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AUTHOR	Quistorff, Kirk
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ABSTRACT

Student scores on the Woodcock-Johnson Achievement Test showed four years of declining scores. Data collected from a teacher pre-questionnaire indicated problems in the areas: elementary mathematics curriculum, the curriculum adoption process, training of teachers in using purchased texts and manipulatives, confidence of teachers in utilizing methods which meet student needs, knowledge of teachers in using computer software and supplementary materials, and parental support of the mathematics program. The elements of the mathematics program that were affected were the adoption of elementary curriculum materials that met student needs in terms of reading level, computation, and problem solving, teacher training in using purchased texts and manipulatives, teacher training in methods of teaching mathematics, teacher training in using computer software and supplementary materials, and programs to increase parental involvement in mathematics. Achievement performance increased following the implementation as measured by the Woodcock-Johnson Achievement Test. The teacher post-questionnaire showed that objectives were met in the following areas: elementary curriculum, sufficiency of curriculum materials to compare and to pilot, teacher confidence in the curriculum review process, the training of teachers in using purchased texts and manipulatives, and the knowledge of staff in using supplementary materials. The teacher post-questionnaire showed improvements in the following areas: the time taken to evaluate curriculum materials, the confidence of teachers in the ability of their teaching methods to meet student needs, the knowledge of teachers in using computer software, and parental support of the mathematics program. (Contains 59 references.) (Author)

PRACTICUM REPORT

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1750 NE 167th Street
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33162-3017

The Mathematics Program in a School for Learning Disabled Students in Grades 2 Through 10: Fostering Mathematical Growth of Students Through Teacher Training, Parent Involvement, and Implementation of New Curriculum Materials

by
Kirk Quistorff
Cluster 68

A Practicum II Report Presented to
the Ed.D. Program in Child and Youth Studies
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Education

Nova Southeastern University
1998

PRACTICUM APPROVAL SHEET

This practicum took place as described.

Verifier: Greg Eisnaugle

Director of New Horizon School
Title

Renton, Washington

9/3/98
Date

This practicum report was submitted to the Ed. D. Program in Child and Youth Studies and approved in partial fulfillment of the requirements for the degree of Doctor of Education at Nova Southeastern University.

Approved:

Aug. 30, 1998
Date of Final Approval of Report

Jonathan Feinn per tg
Jonathan Feinn, Ph. D., Advisor

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ABSTRACT

The Mathematics Program in a School for Learning Disabled Students for Grades 2 Through 10: Fostering Mathematical Growth of Students Through Teacher Training, Parent Involvement, and Implementation of New Curriculum Materials. Quistorff, Kirk D., 1998: Practicum II Report Nova Southeastern University, Ed. D Program in Child and Youth Studies. Administration/ Curriculum Development/ Parent Participation/ Parent-School-Relationship/ Learning Disabilities

Student scores on the Woodcock-Johnson Achievement Test showed 4 years of declining scores. Data collected from a teacher pre-questionnaire indicated problems in the following areas: elementary mathematics curriculum, the curriculum adoption process, training of teachers in using purchased texts and manipulatives, confidence of teachers in utilizing methods which meet student needs, knowledge of teachers in using computer software and supplementary materials, and parental support of the mathematics program.

The elements of the mathematics program that were affected were the adoption of elementary curriculum materials that met student needs in terms of reading level, computation, and problem solving, teacher training in using purchased texts and manipulatives, teacher training in methods of teaching mathematics, teacher training in using computer software and supplementary materials, and programs to increase parental involvement in mathematics.

Achievement performance increased following the implementation as measured by the Woodcock-Johnson Achievement Test. The teacher post-questionnaire showed that objectives were met in the following areas: elementary curriculum, sufficiency of curriculum materials to compare and to pilot, teacher confidence in the curriculum review process, the training of teachers in using purchased texts and manipulatives, and the knowledge of staff in using supplementary materials. The teacher post-questionnaire showed improvements in the following areas: the time taken to evaluate curriculum materials, the confidence of teachers in the ability of their teaching methods to meet student needs, the knowledge of teachers in using computer software, and parental support of the mathematics program.

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Chapter I: Introduction

Description of the Community

The community of the writer's school was located in the northwest region of the United States. The community was an unincorporated urban area, which was near an industrial city, with a population of 43,970 (Greater City Chamber of Commerce, 1995). The community was 10 miles south of a large metropolitan area with a population of 591,000 (Crystal, 1995). The community was further defined geographically by two major interstate highways that lay 5 miles to the west and 3 miles to the south. Most of the businesses in the community were centered along three avenues that connect the large metropolitan area to the north with the industrial city to the south.

The majority of the people in the community had blue-collar jobs. Employment in the community was heavily dependent on a manufacturer in the nearby industrial city. This manufacturer with 17,451 employees was the world's largest producer of commercial aircraft (Greater City Chamber of Commerce, 1995). The public school district of the nearby industrial city operated the public schools of the community.

Writer's Work Setting

The writer's work setting was an independent school, composed of grades 1 through 10. The school had as its focus the education of students with learning disabilities (LD) or attentional problems, such as ADD or ADHD (The School, 1995). Although LD and attentional problems are distinct conditions, frequently students displayed both conditions. Besides teaching the basic academic areas, the school placed a major emphasis on teaching good citizenship, self-confidence, and social skills. The mission of the school was to create an environment that provided opportunities for students to reach their individual learning potentials.

The mission of the school was to create a learning community that contributed to a better world. The vision was a school in which

- Every student was able to succeed at learning.
- Appropriate social interaction was an important goal.
- Excellence was expected in all activities.
- Opportunities were provided for interdisciplinary learning.
- Teachers were expected to develop a supportive environment for learning.
- Students were able to make connections between learning at school and at work.
- Small class size encouraged learning through personal attention to needs.
- Parents were expected to participate in the life of the school.
- Students learned to serve the larger community.

Following are examples of ways in which each of the mission elements was implemented: (a) Success at learning was encouraged by allowing students to redo assignments and tests,(b) success in reading and mathematics were encouraged through student placement according to achievement levels, rather than by grade levels (The School, 1995), (c) appropriate social interaction was encouraged through a required class for social skills, (d) excellence was upheld by expecting that all students achieve at least 80% accuracy in all academic work, (e) interdisciplinary work was encouraged through joint projects, for example, in English and history, (f) a supportive environment was encouraged by using, when necessary, compensatory techniques, such as extended time for completion of work, teaming with a partner, or using a calculator, (g) connections between school and the work world were supported by frequent field trips, (h) teachers were assisted in meeting student needs through an average class size of six, (i) the essential role of parents in the learning process was recognized by requiring parents to attend certain school functions, and (j) each class of students was encouraged to take on a community cause, such as collecting money for the needy at Christmas, or for research on AIDS.

The student population of the school ranged from 85 to 95. The average number of students absent each day was four. Seventy-five percent of the teachers were endorsed in special education. The school had a staff of 17 people, of which 11 were teachers. On an average, the teachers had 16 years of teaching experience. To facilitate the coordination of student programs, staff meetings were held twice a week.

Writer's Role

The writer's role at the school included being the school's curriculum director, the chairperson of the math department, and a math teacher.

The job description of the curriculum director was stated as follows:

1. Provide leadership in the development of curriculum and instruction programs to ensure optimal educational experiences.
2. Provide leadership in the development of educational goals and objectives for the school.
3. Plan and assess program transition towards the school's educational goals and objectives.
4. Assist in the research, development, and implementation of Board policies.
5. Provide leadership in the implementation of staff development.
6. Provide curriculum and instructional support on a continuing basis to staff and students.
7. Communicate the school's curriculum and instructional programs to the staff, the students, the parents, and the community.

In the course of the implementation of this practicum, all elements of the above job description were involved. The implementation of this practicum during the 1997-1998 school year involved the writer in developing optimal curriculum and instructional programs in the mathematics department of the school. The writer brought teachers together to finish writing the last 2 years of the school's math standards, which had been started the previous year. The writer held meetings with grade-level teachers to clarify the

new school standards and discuss how they were to be implemented. The writer made recommendations that changed Board policy towards computer distribution with the result that more computers were shared with elementary teachers. The writer planned and implemented all the staff development in the mathematics curriculum review. The writer was available at all times for consultation with staff on curriculum and instruction. Communication of the school's math program was a focus of the writer that involved articles in the parent newsletter and parent activities and meetings.

The writer's duties, as a department chairperson, were to attend administrative meetings once a week, to hold at least one meeting a month with the teachers in their department, to order curriculum materials, to implement the school's goals and objectives in curriculum and instruction, to support teachers in meeting those goals and objectives, and to discuss the program with parents. Since the focus of the curriculum review during 1997-1998 was mathematics, the jobs of curriculum director and math department chairperson often combined.

The third part of the writer's role was as a teacher of a fifth-grade class of students. The importance of this particular role to the practicum implementation was that the teachers knew that the writer understood the problems of teaching learning disabled students and therefore the writer could relate to the curriculum concerns of the teachers that stemmed from teaching learning disabled students.

Chapter II: Study of the Problem

Problem Statement

The elementary and secondary students who were involved in this practicum demonstrated low achievement levels in mathematics.

Problem Description

Mathematics texts were hurriedly adopted for the school, which was created when another school disbanded. This rapid decision process resulted in the adoption of texts without considering many possibilities, piloting a particular text, or providing adequate training for staff in the use of new materials. The school was lacking any professional leadership in the area of mathematics education.

Various sources of frustration were felt by the staff. Discussions with the 3 elementary teachers revealed that they felt the reading level of the text being used was too high for their students. A review of student records showed that the students had an average reading level that was approximately 1.8 grade levels below their grade placement level. As a result, after using the newly purchased texts for about 2 weeks, the staff in grades 1-5 discontinued their use. The 3 elementary teachers also felt that the basal text was inappropriate for their students in terms of computational skills and problem solving. Discussions with each of the elementary teachers indicated that the texts did not provide sufficient practice in computational skills. They also felt that the text did not meet the problem-solving needs of students because (a) the reading level of the text was not appropriate for the students, and (b) the texts did not provide sufficient practice on each problem-solving skill. The 3 elementary teachers also reported low parental support for the mathematics department. The responses of 3 elementary teachers to a questionnaire indicated significant discomfort with the overall mathematics program.

The 4 secondary teachers had differing concerns. Their major complaints were inadequate and unavailability of computer software and a low level of parental support for the mathematics department.

Problem Documentation

To help identify the causes of the problem, information was collected from teachers and students. Questions were asked about the mathematics department, about teacher attitudes towards the mathematics department, and about the teachers' level of confidence in their methods of teaching. This questionnaire was called the Pre-questionnaire, since at the end of the implementation, an identical questionnaire, called the Post-questionnaire, was collected from the staff.

In addition, the students' Woodcock-Johnson Achievement Tests (W-J) were reviewed for mathematics achievement scores, reading level scores, and grade placement levels. The purpose of the mathematics achievement scores was to determine the average yearly change in achievement for the students that were being followed in this practicum. The purpose for the reading level scores and grade placement levels was to determine the difference between a student's reading level and grade placement level.

Teacher pre-questionnaire.

A pre-questionnaire was distributed to all teachers who taught mathematics both during the 1995-1996 school year and the 1996-1997 school years. This consisted of 3 elementary who taught grades 1-5 and 4 secondary teachers who taught grades 6-10. The responses were separated for the two teacher groups. The elementary teacher responses were summarized under a category titled Elementary Math Teacher (EMT), while responses from the secondary group were summarized under a category titled Secondary Math Teacher (SMT). A third category of All Math Teachers (AMT) was formed, which combined the two previous categories.

Questions with a rating scale with a range of 1-10 were given the following data descriptors for their averages: Very dissatisfied meant 1.0-2.7, dissatisfied meant 2.8-4.5, mixed meant 4.6-6.3, satisfied meant 6.4-8.1, and very satisfied meant 8.2-10.

Any questions that had a percentage range, which teachers were to select, such as "0-10%," were given the following data descriptors for their averages: Very dissatisfied meant

0-20%, dissatisfied meant 21-40%, mixed meant 41-60%, satisfied meant 61-80%, and very satisfied meant 81-100%.

Any questions with a rating scale with a range of 1-5 were given the following data descriptors for their averages: Very dissatisfied meant 1.0-1.7, dissatisfied meant 1.8-2.5, mixed meant 2.6-3.3, satisfied meant 3.4-4.1, and very satisfied meant 4.2-5.0. If a question was not answered, the symbol "---" was inserted in the data table.

The pre-questionnaire (see Appendix A) had 32 questions for the staff to answer. The responses to the pre-questionnaire are found in Table 1. After analyzing the data from the teachers, the results indicated the following:

- All math teachers were very dissatisfied with parent participation in the mathematics program.
- The elementary math teachers were very dissatisfied with their training in using computer software.
- All math teachers expressed dissatisfaction with their training in methods of teaching mathematics.
- All math teachers gave a mixed (slightly below average) response for their level of knowledge in using supplementary material.
- The elementary math teachers expressed dissatisfaction with their ability to employ or utilize teaching methods which met student needs.
- The elementary math teachers expressed dissatisfaction with their text's ability to meet the reading level needs of their students.
- The elementary math teachers were very dissatisfied with the ability of their purchased texts to meet students needs on developing computational skills, and they were dissatisfied with the ability of their purchased texts to meet student needs in problem-solving.
- All mathematics teachers were very dissatisfied with the amount of in-service that was provided after texts and manipulatives were provided.

- The elementary math teachers were very dissatisfied with the amount of curriculum materials that were available for comparison during the last curriculum review process.
- The elementary math teachers were very dissatisfied with the amount of curriculum materials that were available to pilot during the last curriculum review process.
- The elementary math teachers were very dissatisfied with having insufficient time to evaluate materials during the last curriculum review process.
- The elementary math teachers were very dissatisfied with the overall mathematics program.
- All math teachers were very dissatisfied with the adequacy of computer software.
- The elementary math teachers were very dissatisfied with the basal text that was purchased in the summer of 1995.
- All math teachers spent an average of close to 3 weeks discussing math textbooks before textbook selection was made in the summer of 1995.
- All math teachers indicated that the average number of parents who participated in the math program was 0.9 persons.

Table 1

Staff Pre-questionnaire Data

	Question Numbers								
Staff	1	2	3	4	5	6	7	8	9
Elementary mathematics teachers (EMT)									
Elementary 1	5	2	22.5	1	8	4	21-30%	5	11-20%
Elementary 2	9	2	22.5	1	3	3	81-90%	1	---
Elementary 3	1	3	27.5	0	3	3	31-40%	7	0-10%
EMT average	5.0	2.3	24.2	0.7	4.7	3.3	44.3-53.3%	4.3	5.5-15.0%
Secondary mathematics teachers (SMT)									
Secondary 1	10	10	45	4	7	12	31-40%	12	31-40%
Secondary 2	3	4	18	0	3	6	21-30%	24	0-10%
Secondary 3	3	7	3	0	2	10	51-60%	2	0-10%
Secondary 4	5	8	20	0	7	10	71-80%	1	0-10%
SMT average	5.3	7.3	21.5	1.0	4.8	9.5	43.5-52.5%	9.8	7.8-17.5%
All mathematics teachers (AMT)									
AMT average	5.1	4.0	22.6	0.9	4.7	6.9	43.9-53.9%	7.4	7.0-16.7%

Note. --- = question was not answered.

