly lost.

We often hear that such students need to “go back to the basics.” But it is of little use to simply repeat the basics. Students need to have the basics *re-taught in a different way*. That is where Discover Math is so helpful. All students who enter the program are given the “basics” but in a new way. The results have been gratifying.

I am going to present some of those results in Table 1, which bears some explaining.

**Table 1**  
**SUMMARY OF CLINICAL RESULTS USING DISCOVER MATH®**

<b>Grade</b>	<b>N</b>	<b>#Obj.</b>	<b>X Pre</b>	<b>X Post GAINS</b>	<b>%(Obj)</b>	<b>%(Base)</b>	<b>X Hours</b>
2	7	20	7.28	15.85	42.8%	217%	27.40
3	19	37	16.00	29.05	35.3%	181%	39.78
4	21	48	24.09	37.70	30.3%	156%	39.19
5	12	61	33.50	53.40	33.0%	159%	37.60
6	25	85	39.48	65.32	30.4%	165%	47.56
7	16	71	23.31	50.18	39.1%	215%	56.38
8	10	94	37.40	58.90	22.9%	157%	46.10
9	10	113	47.10	86.30	35.0%	183%	57.00
10-12	17	113	50.90	83.50	29.0%	164%	53.29

A total of 137 students from grades 1 to 12 were used for this analysis. All of these students were experiencing great difficulty in understanding basic math concepts and operations. They were pre-tested using the Discover Math tests developed for the program. These tests are organized into three Levels. Level 1 contains questions covering curriculum objectives in grades 1, 2 and 3. For grade 1, a total of 8 objectives are tested; 12 objectives are measured in grade 2 and 17 in grade 3 for a total of 37 objectives. Level 2 covers objectives from grades 4, 5 and 6. Eleven objectives are sampled in grade 4; another 13 in grade 5 and 24 in grade 6 for a total of 48 objectives at Level 2. Level 3 covers objectives from grades 7, 8 and 9. Twenty-three objectives are covered from grade 7; 23 from grade 8 and 19 from grade 9. The student answers each question in a paper-and-pencil format and is not allowed a calculator.

For Table 1, the number of objectives at each grade level is cumulative to the end of grade 6. At the grade 7 level, the total number of objectives was reduced because those from Level 1 (37 in total) were not included (they were usually too easy for the older students). The number of objectives for grade 7 was therefore the total from Level 2

(48) plus the 23 additional grade 7 objectives, for a grand total of 71.

As is evident from Table, 1, the increase in performance at each grade level is encouraging. For example, at the grade 2 level, in an average time of just 27 hours, we saw an increase in performance that doubled the students' scores. The gains that students made were calculated in two ways. The first X% GAIN score was calculated by subtracting the pre-test mean score from the post-test mean score and then dividing by the total number of objectives. So at the grade 2 level, the calculation was  $15.85 - 7.28 = 8.57$ . The 8.57 was then divided by the total number of objectives (20) giving rise to an 42.8% increase in the number of objectives learned. The second % GAIN score was calculated by dividing the mean post-test score by the mean pre-test score and multiplying by 100. The second gain seems much more impressive of course.

Strong gains occurred with each grade level.

The students from Table 1 were all students with quite severe math difficulties prior to the remedial program. All of them received one-to-one treatment.

In Tables 2 and 3, information is provided from the Saskatchewan Rivers School Division. A total of 17 students were involved in this pilot project, done over the summer months of 2003. They were provided with 36 hours of remedial instruction from teachers who had been trained in the Discover Math Program. A total of 8 students in grades 3 and 4 and 9 students in grades 6 and 7 took part in the program. They were pre and post-tested on the Discover Math Tests. The results for each group are provided in Table 2 and Table 3.

**TABLE 2**

<b>Grade 3-4 Group</b>		
Name (School)	Pre-Post	Gain
Brittany*	9% - _____	
Cassandra	24% - 86%	62%
Micah	37% - 70%	33%
Kristin	48% - 84%	36%
Stephen	7% - 76%	69%
Alyssa	0% - 76%	76%
Ryan	15% - 89%	74%
Williams	2% - 81%	79%
Marisza	11% - 95%	84%
AVERAGE	19% - 82%	63%

\* Dropped after first week

**TABLE 3**

<b>Grade 6-7 Group</b>		
Name (School)	Pre-Post	Gain
Mitchell*	30% - 54%	24%
Jasmyne	26% - 83%	57%
Jennifer	46% - 98%	52%
Kelsey	17% - 78%	61%
Samantha	26% - 85%	59%
Joshua	43% - 67%	24%
Kayla	37% - 96%	59%
Mercedes	48% - 89%	41%
Daniel	46% - 91%	45%
AVERAGE	35% - 82%	46%

\*Missed two days

Note: In Camp 2002, with Grade 5-6 students, the average increase was 44%

As can be seen, these results are also very encouraging. In the grade 3-4 group, the average increase in the number of objectives learned was 63%. For the grade 6-7 group, it was 46%. These scores are calculated differently from those in Table 1, since Table 1 scores present group averages rather than scores from individuals. In any event, both the clinical one-on-one data from Table 1 and the small group instruction data from Tables 2 and 3

suggest excellent gains from the Discover Math Program.

### **Training in Discover Math**

Teachers can be trained in The Discover Math Program in a week's time. It takes this long because of all the complexities and subtleties of the program, but the investment is well worth it. The current fee includes:

- ❖ One full week of training and practice.
- ❖ A detailed Instructor's Manual.
- ❖ A complete set of reinforcement sheets. There are about 600 pages of activity sheets that are connected to each strand of the program. The sheets reinforce the concepts and operations that are taught using Discover Reading methodology. Trainees have unlimited photocopy privileges.
- ❖ A complete set of manipulatives good for one-to-one instruction or a small group of students (up to six).

School districts can also purchase the Discover Math Screening Tests.

Training courses are held each summer in both Calgary and Vancouver. Arrangements can also be made for "on-site" training anytime during the school year.

If you would like to discuss this program, please call The Reading Foundation at 1-800-605-9272.