Table 1 cont.

Staff Pre-questionnaire Data cont.

Staff	Question Numbers										
	10a	10b	10c	10d	10e	10f	10g	10h	10i	11	12
Elemen. math. teachers (EMT)											
Elementary 1	4	5	4	4	5	4	3	3	3	4	0
Elementary 2	3	5	5	5	5	5	4	2	5	4	0
Elementary 3	4	3	4	4	5	5	4	3	2	5	0
EMT average	3.7	4.3	4.3	4.3	5.0	4.7	3.7	2.7	3.3	4.7	0.0
Second. math. teachers (SMT)											
Secondary 1	5	5	5	5	5	5	5	5	5	5	0
Secondary 2	4	5	5	5	4	5	4	5	5	3	0
Secondary 3	5	1	2	5	5	5	3	3	3	3	0
Secondary 4	4	3	3	4	4	5	3	3	4	4	0
SMT average	4.5	3.5	3.8	4.8	4.5	5.0	3.8	3.5	4.5	3.8	0.0
All math. teachers (AMT)											
AMT average	4.1	3.8	4.0	4.6	4.7	4.9	3.7	3.4	4.1	4.1	0.0

Table 1 cont.

Staff Pre-questionnaire Data cont.

	Question Numbers											
Staff	13	14	15a	15b	15c	15d	15e	16a	16b	16c	16d	16e
Elemen. math. teachers (EMT)												
Elem 1	1	3	0	0	0	0	10	3	3	4	3	5
Elem 2	2	2	2	2	0	0	3	4	4	5	5	3
Elem 3	1	1	0	0	0	0	0	5	5	5	5	5
EMT aver.	1.3	2.0	0.7	0.7	0.0	0.0	4.3	4.0	4.0	4.7	4.3	4.3
Second. math. teachers (SMT)												
Secondary 1	3	1	0	0	0	0	1	---	---	---	---	---
Secondary 2	1	5	4	40	10	0	50	1	1	1	1	5
Secondary 3	1	2	3	3	1	0	1	1	1	4	3	5
Secondary 4	3	4	3.5	1.5	2.5	0	0	2	4	4	4	4
SMT aver.	2.0	3.0	2.6	11.1	3.4	0.0	13.0	1.3	2.0	3.0	2.7	4.7
All math. teachers (AMT)												
AMT aver.	1.7	2.6	1.6	6.5	1.9	0.0	9.3	2.7	3.0	3.8	3.5	3.9

Note. --- = question was not answered.

Table 1 cont.

Staff Pre-questionnaire Data cont.

	Question Numbers								
Staff	17	18	19	20	21	22	23	24a	24b
Elemen. math. teach. (EMT)									
Elem 1	3.5	25	4	4	3	1	3	1	2
Elem 2	2	42	3	2	2	2	3.5	2	1
Elem 3	1	2	5	1	2	1	1	1	3.5
EMT aver.	2.2	23.0	4.0	2.3	2.3	1.3	2.5	1.3	2.2
Secon. math. teach. (SMT)									
Secon. 1	4	80	---	4	4	5	5	4	4
Secon. 2	3	75	3	1	2	2	2	3	2.5
Secon. 3	2	5	5	1	1	3	1	5	3
Secon. 4	1	0	4	4	4	3	4	3	3
SMT aver.	2.5	40.0	4.0	2.5	2.8	3.3	3.0	3.8	3.1
All math. teach. (AMT)									
AMT aver.	2.3	34.0	4.0	2.7	2.6	2.4	2.7	2.9	2.7

Note. --- = question was not answered.

Table 1 cont.

Staff Pre-questionnaire cont.

	Question Numbers							
Staff	25	26	27	28	29	30	31	32
Elem. math. teach. (EMT)								
Elem 1	0	1	3	0	4	1	1	1
Elem 2	0	1	3	0	4	1	1	1
Elem 3	0	1	2	0	3	2	1	1
EMT av.	0	1.0	2.7	0.0	3.7	1.3	1.0	1.0
Sec. math. teach. (SMT)								
Second. 1	0	1	0	0	4	4	1	2
Second. 2	0	1	3	1	3	3	4	3
Second. 3	0	1	4	2	2	3	3	2.5
Second. 4	0	1	4	2	2	4	4	3
SMT av.	0	1.0	2.8	1.7	2.8	3.5	3.0	2.6
All math. teach. (AMT)								
AMT av.	0	1.0	2.7	0.7	3.1	2.6	2.0	1.9

Change in student achievement scores

Mathematics achievement data was collected for all students who had taken the Woodcock-Johnson Achievement Test (WJ) in both 1995 and 1996, a total of 23 students. The records of these 23 students were then checked for earlier WJ scores. Fourteen of the 23 students had WJ scores from both 1993 and 1994 and 19 of the 23 students had WJ scores from both 1994 and 1995. The 23 students, for whom the writer originally collected data, decreased to 21 by the spring of 1997, due to 2 students withdrawing from the school. The data in the 1996-1997 column in Table 2 below was collected for these 21 students. Results listed indicate the average yearly change in mathematics achievement, where a +1.0 means an increase of 1 grade level in mathematics achievement on the WJ.

The data indicates a consistent decline in student achievement. During the year of 1996-1997 student achievement gains were close to one-third of the gains of 1993-1994.

Table 2

Change in Mathematical Achievement 1993-1997

	Time Period			
Characteristic	1993-1994	1994-1995	1995-1996	1996-1997
Average change in grade-level achievement in mathematics	+0.90	+0.66	+0.40	+0.31

Student reading scores.

All 23 students were given a Reading-Placement Difference Value which represented the difference in their Broad Reading Level score on the WJ and their Grade Placement Level. The results are listed in Table 3 below. In short, the Reading-Placement Difference

Value indicated whether a student's reading level was above or below the student's placement level.

Although the reading level of all elementary students was closer to their grade placement level than the secondary students, the overall small number of elementary students prohibited such a generalization for the entire school. However, the data suggested that curriculum materials must be chosen with the students' reading level carefully in mind. If a student's reading level is 2 years below their grade placement levels, then teachers should be advised to begin topics with curriculum materials closer to their reading level. Thereafter materials closer to grade placement levels were advised.

Table 3

Average of Reading-Placement Difference Values

	Categories of Students		
Characteristic	Students gr. 1-5	Students gr. 6-10	All students
Average of students Reading-Placement Difference number	-1.2 (5 students)	-1.9 (18 students)	-1.8 (23 students)

Causative Analysis

The problems of the math department appeared to be caused by the following: a poor match between the reading levels of students and texts, a shortened curriculum review process, inadequate staff training, low confidence of teachers in their teaching methods, low parent involvement, and minimal support in using supplementary materials and technology.

The elementary text did not meet students' needs in terms of reading level, computational skills, and problem solving. The teachers believed that the reading level of

the purchased texts did not match the reading level of the students. Records of students suggested they had an average reading level which was 1.8 grades below their grade placement level. The elementary teachers also believed that the purchased text did not meet student needs in terms of computational skills or competencies in problem solving.

The curriculum adoption process was limited in terms of leadership and resources. The staff of the school did not have a member with an academic background in mathematics to serve in a leadership or resource capacity. The text adoption process was handicapped by insufficient time to consider the merits and consequences of various basal text choices. The teachers stated that 4 weeks was the longest amount of time that was spent discussing the texts. Only the secondary teachers reported piloting any texts before selection. Selecting and purchasing curriculum materials was just one of many essential jobs that had to be completed before the school opened.

The staff was not provided with any training on how to use the purchased texts and manipulatives. However, they considered such training to be important.

The staff had low confidence in their teaching methods to meet the mathematical needs of students. The elementary teachers expressed the greatest lack of confidence.

The parents had only a limited involvement in the mathematics program. The one way that parents were involved in the mathematics program was through class projects in which both parents and students worked cooperatively.

The staff was not given adequate support in the area of supplementary materials. All math teachers expressed doubts about their knowledge in using supplementary materials.

The staff was not given adequate support in the area of technology. The teachers did not feel that they had sufficient computer software. Neither did they feel knowledgeable about using computer software. Of the two groups, the elementary teachers indicated the greatest need for technology training.

Probable causes for low student achievement scores were (a) curriculum that did not meet student needs in terms of reading level, computational skills, and problem solving (b)

a curriculum adoption process that was limited in terms of leadership and resources, (c) a failure to provide training in using purchased texts and manipulatives, (d) low confidence of the teachers in their methods of teaching mathematics to meet student needs (d) inadequate support for staff in the area of supplementary materials, (e) inadequate support for staff in the area of technology, and (f) parents who were uninvolved in the mathematics program.

Relationship of the Problem to the Literature

All components of the problem--curriculum with inappropriate reading level, the absence of instructional leadership, inadequate funds, insufficient staff training, limited technological resources, minimal parent involvement--were represented by the literature.

In a study on the island of Kauai, Werner and Smith (1992) reported that half of all school failures by age 10 could be attributed to reading deficiencies. In addition, the authors said that, by age 10, 20% of this population had developed serious learning problems.

The fact that half of the school failures by age 10 on the island of Kauai were due to reading problems raised the question as to the extent of the reading problem at the school. To answer this question, the writer researched student data for reading and mathematics achievement scores. Since students at the school were similarly behind grade level in math and reading achievement, then the school data appeared to support the conclusion of the Kauai study.

Certain factors may have prevented LD students from progressing from ability-level reading materials to age-level materials. This was a conclusion of Tama and Martinez (1986). The authors evaluated research on reading comprehension and learning disabilities conducted from 1980-1985. Two factors they identified were (a) failure by the teacher to teach comprehension through readiness strategies and (b) failure of the teacher to provide students with experiences using ability-level materials, during initial learning stages.

It is not clear whether the two factors that Tama and Martinez mentioned were significant influences at the school. In the 2 years the writer visited math classes at the school, he only observed 2 math lessons that involved reading readiness strategies; however, approximately one out of five of the math lessons he observed used some ability-level materials.

Failure to develop consensus in committing resources is a common problem in any new school initiative (Turnbull, 1984). The author maintained that failure to develop consensus on commiting resources often resulted in conflict over priorities.

Committing necessary resources related strongly to the problem at the school, especially the lack of resources during the summer of 1995. Insufficient time was devoted to evaluating texts. Teachers reported spending between 2 and 4 weeks evaluating mathematics texts. Also, no one with a mathematics background was available to help direct the process. Therefore, the commitment of resources was a major problem.

Two common problems of staff training programs were (a) lack of commitment to continuous planning, and (b) lack of commiting adequate resources in terms of people and money (Dillon-Peterson, Greenawald, 1980). The authors identified characteristics associated with both the success and failure of staff development programs.

The writer's first concern, commitment to continuous planning, was addressed by the school during the 1995-1996 year. In the beginning of that year, an Education Committee was formed to direct all curriculum and staff planning. The author's second concern, commitment of resources, was a problem at the school. When starting the school, both time and money were in short supply. No funds were available for outside speakers. However, when a teacher had expertise that other teachers needed, then that teacher was asked by the principal to give an informal workshop.

Failure to maximize use of computers in schools was explored by Bork (1995). His work suggested the following technology problems: (a) too much emphasis on hardware, (b) poorly written software, and (c) poor training of teachers. Bork believed that the undue

emphasis on hardware was partly due to computer vendors. Bork believed that staff training is often equated with just giving lectures to teachers.

The first factor, too much emphasis on hardware, does not apply to the school. Since all hardware at the school was donated, no funds were diverted to purchase either software or hardware. The second factor, poorly written software, may be a factor in low computer usage at the school. Since LD students need software that is both interesting and easy to use, they may choose to ignore software programs that do not have both these characteristics. The third factor, poor training of teachers, does apply to the school. When mathematics texts were purchased, no money was available to pay for any in-service training.

In the process of writing a comprehensive guide about programs for LD students in the state of Wisconsin, O'Donnell (1994) stated that cost must be mentioned in any discussion of technology. Although many of the problems of LD students can be addressed through technology, he stated that cost is a significant impediment to the implementation of appropriate programs.

The problem that O'Donnell mentioned, cost, was of paramount importance in the school. The school had no budget for software during the 1995-1996 school year. Fortunately, the school received donations of basic programs for word processing, spreadsheets, and typing.

The problem of parents' participation in schools was discussed by Fruchter (1984). He listed the following five inhibitors to parent participation: (a) parents who are under pressure for economic survival, (b) school control of structures for parent participation, (c) cultural differences between school and home, (d) parents' lack of knowledge about the causes of student failure, and (e) parents' lack of knowledge about ways to redress student problems. Fruchter believed that schools are often fearful of parent activism.

For the following reasons the first two inhibiting factors listed above did not apply to the school: (a) Parents had sufficient resources to pay for tuition to the school, and (b)

parents had complete control of the school through the school board that they elected. The third factor, cultural differences between the school and the home, was not likely to be a factor at the school since parents were free agents in choosing the school for their child. The effects of the last two factors above, (d) and (e), were more difficult to evaluate. The following three reasons would tend to minimize their effects: (a) The parents had their child evaluated for disabilities before they entered the school, (b) small class size allowed the teacher to know each student well, and (c) teachers were under pressure from administration to maintain close contact with parents.

Frymier (1992) discussed the results of the Phi Delta Kappan Study of Students at Risk. This study collected data on 21,000 students in grades 4,7, and 10 to determine factors associated with failure to graduate from high school. Starting with 45 possible risk factors, the data confirmed the following five indicators of failure: (a) emotional problems or physical disability, (b) academic failure, (c) family socioeconomic status, (d) family instability, and (e) family tragedy.

The first two factors above, (a) and (b), were good descriptors of most of the school's student population. All of the students had learning-disabilities, and most of them came to the school with a history of academic problems in a previous school. The remaining three factors were not likely to relate to most of the students at the school.

In an article that called for additional help for LD students, De Bettencourt and Zigmond (1990) discussed risk factors for LD students. Their study identified the following as significant risk factors: (a) absenteeism, (b) discipline problems, and (c) low grades. They also reported the following: (a) Absenteeism is significantly related to school drop-out rates, (b) many employers are more concerned about good attendance than about grades, and (c) a major cause of discipline problems was the lack of school survival skills, such as bringing a pencil or paper to class. Because of patterns of consistent low grades, the authors had doubts as to how much LD students were learning in required classes. The connection of absenteeism with learning disabilities was also mentioned by Donahoe and

Zigmond (1990). These researchers studied 86 LD students in attempting to determine which variables differentiated the LD students who passed from those who failed. When looking at intelligence, reading level, and absence rates, they found that only absence rates distinguished those who passed from those who failed.

At the school, the first factor, absenteeism, was a problem for some of the students. Students may have a poor attitude towards school because of a history of academic failure. As a consequence, they may have found excuses for not attending school. The second factor, discipline problems, did not relate to the school because the school did not accept students with behavior disorder or with a history of significant discipline problems. The third factor, low grades, properly described most of the students at the school. To a large extent, this school existed because parents were dissatisfied with their children's academic progress at other schools.

Montague and Applegate (1993) compared LD students with their normal achieving peers to determine differences in problem-solving skills. The results indicated that LD students lacked information on preliminary problem-solving strategies, such as paraphrasing and visualizing, which allowed students to interpret, process, and represent information. These processes were essential before students could be expected to select correct solution strategies. The authors found two factors, knowledge of mathematical concepts and computational skills, to be predictors of problem-solving ability in LD students. Other than using concrete objects to solve problems, the researchers were not optimistic about the developmental appropriateness of higher-level abstract reasoning for upper-elementary students with learning disabilities.

The textbook series that was purchased in the summer of 1995 for the elementary grades stressed abstract reasoning. This may have been a factor in its lack of success in the elementary grades. None of the elementary teachers at the school emphasized paraphrasing, although they made efforts to visualize story problems.

In summary, the literature discussed various components of the problem. Failure to develop consensus in committing necessary resources is a common problem in any new school initiative. Poor training of teachers and the high cost of hardware and software often lead to underuse of technology. A significant risk factors for LD students is absenteeism. Problem-solving may be difficult for LD students since they lack preliminary problem-solving strategies, such as paraphrasing and visualizing.

Chapter III: Anticipated Outcomes and Evaluation Instruments

Goal and Expectation

The goal of this practicum was that the students would demonstrate an average of at least 1 year of growth in mathematical achievement.

Expected Outcomes

The following outcomes were projected for this practicum:

1. The 3 elementary teachers will respond an average between 3.4 and 4.1 on a 1-5 Likert Scale that the reading level of the mathematics texts is appropriate.
2. The 3 elementary teachers will respond an average between 3.4 and 4.1 on a 1-5 Likert Scale that the mathematics texts meet student needs in computation and problem-solving skills.
3. The 3 elementary teachers will respond an average at least 4.2 on a 1-5 Likert Scale that sufficient time was allocated to evaluate mathematics materials.
4. The 3 elementary teachers will respond an average of at least 4.2 on a 1-5 Likert Scale that sufficient mathematics materials existed to compare.
5. The 3 elementary teachers will respond an average of at least 4.2 on a 1-5 Likert Scale that sufficient mathematics materials existed to pilot.
6. The 3 elementary teachers will respond an average of at least 4.2 on a 1-5 Likert Scale that sufficient in-service was provided for using the purchased texts and manipulatives.
7. The 3 elementary mathematics teachers and the 4 secondary teachers will respond an average of at least 4.2 on a 1-5 Likert Scale that the curriculum review process met the needs of both students and teachers.
8. The 3 elementary teachers and the 4 secondary teachers will respond an average of at least 4.2 on a 1-5 Likert Scale that their methods of teaching mathematics met student needs.

9. The 3 elementary teachers and the 4 secondary teachers will respond an average of at least 4.2 on a 1-5 Likert Scale to indicate their level of knowledge in using computer software in the teaching of mathematics.

10. The 3 elementary teachers and the 4 secondary teachers will respond an average of at least 4.2 on a 1-5 Likert Scale to indicate their level of knowledge in using supplementary materials in the teaching of mathematics.

11. The 3 elementary mathematics teachers and the 4 secondary mathematics teachers will respond an average of at least 4.2 on a 1-5 Likert Scale to indicate their level of satisfaction with parent participation in the mathematics program.

12. The students will demonstrate at least 1 year of mathematical growth as measured on the Woodcock-Johnson Achievement Test in 1998.

Measurement of Outcomes

The evaluation procedure that the writer selected was a post-questionnaire that was similar to the pre-questionnaire. The post-questionnaire contained the same information as the pre-questionnaire with the dates changed. The pre-questionnaire was a written survey that was distributed to teachers and collected from them just prior to implementation. The post-questionnaire was administered during the 31st week of the implementation. The staff was given a week to complete the post-questionnaire.

Expected outcomes, numbers 1-11, were assessed by comparing the data collected on the staff pre-questionnaire with the data collected on the post-questionnaire. Each expected outcome is first summarized, and then the specific data is compared.

Outcome # 1 was concerned with increasing teacher confidence in the readability of the elementary mathematics textbooks. It was assessed by comparing the responses of the 3 elementary teachers to question # 23 on the pre- and post- versions of the questionnaire.

Outcome # 2 dealt with increasing teacher confidence that elementary texts met student needs in computational skills and problem-solving. It was assessed by comparing the

responses of 3 elementary teachers to question # 24 on the pre- and post- versions of the questionnaire.

Outcome # 3 focused on increasing the satisfaction of elementary teachers with having adequate time to evaluate mathematics materials. It was assessed by comparing the responses of the 3 elementary teachers to question # 32 on the pre- and post- versions of the questionnaire.

Outcome # 4 focused on increasing the satisfaction of elementary teachers with having sufficient curriculum materials to compare. It was assessed by comparing the responses of the 3 elementary teachers to question # 30 on the pre- and post- versions of the questionnaire.

Outcome # 5 focused on increasing the satisfaction of elementary teachers with the quantity of curriculum materials that were available for them to pilot. It was assessed by comparing the responses of the 3 elementary teachers to question # 31 on the pre- and post- versions of the questionnaire.

Outcome # 6 was concerned with increasing the satisfaction of the elementary teachers with the amount of in-service that was provided for using the purchased texts and manipulatives. It was assessed by comparing the responses of the 3 elementary teachers to question # 26 on the pre- and post- versions of the questionnaire.

Outcome # 7 was concerned with increasing the confidence of all mathematics teachers in the curriculum review process. It was assessed by comparing the responses of all 7 mathematics teachers to question # 17 on the pre- and post- versions of the questionnaire.

Outcome # 8 focused on teachers increasing their confidence in their methods of teaching mathematics. It was assessed by comparing the responses of all 7 mathematics teachers to question # 21 on the pre- and post- versions of the questionnaire.

Outcome # 9 was concerned with increasing teachers' knowledge of using computer software to teach mathematics. It was assessed by comparing the responses of all 7 mathematics teachers to question # 14 on the pre- and post- versions of the questionnaire.

Outcome # 10 dealt with teachers increasing their knowledge of supplemental materials. It was assessed by comparing the responses of all 7 mathematics teachers to question # 20 on the pre- and post- versions of the questionnaire.

Outcome # 11 was concerned with teachers increasing their level of satisfaction with parent participation in the mathematics program of the school. It was assessed by comparing the responses of all 7 mathematics teachers to question # 13 on the pre- and post- versions of the questionnaire.

Outcome # 12 focused on the students achieving a gain in mathematical achievement. It was assessed by comparing the yearly change in mathematics achievement on the Woodcock-Johnson Achievement Test between 1997 and 1998 with the yearly change in mathematics achievement from 1996 to 1997, which is found in Table 2 (see page 13). By the fall of 1997, the number of students who were involved in this practicum dropped from 21 to 19, which was due to 2 students withdrawing from the school. These 19 students continued to be enrolled in the school through the spring of 1998.

Chapter IV: Solution Strategies

Statement of the Problem

The problem to be solved in this practicum was that the students demonstrated low achievement levels in mathematics.

Discussion and Evaluation of Solutions

The research to address the practicum problem identified above was focused in the following six areas: (1) the staff--the effects of staff development on student achievement, and the ways to increase teacher involvement in solving school problems, (2) the parents--the effects of parent involvement upon student achievement, and the factors that affect parent involvement, (3) the students--the learning problems of LD students, and the mathematical deficits of LD students, (4) the curriculum--curriculum standards and the role of technology in curriculum, (5) teaching strategies--methods to enable the teacher both to plan effective teaching and to select appropriate curriculum materials, and (6) problem-solving--identifying programs for teaching problem-solving skills to LD students.

The staff.

Research in the area of staff focused on staff development and on staff involvement in decision-making. This area related to the solution of the problem of low student achievement, since several studies have shown that staff development directly affects student achievement. Also, staff are more likely to support school-wide efforts to solve problems if they have been consulted in creating the solution.

Several studies linked increased student achievement to staff development. Gall (1984) conducted research to determine the effect on student mathematics achievement when principals were involved in staff development. He found that students in the classes of the principal-involved groups outperformed the students in the classes of the nonprincipal-involved groups. Gall also identified the following nine leadership roles through which principals facilitate in-service development: (a) Principals act to set priorities, (b) they help acquire necessary in-service resources, (c) they monitor in-service progress, (d) they

encourage staff compliance, (e) they teach the participants, (f) they articulate school policy, (g) they help assess in-service training, (h) they foster home-school relations, and (i) they encourage the continuance of in-service practices after the training has been completed. Staff training increased the achievement scores of primary students in mathematics. This conclusion was reported by Wesson (1992). In this study, staff training focused on the use of manipulatives and problem-solving. Staff development that related to classroom experience increased student achievement. This was a conclusion reached by the Office of Research, Evaluation, and Assessment of the New York City Board of Education (1991). According to this study, in order to have lasting effects on student achievement, staff development must meet the following standards: (a) Staff development must be directed toward helping students reach their potential, (b) it must encourage staff discussion and peer coaching, and (c) it must become a central mission of the schools.

Roy (1995) stated that, in order for schools to address their problems, the staff must be involved in both the setting of goals and the implementation of the goals. Roy said that change is more likely to happen when those who are closest to the problem help to create the solution. He indicated that when teamwork or staff-acceptance are important, then decisions should be made by consensus.

The National Adult Basic Education Staff Development Consortium (1987), to be called subsequently the National Adult Consortium, published guidelines for staff development. Following are four characteristics that the National Adult Consortium indicated were associated with successful in-service: (a) The school has a positive climate for staff development, (b) teachers have a chance to evaluate the in-service training (c) teachers are used as resources during in-service training, and (d) teachers are given the opportunity to discuss ideas in small groups.

The parents.

The involvement of parents in schools has an affect on student achievement. Parent involvement is affected by the following: parents' attitudes toward the schools, events that schools scheduled for parents, opportunities to help their child, and opportunities for decision-making.

Increased mathematical achievement was reported by Brodsky (1994) for students who attended a series of after-school workshops with their parents. Brodsky indicated that the parents who attended the workshops reported a higher involvement rate with their child's school. The workshops consisted of three or more evening meetings that lasted 2 hours. The workshops were enjoyable and they stressed conceptual development and problem-solving strategies.

Bruneau (1988) stated that mildly handicapped students benefit academically from parents working with their child on mathematics. She continued by saying that the mildly handicapped have difficulty making generalizations and that bringing mathematics into the home helps them develop the needed generalizations. She also reported that mathematics achievement was related to parental involvement in their child's education. She believed that learning activities at home should be informal and fun, and that they should engender a positive attitude toward school.

Goldstein and Campbell (1991) reported that high-risk elementary students were achieving at grade level in mathematics after 3 years as a result of being provided with high levels of school-home interaction However, the children in the control group, who were comparable except that they did not receive the school-home treatment, were on the average 0.5 year behind in mathematics achievement. The researchers listed the following eight tenets of home learning activities: (a) Target the pupils who might benefit from supplementary work and individually call their parents, (b) provide practice on a previously learned skill rather than expect the parents to teach a new concept, (c) use activities that promote success, (d) provide written instructions with all work, (e) supply the materials,

(f) furnish activities that only take a limited time, (g) ask for parents' opinion on the activities, and (h) be aware of parents who may feel burdened by frequent home lessons.

Solomon (1991), in a report on California's Policy on Parent Involvement, stated that parents frequently requested learning activities that involved both the parents and the child. He also stated that students in Catholic private schools out-performed comparable public school students, in part, because of the home-school relationship that existed in Catholic schools. Solomon believed that parent involvement was helpful in the following two ways: (a) in promoting learning activities in the home and (b) in acquainting the teacher with the extent of the child's learning in each curriculum area.

Davies (1991) suggested determining the attitudes of school staff towards the involvement of parents in schools and then using this information to design programs that would involve the parents. Davies identified the following three different types of parent involvement in schools: the involvement of parents as school volunteers, the involvement of parents in activities at home that foster learning, and the involvement of parents in school in advocacy and decision-making roles.

"Parental involvement" suffered from a significant perceptual problem according to Crispeels (1991). In her article on San Diego's policy on parental involvement, Crispeels said that teachers view parental involvement as helping their child with homework, parents view parental involvement as parents being welcomed into the classroom, and administrators view parental involvement as parents who are willing to help on school advisory committees. She reported that the California Policy on Parental Involvement emphasized that parents were partners in governing the schools, and that parents should be involved in both advisory and decision-making capacities.

O'Connell (1992) recommended that parents be paired with their child in problem-solving activities from school. Her recommendation was based on research that found that students who problem-solved with another person increased their time-on-task. O'Connell

suggested giving parents a mini-course on the types of mathematics problems encountered at school and on ways the parents could probe their child's thinking.

The students.

The research that was centered on LD students focused on three areas: student attitudes, learning problems of LD students, and mathematical deficits of LD students.

The ability of attributional training to improve students' academic success was discussed by Fulk and Mastropieri (1990). The goal of attributional training was to associate success with effort. The authors stated that unsuccessful students attribute both failure and success to reasons that are beyond their control, such as not having sufficient intellectual ability. To reach the goal, Fulk and Mastropieri used the following instructional sequence with unsuccessful students: (a) The value of associating outcomes with effort was stressed, (b) the students were taught to accept failure as a normal stage of learning, and (c) students were reminded to accept responsibility for success.

Chard and Kameenui (1995) identified the general learning problems of LD students and their remediation. These included the following: (a) difficulty remembering material covered in instruction, which can be remediated by increasing the number and complexity of associations with the concept, (b) poor use of strategies in problem-solving, which can be remedied by explicit strategy instruction and by developing a higher level of automaticity in using basic operations, (c) difficulty maintaining attention, which can be remediated by analysis of the appropriateness of the difficulty level of tasks that are demanded of the LD student, (d) learning at a slower rate than their peers, which can be remediated by activation of prior learning, (e) language performance that is below normal, which can be remediated by accurate, explicit instruction, especially when introducing new concepts and (f) poor motivation, which can be improved by a history of student success.

A significant difference between the learning rates of LD students and the mildly retarded was reported by Parmar, Cawley, and Miller (1994). They showed that students who were learning-disabled showed steady intellectual growth, whereas the mildly retarded

showed little growth. The researchers believed that the difference between LD students and the mildly retarded was significant enough to warrant different teaching environments for both groups.

O'Donnell (1994) determined the following nine mathematical deficit areas and identified a remedy for each: (a) Memory deficits can be remediated with memorization techniques, (b) spatial relationship deficits can be remediated with experience with manipulatives, (c) perception deficits can be remediated by simplifying directions and by repeating the instructions, (d) language deficits can be remediated by instruction in that area, (e) reading deficits are also remediated by instruction in that area, (f) cognition deficits can be remediated by proper diagnosis and by the teacher recognizing the natural limitations of the student, (g) metacognitive deficits can be remediated by direct instruction of metacognition, (h) attitude problems can be remediated by learning experiences that are challenging, yet provide the student with a positive experience, and (i) inadequate prior learning deficit can be remediated by reteaching what was not learned.

Meyers and Burton (1989) stressed remediation for four kinds of learning deficits: visual, auditory, kinesthetic, or reasoning. To compensate for visual deficits they recommended using grids when writing numbers, allowing calculators, and asking students to rephrase procedures in their own words. To compensate for auditory deficits they recommended using concrete objects, encouraging students to tape record lectures, and having the teacher check for understanding before assigning homework. To compensate for kinesthetic deficits, they recommended not emphasizing neatness, having models adjacent to the student while working problems, and utilizing physical objects or having the child move about the class. To compensate for reasoning deficits they recommended teaching in small steps, encouraging the use of manipulatives, and teaching children to estimate answers.

The curriculum.

The research on curriculum covered the areas of curriculum standards, and the role of technology in curriculum.

Parmar and Cawley (1995) proposed that standards be established for LD students, which were different from those for non-LD students. The researchers believed that the standards which were published by the National Council of Teachers of Mathematics (NCTM), called the Curriculum and Evaluation Standards for School Mathematics (NCTM, 1989), did not address the needs of LD students. Furthermore, the researchers did not believe that it was possible for one set of standards to adequately serve the needs of all students. The researchers recommended increased instructional time in geometry, measurement, and statistics, since these topics represent a large part of the mathematics of everyday life.

Parmar was also involved in an effort to paint an outline of new standards for LD students. Following are the recommendations on standards for LD students by Parmar, Cawley, and Miller (1994): (a) Focus on real-world concepts, (b) stress basic concepts, but not computational development after the age of 14, (c) begin instruction with problem-solving and introduce computation as a means of solving problems, (d) a spiral development of concepts must provide sufficient massed practice before the student moves to a new topic. Spiral development means that a curriculum introduces a topic in one lesson and takes the concept further in subsequent lessons. Mercer and Miller (1992) noted that high, attainable goals lead to higher achievement than having lower, easily attainable goals.

Technology held much promise for LD students. Two promising areas were multimedia and videodisc. Multimedia referred to combining various types of media, such as video, text, or animation. If the presentation of the various forms of media was controlled by a computer, then the result was specifically called hypermedia. Henceforth, the term multimedia will refer to both multimedia and hypermedia.

Multimedia has greatly expanded the potential of mathematics instruction (Babbitt & Miller, 1996). It increases the variety of media that can be presented; it allows nonsequential learning; and it supports interactive learning, where the student is in control. All these characteristics benefited the LD learner. The researchers stated that multimedia supported cognitive strategies, such as metacognition. The computer could be directed by the student to read a particular passage, or the computer could prompt a student to think out loud, or to look at a particular clue on the screen. The computer could also fade the prompts over time. The researchers warned, however, that the complexity of multimedia may be a problem for LD students.

Two research teams used videodiscs to teach problem-solving. Teaching with videodisc was very similar to using multimedia, except that the student had fewer chances to interact with the program. The teaching presentation consisted of multimedia lessons that were recorded on a videodisc, which looked like a long-play record. For a lesson the videodisc was inserted in a player, and then the image was projected on a screen in the front of the room. The teacher walked around the class, monitored student activity and controlled the lesson with a remote device.

Moore and Carnine (1989) used a videodisc presentation for the experimental group in a study of two types of secondary mathematics curricula. The control group used a basal text, and the class was taught by a teacher assisted by an aide. The experimental group studied a curriculum that matched the length and content of the control group, but stressed explicit teaching of strategies and a wider range of examples. The experimental group had a single teacher and the videodisc, but no aide. The results showed a significant gain in achievement for the experimental group. The teacher of the control group felt that the assistance of the aide was essential to be able to cover as much material as the experimental group that used videodiscs. As a result, the researchers concluded that videodisc presentation was a cost-effective way of teaching mathematics.

Since instruction was narrated on the videodiscs, students who were poor readers were not hindered. This was the conclusion of Woodward (1995) in an article on research relating to the teaching of mathematics to LD students. He also stated that videodisc facilitated group instruction, since the teacher was in control of the videodisc player from anywhere in the room. Woodward believed that the videodisc used in this way was a comprehensive form of teaching, and that it worked best for computational skills and well-defined concepts. For more open-ended problem solving he favored anchored instruction supported by videodiscs. This form of instruction immersed the students in a problem-solving situation by showing video clips that clearly described the problem setting. After showing the videodisc, the teacher led the group in discussions of possible solutions, and later turned his leadership role over to the students.

Teaching strategies.

Knowledge of effective teaching strategies for LD students was an essential element that enabled teachers both to plan effective teaching methods and to select appropriate curriculum materials.

Chard and Kameenui (1995) proposed the following general strategies for teaching LD students: (a) Smaller concepts should be organized into larger concepts, (b) the explanation of strategies must include the teaching of when and under what conditions strategies are to be applied, (c) gradual reduction of teacher assistance, called mediated scaffolding, should be used to bridge between initial learning and self-directed learning, (d) new knowledge should be integrated with old knowledge, (e) background knowledge should be activated prior to the introduction of new learning, and (f) review--which is sufficient, cumulative, varied, and distributed over all previously taught concepts--should be provided to students.

The research team of Mercer and Miller (1992) identified several types of coordinated strategies for learning basic mathematical facts. First, they stated that higher student achievement is related to the following assessment strategies: frequency of assessment, the resulting modification of instruction, and the quality of feedback. Next, they advocated the

concrete-representational-abstract sequence of teaching concepts. Finally, the authors emphasized the continued use of demonstration, guided practice, and independent practice, as well as the use of advance organizers. In addition, the authors suggested that practice for mastery should be facilitated with games that students enjoy.

Many textbooks for LD students used programs of direct instruction. This method of teaching consisted of scripted lessons where teachers asked questions and the class answered or acted in unison. The purpose of direct instruction was to keep students' attention focused. In contrast, traditional instruction expected students to do more listening and to work independently. Wilson and Sindelar (1991) reported that direct instruction in mathematics was superior to traditional methods in the teaching of addition and subtraction facts. In addition, they concluded that teaching explicit strategies improved learning. They also felt that students would retain their skills longer if problems were sequenced according to type.

Active-learning experiences and the use of manipulatives have often been used to address the needs of LD students. Fox and Thompson (1994) discussed the active-learning approach of the Lab School of Washington. They reported that the school first diagnosed the functional level of the child and then determined the student's interest areas. With this background they developed appropriate learning materials for each child. Children were then allowed to learn through exploration and through using manipulatives. The school integrated art and writing into all academic areas.

Burns (1996) recommended that manipulatives be used to support the existing curriculum. She suggested that they should be available at all times to assist students in reasoning, or to check their work. She advised introducing one type of manipulative at a time, and letting the children become accustomed to its use before introducing a second type of manipulative. To avoid conflict between various departments and teachers, she advocated coordination at the school district level as to when certain manipulatives should be introduced.

Land and Edwards (1994) reviewed the literature relating to the teaching of mathematics to LD students. Their search suggested that teachers should use an active learning style with LD students. They defined active learning as either the individual use of manipulatives, or as a group activity. In addition, they suggested close communications between home and school.

Active involvement of students was identified as a goal of mathematics education by the Mathematical Sciences Education Board (1990). This board advocated using varied activities, such as cooperative learning in small groups, investigational work, or reciprocal teaching. In reciprocal teaching, students take the role of the teacher and ask questions and summarize or clarify the thoughts of other students.

Much of the research on mathematics education for LD students focused on learning basic facts. Mercer and Miller (1992) conducted research on how best to teach LD students to acquire, to understand, and to apply basic mathematical facts. The researchers used the following instructional sequence from the Strategic Mathematics Series (Mercer & Miller, 1991): (a) administer a pre-test, (b) teach a concrete application of the concept, (c) teach a representational application of the concept, (d) introduce a specific problem-solving strategy, (e) teach an abstract application of the concept, (f) administer a post-test, and (g) provide sufficient practice to develop fluency. Their results confirmed that LD students can learn, can understand, and can apply basic mathematics facts.

Bierne-Smith (1991) found that counting-on was a superior teaching technique for low-achieving students. "Counting-on" means that, rather than having students memorize the addition fact, such as 9+2=11, students can progress faster by starting the counting process with 9, then utilizing the 2 by counting the next two numbers, 10, 11.

Van Houten (1993) studied the teaching of subtraction facts to LD students. He concluded that rule recitation produced a significant increase in learning. Rule recitation means that a student recites the rule while performing the mathematical step.

In addition, the following researchers made suggestions about a variety of teaching techniques. Fulk (1992) advocated the use of the following three teaching strategies with LD students: goal-setting, demonstration, followed by the creation of a permanent model for the student, and the development of inner speech, also called self-instruction. This latter technique is taught using the following procedures: (a) While saying the steps to a procedure, the teacher performs the procedure, (b) the student emulates the task, while the teacher recites the steps, (c) the student does the task while softly speaking the self-instructions, and (d) the student carries out the task while silently saying the instructions.

Woodward and Howard (1994) made the following suggestions on teaching strategies: (a) teachers should use a variety of representational methods in teaching mathematics, (b) students should go over fewer problems carefully, and (c) misconceptions are resilient to more practice. This last idea meant that if a student did not know how to perform an operation, then more practice of the same kind was not profitable. Instead, the teacher needed to evaluate the student to determine the type of learning problem and then determine appropriate remediation.

Kaluck (1993) stated that the frequency with which a fact was presented was important in developing automaticity. In a similar vein Mercer and Miller (1992) believed that once an understanding of a particular skill was achieved, then instruction for mastery was important. Mercer and Miller advised teachers to create an atmosphere in the classroom that tolerated errors, but that rewarded the correction of errors.

Thornton (1991) believed that for the less assertive student, "think-tell-share" is a task that a LD student could perform. "Think-tell-share" means that a student first thinks about what has been studied, then tells it to a neighbor, and then shares it with the class. The author also provided an appendix about teaching to different modalities.

O'Donnell (1994) advocated diagnostic teaching. This method used a variety of teaching strategies to identify a student's learning style Once a student's learning type had

been established, the teacher needed to tailor learning experiences for that student that incorporate elements of the identified style.

Land and Edwards (1994) and Fulk (1992) gave advice on using rewards. They suggested that since LD students seldom engaged in appropriate behavior, then using physical rewards to promote the desired behavior might be necessary. They pointed out that the rewards could be removed later. Examples of rewards were praise, star charts, awards sent to parents, or physical rewards, such as food or entertainment.

Land and Edwards (1994) advised the use of peer tutoring and response-cost. They found that response-cost, a combination of both positive and negative feedback, produced greater student compliance than either positive or negative feedback alone.

More and Carnine (1989) suggested using small teaching steps with LD students. They also suggested using a wide range of examples when teaching LD students.

Problem-solving.

This area related to the problem since knowledge of effective problem-solving would assist teachers in selecting appropriate curriculum materials, and knowledge of effective problem-solving is central to student success in mathematics.

The following programs were designed to teach problem solving to LD students. Montague and Bos (1996) developed a program to teach problem-solving using an eight-step procedure. This procedure improved the ability of LD students to solve verbal problems. The procedure consisted of the following steps: (a) reading the problem out loud, (b) restating the problem out loud, (c) displaying the information graphically, (d) identifying the important information in the problem, (e) describing the types of operations to be used, (f) estimating the answer, (g) calculating the answer, and (h) checking the answer.

Case, Harris, and Graham (1992) also designed a program to teach problem-solving skills to LD students. First, this program required each student to memorize a sequence of five strategy steps. Next, the students were given guided practice solving word problems

using those strategy steps. Finally, students practiced solving word problems independently. The Case, Harris, and Graham five-step strategy that was mentioned earlier consisted of the following steps: (a) read the problem aloud, (b) identify critical words, (c) visually represent the information, (d) write a mathematical sentence that relates the essential information in the problem, and (e) solve the mathematical sentence.

Simple, easy-to-follow strategies often work best with LD students. In evaluating many problem-solving strategies, the writer found that the simplest strategy sequence was described by Polya (1973). Although not intended just for LD students, it had only four steps: understand the problem, create a plan, follow the plan, and check.

Babbitt and Miller (1996) described a problem-solving method called the graduated word-problem sequence. The authors started with word problems that were formatted to look like addition problems. Gradually the authors added words and phrases and changed the format of the problems until they looked like standard word problems. They pointed out that it took 22 lessons to teach the entire graduated sequence.

Emphasizing strategy was a theme of the following researchers who studied problem-solving. Wilson and Sindelar (1991) attempted to maximize success in problem-solving by combining several approaches that had been shown to be successful by earlier researchers. All groups used direct instruction as the basic teaching format. One idea that they tested was the teaching of a strategy to help students determine when to add and when to subtract. Another idea they tested was having all word problems sequenced by type. One group was taught with strategy plus sequencing, one with just strategy, and one with just sequencing. The results showed a significant gain in the strategy plus sequencing group.

Babbitt and Miller (1996) found that LD students suffered from a lack of strategies when solving word problems. The researchers analyzed word-problem strategies that were recommended by other researchers. They found that they all shared the following components: (a) careful reading of the problem, (b) taking time to understand the problem, (c) determining an appropriate strategy, (d) writing an equation, (e) solving the equation,

and checking the answer. The authors also addressed the following two areas of word problems in which LD students need specific instruction: (a) LD students have trouble reading word problems correctly and therefore the instructor needs to stress the importance of this step; and (b) they also have difficulty choosing the correct strategy so the researchers recommend explicit instruction in problem-solving strategies. The authors listed the following general suggestions for improving problem solving: (a) give increased attention to problem solving in elementary school and (b) give LD students sufficient practice in problem-solving.

Montague (1992) investigated the teaching of problem-solving to LD students by combining the effects of problem-solving strategies and a simple metacognitive strategy, called say-ask-check. The results showed significant gains for the experimental group. According to the researchers, the students learned the strategy and metacognition processes with relative ease. Additionally, the research showed the following: (a) Lack of retention of gains in problem-solving showed a need for students to have periodic review work, (b) the fact that the youngest students in the experiment, the sixth-grade students, did not reach mastery suggests that younger students needed a simpler strategy, and (c) some students who needed additional remediation were allowed to use a calculator, or to work in groups.

Parmar's research (1992) yielded the following conclusions about problem-solving: (a) Students need problems broken down into workable steps and then re-integrated, (b) after learning two types of problems, students need practice discriminating between the types, (c) students need assistance making the connection between language and a pictorial representation of a problem, (d) teachers need to provide explicit instruction in self-correction (e) before students work problems which have extraneous information they must be successful at working similar problems which have only the necessary information, and (f) lack of success at solving word problems is generally not due to lack of ability to classify information.

The research of Parmar, Cawley, and Frazita (1996) stated the following about problem solving: (a) Mathematics instruction must move from a focus on computation to a focus on problem solving, (b) teachers of LD students would feel more confident about teaching problem-solving if major types of word problems were organized into a list, (c) a number of errors due to language indicates the need for concise, explicit instructions, especially on new material, (d) errors due to extraneous material in problems indicates the need for earlier student success at problems that do not have the extraneous material, and (e) errors associated with "cue" words indicates a need for reduced emphasis on cue words.

The following are some additional suggestions on problem-solving: (a) Acronyms helped students remember problem-solving steps (Miller & Mercer, 1993), (b) students benefited from work problems that were a part of the students' daily life (Mercer & Miller, 1992), and (c) problem-solving was enhanced through using the techniques of personalizing, visual representation, manipulation of objects, and paraphrasing (Giordano, 1990).

Possible solutions developed by the writer.

Staff attendance at in-service meetings at the school was a concern of the writer. While reading the research of Roy (1995), the writer developed the idea of interviewing each staff member to ascertain his or her attitude towards in-service. The purpose was to create more cooperation on the part of the teachers attending in-service meetings.

The work of Howze (1985) motivated the writer to generate ideas about the organization of in-service meetings. To help keep track of ideas that would be developed during in-service meetings, the writer planned to provide a detailed summary to all staff members. So that training sessions could be referenced in the future, the writer decided to type up a detailed summary of each in-service meeting and to distribute them to all staff members.

The writer had two projects in mind. One dealt with games; the other dealt with themes. After reading Land and Edwards' (1994) recommendation about making learning

enjoyable, the writer decided to encourage teachers to use games in the teaching of mathematics. The second project was developed after reading the work of Chard and Kameenui (1995). Those authors suggested connecting small ideas into larger ones. This led the writer to propose using themes to enhance students' educational experience.

Although displaying charts was not listed as a recommendation, the writer noted that the research methods of Babbit and Miller (1996) included using wall charts that listed strategy steps. Therefore, the writer believed that each teacher's room should have a large chart of the problem-solving strategy that was presently being used.

After reading the works of Brodsky (1994) and Bruneau (1988), the writer suggested a problem solving contest in mathematics This contest would involve mathematical activities, and it also would encourage parent involvement.

Montague and Applegate (1993) suggested that it was inappropriate to expect LD students in elementary school to have sophisticated problem-solving skills. Their concern for the problem-solving abilities of elementary students led the writer to propose developing a simplified problem-solving strategy for younger students.

Evaluation of the solution literature.

The solution literature is evaluated in terms of its applicability to the writer's work setting. This evaluation will follow the sequence in which the literature was presented: staff, parents, students, curriculum, teaching strategies, and problem solving.

Staff development can have a direct affect on student achievement. Wesson (1992) concluded that teacher training in the use of manipulatives increased student achievement in mathematics. The writer's school was well positioned to take advantage of this information, since large sets of manipulatives for discontinued elementary texts were available, but not being used. The writer proposed using them for in-service training.

Staff development, to be successful, must have support from the school and the principal. The staff development guidelines published by the National Adult Consortium (1987) contained recommendations for a positive climate for successful in-service training.

It also recommended both financial and personnel support for in-service training. The writer's school had a positive in-service climate which was due to a supportive staff. However, financial support was lacking. The role of the principal affects student achievement (Gall, 1984). The writer's school was fortunate to have a principal who took a strong curriculum profile. The writer believed that the entire staff needed to understand the academic significance of the principal's role. To this end, the writer intended to distribute this particular research to all the staff.

Staff development must have staff involvement at all stages. Staff involvement in goal setting for a school was advised by Roy (1995). The writer believed that the author's conclusion had direct application to staff development at the writer's school. Teachers were more likely to attend in-service meetings if they shared some of the goals of the meetings. Howze (1985) advocated involving everyone in the evaluation of the in-service meetings. The writer agreed with the author's idea and believed that this approach would allow the writer to modify and improve staff development. Staff development that promoted the professional growth of each staff member was the focus of Fisher (1989). The writer informally gathered information regarding individual staff members ideas regarding their professional growth. The next step was to incorporate the professional growth plans of individual staff members into the school's overall staff development plan.

Parent involvement with students had direct benefits for students. Parental-teacher contact that helped high-risk students stay at grade level was discussed by Goldstein and Campbell (1991). The writer believed that the researchers had compelling evidence in favor of increased parent-teacher involvement. The writer strongly encouraged staff discussions to investigate the possibility of increased parent-teacher contact. Home learning activities resulted in increased academic generalization (Bruneau, 1988) The writer believed that, besides providing additional practice in certain areas, home learning needed to focus on generalizations about what the child was learning. The writer planned to schedule in-service time on increasing parental involvement with the school. O'Connell

(1992) encouraged schools to pair parents with their child on problem-solving activities at home. He believed that pairing the parent with the child in a problem solving activity would result in increased time-on-task. The writer believed that the author's conclusion needed to be shared with the staff and that parent-child problem-solving needed to be encouraged.

Student needs were the concern of three sets of researchers--Chard and Kameenui (1995), O'Donnell (1994), and Meyers and Burton (1989). All of these researchers addressed learning problems of LD students and suggested possible remediations. Since the special education training of the teachers at the school varied widely, this essential information must be available to all staff.

Brodsky (1994) recommended after-school activities. Such a program was instituted in the past with limited success since teachers were not supportive. However, they were open to considering an occasional after-school session.

Students who were learning-disabled and those who were mildly retarded had different learning patterns that necessitated their being in different learning environments (Parmar, Cawley, & Miller, 1994). Although the staff at the school already were aware of this need, occasionally class size limitations caused these two groups to be placed in the same room. Therefore, it was an important topic to discuss with the staff and one that needed to be included in staff notebooks

Curriculum concerns for LD students were addressed by Parmar, Cawley, and Miller (1994). They emphasized the following: (a) After the age of 14, students should be given a calculator if they have had significant problems learning mathematics facts, and (b) concepts should be introduced with problem-solving, and computation should be introduced as a way of solving the problems. The teachers were already implementing the first recommendation. The second recommendation, which emphasized the appropriate relationship between problem-solving and computation, was not emphasized by the

curriculum. The importance of this solution, necessitated its discussion by the staff and its inclusion in the staff notebook.

Technology is a curriculum component that the writer believed had great potential to raise the achievement levels of LD students. Both Babbit and Miller (1996) and Gates (1994) stated that multimedia held the interest of LD students. Although improved and cutting-edge technology was a goal for the school program, lack of staff training and funding were two obstacles which needed to be solved.

Another technology format was videodiscs. Woodward (1995) identified two different roles for videodiscs. He said that videodiscs worked well for well-defined concepts, such as basic mathematical instruction and also for anchored instruction. When used for anchored instruction, the videodisc introduced problems that were followed by class discussions. Moore and Carnine (1989) believed that videodiscs were a cost-effective way of presenting mathematics instruction. Of all the technology alternatives, videodiscs were the least expensive. The writer intended to demonstrate the technology, to provide training for, and to suggest purchase of video-disc technology.

Teaching strategies were viewed by Mercer and Miller (1992) as holding great potential for raising student achievement. This research team emphasized that academic achievement was related to frequent assessment, the resulting modification of instruction, and quality feedback to the student. The writer believed that each of these ideas was important enough to warrant significant in-service time.

Two teaching strategies that Fox and Thompson (1994) urged were the use of active learning and manipulatives. In particular, they suggested integrating art and writing in all classes. The writer was interested in developing these two ideas with the staff. The writer had background in both areas, and, in addition, the staff was in the process of developing a coordinated writing program across all grades. The writer wanted the teachers to incorporate writing in math classes, and he planned to use in-service time for it. Also, Burns (1996) believed that manipulatives should be available at all times in the classroom.

The writer's school had many manipulative sets that were not being used because of lack of staff training. They were a ready resource that the writer wanted the teachers to be able to use. In addition, The Mathematical Sciences Education Board (1990) supported investigational types of activity. This was an area where science and mathematics were able to cooperate with technology. Hand-held calculators with scientific probes were able to collect and display data. The companies that made the calculators often loaned the equipment to schools for a limited time at no charge. The writer hoped that the teachers would use this technology.

Teaching strategies for LD students were addressed by Chard and Kameenui (1995). They advocated organizing small learning ideas into larger ones, which are sometimes called themes. The writer believed that students remembered ideas easier when they were organized into themes. The writer decided to discuss this idea with the staff and to advocate use of themes in mathematics.

Direct instruction strategy was suggested by Wilson and Sindelar (1991). In the past, direct instruction was used extensively by the elementary teachers at the school. Recently the elementary teachers reported that it was difficult to implement direct instruction because of having two grades in the same room. The writer intended to encourage the continued use of direct instruction, but he was unsure as to how extensively it could be used.

A mathematics text that consistently used strategies to teach basic mathematical facts was described by Mercer and Miller (1992). The writer believed that since teaching mathematical facts was a concern of all mathematics classes then it was important for the writer to devote in-service time to this area.

Additionally, valuable teaching strategies were suggested for LD students by other authors. Woodward and Howard (1994) contended that students should go over fewer problems more carefully. The writer agreed with the authors that quality was more important than quantity. Since the teachers had varying interpretations as to its implications, in-service time needed to be devoted to it. Mercer and Miller (1992)

suggested that a classroom should tolerate errors and at the same time reward correction of errors. Since the writer believed that not all teachers used this principle, it needed to be modeled at in-service training. Thornton (1991) suggested a cooperative-learning strategy called think-tell-share. The writer believed that this was an easy method to get LD students to be involved in a group, and the he planned to model the process for the staff. The writer planned to suggest that teachers use it. Moore and Carnine (1989) stressed the importance of providing many teaching examples for LD students. The writer believed that this was a simple, yet essential, strategy for teaching LD students, and he hoped to increase its use by the teachers.

Problem-solving should become the main emphasis in the teaching of mathematics, not computation (Parmar, Cawley, and Frazita, 1996). The researchers also suggested that teachers would understand the scope of problem-solving better if they had a list of the types of problems. The writer agreed with both ideas. The first idea, however, was a very long-term problem that cannot be addressed in one year; but the writer did plan to draw attention to problem-solving. The second suggestion, making a problem list, was a solution that could be carried out during the practicum.

Babbitt and Miller (1996) suggested giving increased attention to problem-solving in the elementary grades. This idea was a solution. Rather than trying to decrease attention to teaching computation, a better approach was simply to draw more attention to problem-solving possibilities in the elementary grades. However, Montague and Applegate (1993) warned not to expect high-level problem solving from elementary students.

The most complete program for teaching problem solving to LD students, according to the writer, must include (a) a simple four-step strategy for problem solving, (b) metacognitive strategies added to cognitive strategies, and (c) the incorporation of both guided practice and independent practice. In addition, the writer believed that the staff must be involved in establishing goals for a problem solving program.

The writer did not recommend the eight-step approach of Montague and Bos (1986) because the writer believed that eight steps would be difficult for LD students to remember. Also, the writer did not advocate the use of the graduated-word-problem sequence to teach problem-solving that was suggested by Babbit and Miller (1996). That method required 22 sequenced lessons and none of the teachers at the school were going to allow that much time to be taken up with one single topic.

Description of Selected Solutions

1. The writer directed a curriculum search for elementary mathematics materials that would meet students' needs in reading, computational skills, and problem-solving.
2. The writer directed the elementary curriculum review process in order to meet the needs of both staff and students.
3. The writer provided training to the elementary staff on how to use newly-purchased texts and associated manipulatives.
4. The writer provided staff training in the methods of teaching mathematics.
5. The writer supported mathematical opportunities for the parents in the following ways:
    - Parents were invited to be members of the curriculum committee that was in charge of evaluating the elementary texts.
    - Parents were invited to examine the elementary curriculum components before the mathematics committee adopted the program.
    - The writer provided training and encouragement for teachers to develop home-learning experiences for both the parent and student to work on as a team.
    - The writer contributed a weekly column on mathematical activities to the parent newsletter. The purpose was to encourage parent involvement in mathematics with their son or daughter. Those students who completed the activities brought their solutions to the writer at school. The names of all those

who completed the activities were put in a pot, one name was drawn for a prize, and then that person's name was put in the next parent newsletter.

- Parents and students were invited to an after-school mathematics fair.

6. The writer provided staff training in using supplementary mathematics materials.
7. The writer provided staff training in using computer software that supports the teaching of mathematics.
8. The writer believed that the execution of the previous 7 selected solutions would enable the students at the school to increase their mathematical achievement by at least 1.0 years.

Report of Actions Taken

(1) Discussed the problem and the intervention with the administrators and staff

The first step was to have an unhurried, private meeting with the director of the school so that all areas of the problem and the intervention could be explored. Getting his support was essential to the success of the practicum. Next, at two weekly staff meetings, the writer discussed the problem of the students' declining math scores and the proposed interventions. The staff suggested factors that could have contributed to the declining student scores. They were also concerned that they might not be able to attend all the training sessions. The writer responded that all training sessions were completely voluntary.

The writer asked the staff what their preferences were with regard to in-service instruction. They responded by saying that if research was to be presented, it had to be related to their work situation; and they wanted something they could directly use in their classes. They wanted to learn about teaching techniques that had a history of success. Since opinions for workshop times differed widely, the writer scheduled workshops at all possible times-- after-school sessions, evening sessions, and weekend sessions. Then at mid-year he reassessed what worked best. At midyear he scheduled all remaining workshops after school.

(2) Directed and supported an elementary curriculum search

The writer formed a mathematics committee to guide the curriculum search, directed the drafting of a point of view for mathematics and the setting of goals for mathematics, and then conducted an evaluation of texts and manipulatives. The mathematics committee consisted of all teachers of mathematics, one administrator, who was the writer, a parent member, and a community member. The writer wrote a letter for the parent newsletter that contained information about the curriculum review process. The first step in drafting a point of view and goals for mathematics was to collect samples of the two kinds of documents for the subcommittee members to study. After they had a chance to study them and to propose both their own point of view and goals for mathematics, the writer met with one member of each subcommittee and gave supportive criticism. After they were reviewed by the mathematics committee, all versions of the point of view were united into one document that applied to all levels of the school. A similar process was used with the set of goals of mathematics. When finally completed, both documents were distributed to all the teachers. Although, a curriculum search was only to be done for the elementary grades, these documents helped to guide similar curriculum searches at a later time for other levels in the school.

The evaluation of elementary texts and manipulatives began with the elementary subcommittee establishing criteria by which to evaluate sample texts. After soliciting names of possible texts from the staff and researching curriculum files, the writer ordered sample texts for grades 1-6. Sample texts were ordered from all possible companies. After the sample texts were received and evaluated, the writer directed the subcommittee to limit the texts to five for further discussions. During another round of evaluations, the texts were limited to three for piloting. Each of the top three texts was assigned to a teacher to pilot. These teachers evaluated the texts according to the mathematical goals and the texts criteria that had been established. They also evaluated the ability of the texts to meet student needs in terms of reading, computational skills and problem-solving. In addition,

they made notes as to the types of teacher training that would be needed in the following areas: content, teaching methods for the texts, manipulatives and games, and problem solving and technology. After the piloting, the elementary subcommittee met to tentatively select one text per grade level. In addition to meeting stated text criteria, the selected texts stressed lessons that were easy for students to follow and that used continuous review of content. These texts were presented to the full mathematics committee along with the rationale for selecting them; they were put in the faculty lounge for all teachers to evaluate; and parents were notified that they would have a week in which to look at them and give their opinions. After all opinions were evaluated, the selected texts and associated manipulatives were ordered.

(3) Trained elementary teachers to use curriculum materials and manipulatives

The writer conducted the first hour-long training session on the content of the chosen texts during week ten. The purpose was to present the basic outline of the new text, to note differences from the previous curriculum, to thoroughly explain all new content areas, to help teachers understand how a typical lesson was organized, and where to find all the lesson components. The writer was available during the school day to answer teachers' questions.

Later the same week the writer conducted the second hour-long training session. This one was on teaching methods for the chosen texts. The purpose of this session was to familiarize the staff with the kinds of explanations that the texts used to explain ideas, such as basic number concepts and basic operations. The training focused on examining representative lessons in detail. In particular, the writer focused on lessons in the following areas: number sense, beginning addition and subtraction, counting by different groups, and time and measurement.

The third training session for the newly purchased texts was on manipulatives and games. In addition to purchasing manipulatives that were associated with the texts, the school also had large sets from the elementary texts that were purchased two years ago

which were not being used. Consequently, the school was well stocked with manipulatives. The first focus was on the timing of manipulative usage. This was important so that the teacher would be prepared for each lesson. The second focus was on knowing how the manipulatives were to be used. One teacher felt very unsure of how to use Cuisenaire rods in the classroom. As a result, the writer presented two lessons to her class. That was enough instruction to make her feel comfortable using the rods on her own.

The fourth training session was on problem solving. The writer first explained problem solving strategies that were appropriate for the elementary grades. Then the writer showed where the authors used them in the texts. Following that, the writer highlighted a list of problems from the text, discussed how the authors expected the problems to be solved, and identified where to find that information in the teachers' manual.

The fifth session was on technology. Since there were only three elementary teachers, the writer used his own IBM-type laptop computer. The workshop began with a discussion of the importance of beginning technology education at an early age. Each teacher had only one computer in his or her classroom; few of them used their computer at all; and none of them had the Windows 95 operating system. The writer demonstrated "learning to type" programs for elementary students and three programs to teach mathematical concepts that were specifically designed for students with learning problems.

(4) Trained teachers in the methods of teaching mathematics

A crowded school schedule made it necessary to group the first five hours of methods instruction together into one weekend workshop. The writer was worried that the school might be too cold for the teachers on the weekend, since the heat would be turned off. Therefore, he bought a portable heater--for safety reasons it had to be the hot-water type--which completely solved the problem. The first hour of the workshop was spent discussing recommendations of various researchers for the general strategy steps that students needed to progress through in solving problems. Next, the teachers discussed

how to vary these steps for different age levels. In particular, problem-solving methods of the following researchers were mentioned: (a) Case, Harris, and Graham (1992) recommended a five-step strategy with guided and independent practice, (b) Wilson and Sindelar (1991) recommended the use of strategy plus problem sequencing, and (c) Babbitt and Miller (1996) suggested drawing increased attention to problem-solving during the elementary years. The second hour continued the focus on problem solving. During this hour, the research of Montague (1992), which emphasized using metacognition as an aid in problem solving, was discussed. Also the work of Parmar (1992) was presented on problem-solving strategies. In addition, the suggestion of Parmar, Cawley, Frazita (1996) about making a problem list was mentioned. The third hour focused on learner problems and their remediation. The sources for this topic were Chard and Kamenuii (1995), O'Donnell (1994), and Meyers and Burton (1989). The fourth hour dwelled on the value to problem-solving of developing inner speech in students. In this case, the research was by Fulk (1992). The fifth hour centered on making children more successful through attributional training. Attributional training attempted to develop in the child a connection between effort and success. The methods described by Fulk and Mastropieri (1990) were discussed and modeled.

In an attempt to improve attendance, the remaining five hours of methods instruction were all presented in after-school sessions of one hour each. The sixth-hour workshop attempted to connect mathematics with creativity through integration with art and writing. This approach was recommended by Fox and Thompson (1994). The focus of the seventh-hour workshop was the effective use of simple methods that had a history of producing dramatic results. The following methods were discussed: (a) Mercer and Miller (1992) emphasized the sequence of assessment, instruction modification, and feedback, (b) Stallings, Robbins, Presbry, and Scott (1986) recommended time on task, (c) Parmar, Cawley, and Miller (1994) suggested that concepts in mathematics should be introduced in the context of problems and then computation should be introduced in order to solve the

problem, and (d) Chard and Kameenui (1995) believed that children retained information longer if ideas were organized into larger concepts or themes. The eighth-hour workshop was devoted to a demonstration of the ability of multimedia to hold the attention of LD students. This involved borrowing a video projector from the local school district and hooking it up to the writer's IBM-type laptop. Featured were science programs that allowed students to experience aspects of real science experiments by watching a CD. The advantages of this technology were cost savings, since the school need not buy expensive laboratory equipment, and a predicted high level of student interest. Multimedia was recommended by Babbitt and Miller (1996). The ninth-hour workshop involved a demonstration of videodisc technology. The topic of the videodisc demonstration was the teaching of fractions. Implementing this technology required the coordination of videodiscs and a videodisc player. The first was on a 30-day loan from Phoenix Film Group in St. Louis, MO; the second was borrowed from the local school district for two days. Research indicated that videodiscs were very effective in teaching fractions. In addition, three local school districts advocated the use of videodiscs. The main disadvantage was the initial investment of approximately $5,000. Videodisc technology was advocated by Moore and Carnine (1989) and Woodward (1995). The tenth-hour workshop was a demonstration of using hand-held calculators as investigational devices. Texas Instruments loaned the school a set of five graphing calculators with four different types of sensors for one week. Equipped with the sensors, this instrument had both mathematical and scientific applications. With the probes attached it was primarily designed to be used in a science classroom. After the writer demonstrated the equipment to the teachers, the science teacher used it in her classroom for the rest of the week.

(5) Trained teachers in using computer software

The first five hours of software workshops were grouped into one Saturday. These five hours were devoted to letting teachers become familiar with software that taught specific math skills, often in a game format. The writer decided to hold this workshop at

the local public school district's media center. That location was picked because of the operating system that some of the software required. Windows 95, which none of the school's computers had, was needed on some of the software. The only feasible way to coordinate getting the software, using the district facility, and giving the staff the maximum opportunity to see the software was to give the workshop for five hours on a Saturday. This obligated the writer paying for a day of wages for a janitor. Even that cost was less than renting the necessary number of computers. Another problem was that the media center required the writer to have adequate insurance coverage if his staff should accidentally harm any of the equipment at the center. A simple call to the school's insurance agent solved this problem.

The second workshop, on spreadsheets and databases, was held for two hours in the evening at the school. The following four concepts were illustrated: (a) creating small spreadsheets which could be used by LD students, (b) demonstrating problems which LD students could solve with spreadsheets, (c) creating small databases which could be used by LD students, and (d) demonstrating problems which LD students could solve with databases.

The next three software workshops were held at the school for an hour after school. The eighth hour of workshops was on using printing tools in a mathematics class. The writer demonstrated making calendars, banners, and daily schedules. In addition the writer demonstrated adding color pictures to school reports using pictures he had previously loaded onto his laptop. The ninth and tenth hours of workshops focused on using statistics software, first at the elementary and then at the secondary level. Statistics at the elementary level is often called data collection. Data collection is concerned with accurately describing the real world. The statistics software, which was demonstrated at each level, emphasized data collection. Using this software students were able to input raw data into a data table, the computer drew the appropriate graphs, and then the software permitted students to

integrate these elements into a report. This topic was recommended by Parmar, Cawley, and Miller (1994).

(6) Trained teachers in using supplementary materials

The first-hour workshop was spent demonstrating manipulatives that develop basic number sense, with an emphasis on everyday objects. Manipulatives were discussed by Burns (1996). She said that manipulatives should always be available. Wesson (1992) said that the use of manipulatives increased achievement.

The second-hour workshop was spent demonstrating various materials that develop students' geometrical sense. A specific focus was showing how space is filled by shapes. At the elementary level, pattern blocks and Tanagrams were demonstrated and discussed. At the secondary level, tesselations and the properties of basic geometric shapes were illustrated.

The third-hour workshop focused on ways in which manipulatives can be used to help solve problems. The first objective was to familiarize the staff with the manipulatives that were available. For this end, all of the materials that the school had collected were first set out for the staff to see. Next, the applications of each manipulative were discussed.

The fourth-hour workshop focused on manipulatives involved in linear and solid measurement. The main focus of this workshop was for secondary teachers. One teacher put on a demonstration of building castles out of sugar cubes. The writer first showed how to have students build a trundle wheel to measure distances greater than fifty feet. Then, he discussed a lesson on making a map of the school.

During the fifth-hour workshop the writer discussed the use of manipulatives in telling and measuring time. Most of this workshop centered around activities for the elementary grades. The writer demonstrated various clock manipulatives, and showed the teachers a book with a story line that was centered around time. The remainder of the time teachers discussed effective teaching techniques for teaching time.

The writer had an extensive collection of supplementary materials in mathematics which he freely loaned to the staff. The school was fortunate that a local store had a collection of mathematics materials, which was considered to be the largest of its kind for teachers in the United States. Because of the writer's interest in LD students, the store invited the writer to give a workshop when he finishes his doctoral work.

(7) Supported opportunities for parent involvement in the mathematics program

The writer involved the parents in the mathematics program through encouraging their participation in the following activities: the math fair, the mathematics committee, elementary text evaluation, training for home learning, and math activities in the parent newsletter.

The first stage in preparing for the math fair was writing an article for the parent newsletter, telling parents what kinds of activities would be offered and letting them know the date. A week before the math fair another letter appeared in the parent newsletter reminding them of the event. One problem was that another teacher insisted on being named head of the fair. The writer soon realized that the other teacher was only a titular head and that the writer was still required to do all the organization. The event itself required the participation of administrators, teachers, and other staff. The first week of the practicum, the administrators and staff were included in the discussion about the math fair. Shortly thereafter, the writer arranged the actual date with the administrator. Several staff meetings were used to discuss possible fair activities with the teachers. The activities were critical to the success of the math fair. These activities needed to have a component that was either mathematical, scientific, or problem-solving and all activities needed to have broad student appeal. The writer's main job was to consistently check on the status of the teachers' needs with regard to the activity that they had agreed to sponsor. When they had a need for materials that they could not fill, then the writer's job was to find the materials. The writer's extensive collection of supplementary mathematics materials was heavily used by teachers during preparations for the math fair.

The mathematics committee, which directed the elementary text review, had one parent member. Volunteers had been solicited through the parent newsletter and the volunteer with the greatest experience working with schools and with curriculum was chosen. The parent chosen was a former board member of the school. After the elementary subcommittee had selected texts, the parents were given a week to look them over.

Training was given to both teachers and parents to use home learning. The teachers were given three hours of training on home learning. The first-hour workshop featured the research of Bruneau (1988), who said that home learning helps students develop generalizations about the world. During the second-hour workshop the work of O'Connell (1992) was discussed. He recommended pairing parents with their children in order to increase problem-solving time-on-task. The focus of the third-hour workshop was the work of Goldstein (1991). This author stated that continuous home-school contact kept high-risk students at grade level over a three-year period. One hour of training for parents on home learning occurred at a evening meeting. It was a meeting for the school to present information to the parents about the math department. The main focus of the writer's talk was to share ways to build mathematical learning into everyday experiences at home. The body language of many of the parents indicated disinterest in the material being presented. The remedy for their disinterest is to work for increased achievement for the students. Then pride from student success would increase the interest of parents.

The writer composed 32 math activities for the parent newsletter, each of which was two pages long. Each week they rotated between the elementary, middle school, and high school levels. The writer attempted to present material that was different from activities that students would normally see in the school's curriculum. Each week one student was selected for a prize. Since the prizes were costing more than the writer could afford, he called a local fast-food restaurant for a donation. As a result he was given all necessary prizes.

(8) Other practicum activities

Having noticed that few games were being used, the writer first collected descriptions from the teachers of games that they used. He consulted the staff at another local school for LD students and next, he researched commercial texts and books on games. The resulting collection was distributed to the entire staff.

During the methods workshops, the teachers stated that they liked the problem-solving steps of Polya (1973). In response, the writer made each teacher in the middle school and high school a poster of those steps. The elementary teachers were each given a poster of problem solving strategies.

When all workshops had been given, he arranged for time at a staff meeting to discuss their opinions of the workshops. Their first comment was that they liked having a person on the staff with a math background to act as a resource. Many were apologetic for not being able to attend all meetings. Some stated that weekends and evenings were often inconvenient for them to attend workshops. Weekdays, after school was the preferred workshop time.

As a time and cost-saving action, the staff of the school decided to discontinue the previous practice of administering the WJ to all students in the school each spring; instead only half of the students were going be given the test each year. This action would have left 10 of the 19 students who were still involved in the practicum without a concluding WJ test. After much pleading on the writer's part, the staff agreed to administer the WJ to all the students who were still involved in his practicum. Initially the writer was going to be required to pay for the testing of the additional students. As it turned out, the other staff members did the testing without cost to the writer. The writer only had to substitute for the teachers during testing and test evaluation.

Chapter V: Results

Results

The problem to be solved was that students in the school had demonstrated low achievement levels in mathematics. The work setting was a school for learning-disabled students serving students from grades 1 through 10. Elements of the problems were the following: basal texts did not meet elementary students' needs in terms of reading level, insufficient training for teachers on how to use texts, the absence of teachers with expertise in mathematics or science, insufficient computer software, and low parental support for the mathematics program. The solution strategy employed the following interventions: a curriculum review and basal text purchase; training in using texts, manipulatives, and computer software; teacher training in teaching methods; and programs designed to involve parents in the mathematical program of the school. The goal of this practicum was to enable students who were being followed in this practicum to demonstrate an average of at least 1 year of growth in mathematical achievement.

Following are the results of this practicum.

1. The 3 elementary teachers will respond an average between 3.4 and 4.1 on a 1-5 Likert Scale that the reading level of the mathematics texts is appropriate.

This outcome was met.

The elementary teachers indicated their confidence in the appropriateness of the reading levels of their texts with a response average of 4.6 to question # 23 (see Table 4, p. 76).

2. The 3 elementary teachers will respond an average between 3.4 and 4.1 on a 1-5 Likert Scale that the mathematics texts meet student needs in computation and problem-solving skills.

This outcome was met.

The elementary teachers indicated their level of confidence in their texts meeting student needs in computation and problem solving with respective response averages of 4.6 and 4.3 on question # 24 (see Table 4, p. 77).

3. The 3 elementary teachers will respond an average at least 4.2 on a 1-5 Likert Scale that sufficient time was allocated to evaluate mathematics materials.

This outcome was not met.

The elementary teachers indicated their level of satisfaction with the amount of time taken to evaluate curriculum materials with a response average of 3.0 on question # 32 (see Table # 4, p. 79).

4. The 3 elementary teachers will respond an average of at least 4.2 on a 1-5 Likert Scale that sufficient mathematics materials existed to compare.

This outcome was met.

The elementary teachers indicated their level of satisfaction with the amount of curriculum materials that were available to compare with a response average of 5.0 on question # 30 (see Table 4, p. 79).

5. The 3 elementary teachers will respond an average of at least 4.2 on a 1-5 Likert Scale that sufficient mathematics materials existed to pilot.

This outcome was met.

The elementary teachers indicated their level of satisfaction with the amount of curriculum material that was available to pilot with a response average of 5.0 on question # 31 (see Table 4, p. 79).

6. The 3 elementary teachers will respond an average of at least 4.2 on a 1-5 Likert Scale that sufficient in-service was provided for using the purchased texts and manipulatives.

This outcome was met.

The elementary teachers indicated their level of satisfaction with the amount of training that they received to use the texts with a response average of 4.3 on question # 26 (see Table 4, p. 78).

7. The 3 elementary mathematics teachers and the 4 secondary teachers will respond an average of at least 4.2 on a 1-5 Likert Scale that the curriculum review process met the needs of both students and teachers.

This outcome was met.

The elementary teachers (the only teachers to respond) indicated their level of confidence that the curriculum review process met the needs of both teachers and students with a response average of 4.6 to question # 17 (see Table # 4, p. 75).

8. The 3 elementary teachers and the 4 secondary teachers will respond an average of at least 4.2 on a 1-5 Likert Scale that their methods of teaching mathematics met student needs.

This outcome was not met.

The teachers indicated their level of confidence in their ability to teach mathematics with a response average of 3.3 on question # 21 (see Table # 4, p. 76).

9. The 3 elementary teachers and the 4 secondary teachers will respond an average of at least 4.2 on a 1-5 Likert Scale to indicate their level of knowledge in using computer software in the teaching of mathematics.

This outcome was not met.

The teachers indicated their level of knowledge of using computer software to help teach mathematics with a response level of 3.1 to question # 14 (see Table # 4, p. 71).

10. The 3 elementary teachers and the 4 secondary teachers will respond an average of at least 4.2 on a 1-5 Likert Scale to indicate their level of knowledge in using supplementary materials in the teaching of mathematics.

This outcome was met.

The teachers indicated their level of knowledge in using supplementary materials to teach mathematics with a response average of 4.3 to question # 20 (see Table # 4, p. 75).

11. The 3 elementary mathematics teachers and the 4 secondary mathematics teachers will respond an average of at least 4.2 on a 1-5 Likert Scale to indicate their level of satisfaction with parent participation in the mathematics program.

This outcome was not met.

The teachers indicated their level of satisfaction with parent participation in the mathematics program with a response average of 3.4 to question # 13 (see Table # 4, p. 71).

12. The 23 students who are being followed in this practicum will demonstrate 1 year of mathematical growth as measured on the Woodcock-Johnson Achievement Test in 1998.

This outcome was not met.

The students showed a grade placement change of +0.61 from 1997 to 1998 (see Table # 5, p. 80)

Table 4

Staff Pre- and Post-Questionnaire Data

	Question Numbers							
Staff	Pre-1	Post-1	Pre-2	Post-2	Pre-3	Post-3	Pre-4	Post-4
Elem. math. teach. (EMT)								
Elem. 1	5	9	2	9	22.5	20	1	30
Elem. 2	9	10	2	9	22.5	25	1	20
Elem. 3	1	6	3	8	27.5	30	0	15
EMT av.	5.0	8.3	2.3	8.7	24.2	25.0	0.7	21.7
Sec. math. teach. (SMT)								
Second. 1	10	10	10	10	45	40	4	20
Second. 2	3	4	4	6	18	25	0	25
Second. 3	3	5	7	8	3	10	0	30
Second. 4	5	5	8	8	20	25	0	15
SMT av.	5.3	6.0	7.3	8.0	21.5	25.0	1.0	22.5
All math. teach. (AMT)								
AMT av.	5.1	7.0	4.0	8.3	22.6	25.0	0.9	22.1

Table 4 cont.

Staff Pre- and Post-Questionnaire Data cont.

	Question Numbers							
Staff	Pre-5	Post-5	Pre-6	Post-6	Pre-7	Post-7	Pre-8	Post-8
Elementary math. teach.(EMT)								
Elem. 1	8	8	4	6	21-30%	41-50%	5	4
Elem. 2	3	6	3	3	81-90%	61-70%	1	3
Elem. 3	3	4	3	4	31-40%	71-80%	7	8
EMT av.	4.7	6.0	4.0	4.3	44.3-53.3%	57.7-66.7%	4.3	5.0
Sec. math. teach. (SMT)								
Second. 1	7	8	12	14	31-40%	61-70%	12	10
Second. 2	3	5	6	6	21-30%	31-40%	24	20
Second. 3	2	4	10	12	51-60%	41-50%	2	8
Second. 4	7	8	10	9	71-80%	61-70%	1	2
SMT av.	4.8	6.3	9.5	10.3	43.5-52.5%	48.5-57.5%	9.8	10.0
All math. teach. (AMT)								
AMT av.	4.7	6.1	7.1	7.7	43.9-53.9%	51.8-61.4%	7.4	7.9

Table 4 cont.

Staff Pre- and Post-Questionnaire Data cont.

	Question Numbers					
Staff	Pre-9	Post-9	Pre-10a	Post-10a	Pre-10b	Post-10b
Elementary math. teach.(EMT)						
Elem. 1	11-20%	31-40%	4	1	5	1
Elem. 2	---	51-60%	3	1	5	1
Elem. 3	0-10%	21-30%	4	1	3	1
EMT av.	5.5-15.0%	34.3-43.3%	3.7	1.0	4.3	1.0
Sec. math. teach. (SMT)						
Second. 1	31-40%	41-50%	5	1	5	1
Second. 2	0-10%	21-30%	4	1	5	1
Second. 3	0-10%	31-40%	5	1	1	1
Second. 4	0-10%	31-40%	4	1	3	1
SMT av.	7.8-17.5%	31-40%	4.5	1.0	3.5	1.0
All math. teach. (AMT)						
AMT av.	7.0-16.7%	32.4-41.4%	4.1	1.0	3.8	1.0

Table 4 cont.

Staff Pre- and Post-Questionnaire Data cont.

	Question Number					
Staff	Pre-10c	Post-10c	Pre-10d	Post-10d	Pre-10e	Post-10e
Elementary math. teach.(EMT)						
Elem. 1	4	1	4	1	5	1
Elem. 2	5	1	5	2	5	3
Elem. 3	4	1	4	1	5	1
EMT av.	4.3	1.0	4.3	1.3	5.0	1.7
Sec. math. teach. (SMT)						
Second. 1	5	1	5	1	5	5
Second. 2	5	1	5	1	4	1
Second. 3	2	1	5	1	5	1
Second. 4	3	1	4	1	4	3
SMT av.	3.8	1.0	4.8	1.0	4.5	2.5
All math. teach. (AMT)						
AMT av.	4.0	1.0	4.6	1.1	4.7	2.1

Table 4 cont.

Staff Pre- and Post-Questionnaire Data cont.

	Question Number					
Staff	Pre-10f	Post-10f	Pre-10g	Post-10g	Pre-10h	Post-10h
Elementary math. teach.(EMT)						
Elem. 1	4	1	3	1	3	1
Elem. 2	5	1	4	1	2	1
Elem. 3	5	4	4	1	3	1
EMT av.	4.7	2.0	3.7	1.0	2.7	1.0
Sec. math. teach. (SMT)						
Second. 1	5	5	5	1	5	1
Second. 2	5	1	4	1	5	1
Second. 3	5	1	3	1	3	1
Second. 4	5	1	3	1	3	1
SMT av.	5.0	2.3	3.8	1.0	3.5	1.0
All math. teach. (AMT)						
AMT av.	4.9	2.0	3.7	1.0	3.4	1.0

Table 4 cont.

Staff Pre- and Post-Questionnaire Data cont.

	Question Number					
Staff	Pre-10i	Post-10i	Pre-11	Post-11	Pre-12	Post-12
Elementary math. teach.(EMT)						
Elem. 1	3	1	4	5	0	2
Elem. 2	5	1	4	4	0	1
Elem. 3	2	1	5	5	0	4
EMT av.	3.3	1.0	4.7	4.7	0.0	2.3
Sec. math. teach. (SMT)						
Second. 1	5	1	5	4	0	1
Second. 2	5	1	3	4	0	2
Second. 3	3	1	3	5	0	2
Second. 4	4	1	4	4	0	1
SMT av.	4.5	1.0	3.8	4.3	0.0	1.5
All math. teach. (AMT)						
AMT av.	4.1	1.0	4.1	4.4	0.01	3.3

Table 4 cont.

Staff Pre- and Post-Questionnaire Data cont.

	Question Number					
Staff	Pre-13	Post-13	Pre-14	Post-14	Pre-15a	Post-15a
Elementary math. teach.(EMT)						
Elem. 1	1	3	3	3	0	0
Elem. 2	2	4	2	3	2	2
Elem. 3	1	4	1	2	0	0
EMT av.	1.3	3.6	2.0	2.7	0.7	0.7
Sec. math. teach. (SMT)						
Second. 1	3	5	1	2	0	0
Second. 2	1	3	5	5	4	5
Second. 3	1	3	2	3	3	3
Second. 4	3	2	4	4	3.5	4
SMT av.	2.0	3.3	3.0	3.5	2.6	3.3
All math. teach. (AMT)						
AMT av.	1.7	3.4	2.6	3.1	1.6	2.0

Table 4 cont.

Staff Pre- and Post-Questionnaire Data cont.

	Question Number					
Staff	Pre-15b	Post-15b	Pre-15c	Post-15c	Pre-15d	Post-15d
Elementary math. teach.(EMT)						
Elem. 1	0	0	0	0	0	0
Elem. 2	2	2	0	0	0	0
Elem. 3	0	1	0	0	0	0
EMT av.	0.7	1.0	0.0	0.0	0.0	0.0
Sec. math. teach. (SMT)						
Second. 1	0	0	0	1	0	0
Second. 2	40	35	10	10	0	1
Second. 3	3	3	1	5	0	0
Second. 4	1.5	2	2.5	4	0	0
SMT av.	11.1	10.3	3.4	5.0	0.0	0.3
All math. teach. (AMT)						
AMT av.	6.5	6.1	1.9	2.9	0.0	0.1

Table 4 cont.

Staff Pre- and Post-Questionnaire Data cont.

	Question Number					
Staff	Pre-15e	Post-15e	Pre-16a	Post-16a	Pre-16b	Post-16b
Elementary math. teach.(EMT)						
Elem. 1	10	12	3	2	3	3
Elem. 2	3	3	4	1	4	4
Elem. 3	0	1	5	3	5	4
EMT av.	4.3	5.3	4.0	2.0	4.0	3.6
Sec. math. teach. (SMT)						
Second. 1	1	2	---	1	---	4
Second. 2	50	52	1	1	1	1
Second. 3	1	2	1	2	1	1
Second. 4	0	1	2	1	4	3
SMT av.	13.0	14.3	1.3	1.3	2.0	2.3
All math. teach. (AMT)						
AMT av.	9.3	10.4	2.7	1.6	3.0	2.9

--- = question not answered.

Table 4 cont.

Staff Pre- and Post-Questionnaire Data cont.

	Question Number					
Staff	Pre-16c	Post-16c	Pre-16d	Post-16d	Pre-16e	Post-16e
Elementary math. teach.(EMT)						
Elem. 1	4	2	3	2	5	5
Elem. 2	5	2	5	3	3	4
Elem. 3	5	4	5	4	5	5
EMT av.	4.7	2.7	4.3	3.0	4.3	4.7
Sec. math. teach. (SMT)						
Second. 1	---	3	---	1	---	5
Second. 2	1	1	1	1	5	3
Second. 3	4	2	3	2	5	2
Second. 4	4	3	4	3	4	2
SMT av.	3.0	2.3	2.7	1.8	4.7	3.0
All math. teach. (AMT)						
AMT av.	3.8	2.4	3.5	2.3	3.9	3.7

--- = question not answered.

Table 4 cont.

Staff Pre- and Post-Questionnaire Data cont.

	Question Number							
Staff	Pre-17	Post-17	Pre-18	Post-18	Pre-19	Post-19	Pre-20	Post-20
Elementary math. teach.(EMT)								
Elem. 1	3.5	5	25	33	4	3	4	3
Elem. 2	2	5	42	45	3	2	2	4
Elem. 3	1	4	2	8	5	3	1	4
EMT av.	2.2	4.6	23.0	28.7	4.0	2.6	2.3	3.6
Sec. math. teach. (SMT)								
Second. 1	4	---	80	84	---	2	4	5
Second. 2	3	---	75	80	3	1	1	5
Second. 3	2	---	5	10	5	4	1	4
Second. 4	1	---	0	3	4	2	4	5
SMT av.	2.5	---	40.0	44.3	4.0	2.3	2.5	4.8
All math. teach. (AMT)								
AMT av.	2.3	4.6	34.0	37.6	4.0	2.4	2.7	4.3

--- = question not answered

Table 4 cont.

Staff Pre- and Post-Questionnaire Data cont.

	Question Number					
Staff	Pre-21	Post-21	Pre-22	Post-22	Pre-23	Post-23
Elementary math. teach.(EMT)						
Elem. 1	3	4	1	5	3	5
Elem. 2	2	3	2	4	3.5	5
Elem. 3	2	2	1	4	1	4
EMT av.	2.3	3.0	1.3	4.3	2.5	4.6
Sec. math. teach. (SMT)						
Second. 1	4	5	5	n.a.	5	n.a.
Second. 2	2	2	2	n.a.	2	n.a.
Second. 3	1	2	3	n.a.	1	n.a.
Second. 4	4	4	3	n.a.	4	n.a.
SMT av.	2.8	3.3	3.3	n.a.	3.0	n.a.
All math. teach. (AMT)						
AMT av.	2.6	3.1	2.4	4.3	2.7	4.6

n.a.= not applicable

Table 4 cont.

Staff Pre- and Post-Questionnaire Data cont.

	Question Number					
Staff	Pre-24a	Post-24a	Pre-24b	Post-24b	Pre-25	Post-25
Elementary math. teach.(EMT)						
Elem. 1	1	5	2	5	0	5
Elem. 2	2	4	1	4	0	6
Elem. 3	1	5	3.5	4	0	8
EMT av.	1.3	4.6	2.2	4.3	0.0	6.3
Sec. math. teach. (SMT)						
Second. 1	4	n.a.	4	n.a.	0	n.a.
Second. 2	3	n.a.	2.5	n.a.	0	n.a.
Second. 3	5	n.a.	3	n.a.	0	n.a.
Second. 4	3	n.a.	3	n.a.	0	n.a.
SMT av.	3.8	n.a.	3.1	n.a.	0.0	n.a.
All math. teach. (AMT)						
AMT av.	2.9	4.6	2.7	4.3	0.0	6.3

n.a.= not applicable

Table 4 cont.

Staff Pre- and Post-Questionnaire Data cont.

	Question Number					
Staff	Pre-26	Post-26	Pre-27	Post-27	Pre-28	Post-28
Elementary math. teach.(EMT)						
Elem. 1	1	5	3	5	0	2
Elem. 2	1	4	3	5	0	2
Elem. 3	1	4	2	5	0	2
EMT av.	1.0	4.3	2.7	5.0	0.0	2.0
Sec. math. teach. (SMT)						
Second. 1	1	n.a.	0	n.a.	0	n.a.
Second. 2	1	n.a.	3	n.a.	1	n.a.
Second. 3	1	n.a.	4	n.a.	2	n.a.
Second. 4	1	n.a.	4	n.a.	2	n.a.
SMT av.	1.0	n.a.	2.8	n.a.	1.7	n.a.
All math. teach. (AMT)						
AMT av.	1.0	4.3	2.7	5.0	0.7	2.0

n.a.= not applicable

Table 4 cont.

Staff Pre- and Post-Questionnaire Data cont.

	Question Number							
Staff	Pre-29	Post-29	Pre-30	Post-30	Pre-31	Post-31	Pre-32	Post-32
Elementary math. teach.(EMT)								
Elem. 1	4	7	1	5	1	5	1	3
Elem. 2	4	6	1	5	1	5	1	3
Elem. 3	3	6	2	5	1	5	1	3
EMT av.	3.7	6.3	1.3	5.0	1.0	5.0	1.0	3.0
Sec. math. teach. (SMT)								
Second. 1	4	n.a.	4	n.a.	1	n.a.	2	n.a.
Second. 2	3	n.a.	3	n.a.	4	n.a.	3	n.a.
Second. 3	2	n.a.	3	n.a.	3	n.a.	2.5	n.a.
Second. 4	2	n.a.	4	n.a.	4	n.a.	3	n.a.
SMT av.	2.8	n.a.	3.5	n.a.	3.0	n.a.	2.6	n.a.
All math. teach. (AMT)								
AMT av.	3.1	6.3	2.6	5.0	2.0	5.0	1.9	3.0

n.a.= not applicable

Table 5

Change in Mathematical Achievement 1993-1998

	Time Period				
Characteristic	1993-1994	1994-1995	1995-1996	1996-1997	1997-1998
Average changes in grade-level achievement in mathematics	+0.90	+0.66	+0.40	+0.31	+0.61

Discussion

To raise student math achievement the writer chose interventions that addressed specific problems brought to light by the data, and that involved all groups in the school community: the teachers, the parents, and the administration. To get a clearer picture of the results, the writer discussed the data for each objective and identified factors that may have influenced the results.

Outcome # 1 expected a specific increase in EMT confidence in the appropriate reading level of the math texts. That this outcome was met was likely due to the fact that one of the important criteria for selecting the materials was a reading level that was appropriate for the students. The selection process continued this emphasis, since this text was piloted and evaluated on this criteria before it was selected.

Outcome # 2 expected a specific increase in EMT confidence in the math texts meeting student needs in computation and problem solving. That this outcome was met was likely due to the fact that important criteria for selecting the texts were meeting student needs in

computation and problem solving. The selection process continued this emphasis, since this text was piloted and evaluated on these criteria before it was selected.

Outcome # 3 expected a specific increase in EMT satisfaction with the time allocated to evaluate math materials. The fact that this outcome was not met reflects the size of the task when teachers select new basal texts. It was the experience of the writer in other settings that some teachers needed up to four months to pilot and to reach consensus on their selections. The increase in EMT satisfaction was likely due to the fact that the Implementation Plan this year allowed teachers seven weeks to evaluate materials as opposed to approximately 3 weeks in the summer of 1995.

Outcome # 4 expected a specific increase in EMT confidence with having sufficient materials to compare. The success of this outcome was likely due to the writer ensuring that five texts were available to compare at each level.

Outcome # 5 expected a specific increase in EMT confidence with having sufficient materials to pilot. Having three texts to pilot at each level contributed to making this outcome successful.

Outcome # 6 expected a specific increase in EMT satisfaction with the amount of in-service provided for using purchased materials. The success of this outcome was largely due to the fact that five hours of in-service were provided on using the purchased texts, while no training was provided during the summer.

Outcome # 7 expected a specific increase in teacher confidence that the curriculum review process met the needs of students and teachers. Although this question appeared on the secondary questionnaire, it was clearly intended just for the elementary teachers. Only the elementary teachers had a curriculum review process. The fact that the curriculum process was organized and that there were sufficient texts both to compare and to pilot helped to make this outcome a success for those teachers for whom it was appropriate.

Outcome # 8 expected a specific increase in teacher confidence in teaching mathematics. The lack of success on this outcome could be due to the fact that the first workshop on

methods, which was five hours on a weekend, was not well attended. Another contributing factor could have been that, although national standards have been established for the teaching of mathematics to non-LD students, no such agreement has been reached for teaching LD students. The writer believed that the elementary teachers would become more confident after they used their texts for another year. Confidence in teaching methods may require more than one year to build. To raise the confidence of teachers in the teaching of mathematics, the writer recommended that the school support teachers by encouraging teacher attendance at math conferences and by continued inservice at school. Also, the mathematics curriculum and goals must be consistently monitored and evaluated by the principal. On the positive side, the confidence level of the teachers in their teaching methods increased from 2.6 in 1995 to 3.1 in 1998.

Outcome # 9 expected a specific increase in teacher knowledge of using computer software. That this outcome was not met may, in large part, be due to the fact that the school had no funds for software. Since the teachers knew this, they were not encouraged to participate in related workshops. Another factor may have been that the first software workshop of five hours on a weekend was not well attended. Also, the elementary teachers, were particularly disadvantaged with respect to computers. They all began the year with just one computer in each room and with no software. However, at the end of the year, computers were distributed more equitably. To improve the teachers' knowledge of computer software, the school must provide more support for technology.
On the positive side, the knowledge of the teachers in using computer software increased from 2.6 in the summer of 1995 to 3.1 in 1998.

Outcome # 10 expected a specific increase in teacher knowledge in using supplementary materials. The author attributes the success of this outcome to the fact that the teachers started using the writer's supply of supplementary materials during the math fair and, with his encouragement, they continued to use them for the rest of the year.

Outcome # 11 expected a specific increase in teacher satisfaction with parent participation in the math program. This outcome may not have been successful because one school year may not have been a long enough intervention. To improve parent participation may take several years of child success. Workshops given each year by the school on successful home-learning methods would be helpful. Also, the teachers may have been depressed because of a low parent turnout at the Math Fair. On the positive side, the average teacher satisfaction increased from 1.7 to 3.4.

Outcome # 12 expected a specific increase in student achievement. Although this outcome was not successful, it should be noted that the achievement gain of +0.61 years was almost double the gain of the previous year. To attempt to raise student achievement by one year, the practicum implementation and recommendation made below should be implemented over more than one year.

The one overpowering idea that was reinforced by this practicum is that student achievement of LD students is mutable. Learning-disabled students are not condemned forever to low rates of learning. This practicum supports the hope of teachers and administrators that they can indeed make a difference. Although only seven of the 12 objectives were met, looking at the overall picture of the objectives gives a brighter picture to the practicum. The data for all objectives, even those that were not met, showed improvement.

Recommendations

The writer suggested the following recommendations:

1. Create a position of math coordinator, whose responsibility would be to guide the mathematics program.
2. Provide support to the math coordinator with release time for attendance and training at regional meetings.
3. Have the staff set goals for improving math instruction.
4. Utilize before-school meeting time for math workshops.

5. Provide multiple parent workshops on home-learning methods.
6. Develop sources for funding of software for mathematics.
7. Increase supervision of math instruction by the director of the school.

Dissemination

The writer will discuss the results of this practicum with the school administration and staff, all of whom will receive copies. In addition, copies will be distributed to state and local organizations that focus on either learning disabilities or mathematics.

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Appendix A

Pre-questionnaire

Pre-questionnaire

Pre-questionnaire of Mathematics Curriculum Materials and Teaching Methods at the school for 1995-1996

1. How well did the reading level of the basic math materials match your students' reading level? The basic math curriculum materials could be texts or workbooks that the school provided for your students. Indicate your answer by using a 1-10 rating scale. A 1 means a poor match between the reading level of the basic math materials and your students' reading level and a 10 means an excellent match. _____

2. What was your overall level of comfort with the math program in your departmental level last year? Use a 1-10 rating scale, where 1 represents the lowest comfort level and 10 represents the highest comfort level. _____

3. Approximately how many of your lessons in a quarter (9 weeks) used math curriculum materials that you would describe as including manipulatives or "active," hands-on work? _____

4. List the total number of parents you were aware of that came to the school last year to assist the math program or participate in a math event. _____

5. How would you rate your knowledge of teaching mathematics? Use a 1-10 rating scale. A one (1) means "I do not feel knowledgeable about methods of teaching mathematics." A ten (10) means "I feel very knowledgeable about methods of teaching mathematics. Response_____

6. Please state the total number of different games that you used this last year in teaching mathematics during the 1995-1996 school year. Response____

7. How would you rate the adequacy of supplementary resources other than a basic text or workbook during the 1995-1996 school year? Supplementary resources could have been those mathematical resources that were either provided by the school or those that came from other sources. Indicate your answer below by checking the approximate level of your needs that were met.
   - From 0- 10% of the time your supplementary needs were met._____
   - From 11-20% of the time your supplementary needs were met._____
   - From 21-30% of the time your supplementary needs were met._____
   - From 31-40% of the time your supplementary needs were met._____
   - From 41-50% of the time your supplementary needs were met._____
   - From 51-60% of the time your supplementary needs were met._____
   - From 61-70% of the time your supplementary needs were met._____
   - From 71-80% of the time your supplementary needs were met._____
   - From 81-90% of the time your supplementary needs were met._____
   - From 91-100% of the time your supplementary needs were met._____

8. What was the total number of assignments or projects that you used in mathematics classes that cooperatively involved students and parents during the 1995-1996 school year? Examples might be a mathematical construction that involved both student and parent or a data collection activity in which the student interviews the parent.
   Response____

9. How would you rate the adequacy of computer software during the 1995-1996 school year? Indicate your answer below by checking the approximate level of your needs that were met.
   - From 0- 10% of the time your computer or software needs were met. _____
   - From 11-20% of the time your computer or software needs were met. _____
   - From 21-30% of the time your computer or software needs were met._____
   - From 31-40% of the time your computer or software needs were met._____
   - From 41-50% of the time your computer or software needs were met._____
   - From 51-60% of the time your computer or software needs were met._____
   - From 61-70% of the time your computer or software needs were met._____
   - From 71-80% of the time your computer or software needs were met._____
   - From 81-90% of the time your computer or software needs were met._____
   - From 91-100% of the time your computer or software needs were met._____

10. What is your level of need in receiving copies of articles related to LD students and mathematics? On each of the following topics indicate your level of need in having copies of articles on that topic. Use a 1-5 rating scale where a 1 means no need exists and a 5 means a need definitely exists.

    a) Factors associated with failure _____
    b) Characteristics of LD students _____
    c) Learning problems of LD students _____
    d) Curriculum for LD students _____
    e) Teaching strategies for LD students _____
    f) Methods of teaching various math topics _____
    g) Technology and the LD student _____
    h) Parent involvement in the schools _____
    i) Staff development in schools _____

11. How important do you consider the training after selection of texts and manipulatives? Use a 1-5 rating scale where a 1 means you do not consider the training important and a 5 means you consider it very important. _____

12. How many hours did you spend working on a school math fair for parents and students during the 1995-1996 school year? _____hours

13. How satisfied were you with the level of parent participation in the mathematics program during the 1995-1996 school year? Use a 1-5 rating scale where a 1 means you are not satisfied and a 5 means that you are satisfied. _____

14. How knowledgeable are you in using computer software to teach mathematics? Use a 1-5 rating scale where a 1 means that you are not knowledgeable and a 5 means that you are knowledgeable. _____

15. How many hours of training have you had using the following types of software? To the right of each, list the hours of training that you have had, either in a class, or workshop, either formal or informal.

a) database _____
b) spreadsheet _____
c) information organizers _____
d) basic graphing and statistical tools _____
e) software that teaches various math concepts, possibly in a game format _____

16. What is your level of need in having training on using the following types of software? Use a 1-5 rating scale, where a 1 means no need exists and a 5 means a need definitely exists.

a) database _____
b) spreadsheet _____
c) information organizers _____
d) basic graphing and statistical tools _____
e) software that teaches various math concepts, possibly in a game format _____

17. What is your level of confidence that the curriculum review process during the summer of 1995 met the needs of both students and teachers? Use a 1-5 rating scale where a 1 means you have no confidence and a 5 means that you are very confident.

_____

18. How many hours of training have you had in teaching mathematics, as in a workshop on a specific topic or a methods course in teaching mathematics?

_____hours

19. What is your level of need in having training in methods of teaching mathematics, such as how to teach basic facts, fractions, or decimals? Use a 1-5 rating scale where a 1 means no need exists and a 5 means a need definitely exists. _____

20. What is your level of knowledge of using supplementary materials in teaching mathematics? Use a 1-5 rating scale where a 1 means you do not consider yourself knowledgeable at all and a 5 means that you consider yourself very knowledgeable.

_____

21. How confident are you that your teaching methods meet student needs in the teaching of mathematics? Use a 1-5 rating scale, where a 1 means that you are not confident and a 5 means that you are confident. _____

22. How pleased were you with the basal text materials that were purchased this last year? Use a 1- 5- rating scale, where a one (1) means completely dissatisfied with the text and a five (5) means completely satisfied with the text. Response____

23. For the mathematics text that was purchased in the summer of 1995, what was your level of confidence that it had the appropriate reading level for your students? Use a 1-5 rating scale where a 1 means you had no confidence at all that the text had the appropriate reading level and a 5 means that you were confident that it had the appropriate reading level for your students. _____

24. How confident were you that the basal text materials that were selected this last year met student needs in the areas of computational skills and problem solving? Use a 1-5 rating scale where a 1 means that you completely lacked confidence that it met their needs and a 5 means that you had complete confidence that it met their needs.
    a) Computational skills ____
    b) Problem solving ____

25. How many hours of in-service training were provided for teachers after purchasing mathematics texts and manipulatives in the summer of 1995?
    _____hours

26. How satisfied were you with the amount of training that you received to use the texts and manipulatives that were purchased? Use a 1-5 rating scale where a 1 means you were not satisfied with the amount of training and a 5 means that you were satisfied with the amount of training. _____

If you were <u>involved in the selection</u> of mathematics materials during the summer of 1995, please respond to # 27-32.

27. How many texts were compared at your teaching level. Response____

28. How many texts at your level were piloted before one text was selected?
    Response____

29. How many weeks were spent discussing basic texts before selection?
    Response____

30. How satisfied were you with the amount of curriculum material that was available <u>to compare</u>? Use a 1-5 rating scale where a 1 means you were not satisfied and a 5 means that you were satisfied. _____

31. How satisfied were you with the amount of curriculum material that was available <u>to pilot?</u> Use a 1-5 rating scale where a 1 means you were not satisfied and a 5 means that you were satisfied. _____

32. How satisfied were you with the <u>amount of time</u> taken to evaluate curriculum materials and texts? Use a 1-5 rating scale where a 1 means you were not satisfied and a 5 means that you were satisfied. _____

Appendix B

Post-Questionnaire

Post-Questionnaire

Post-questionnaire of Mathematics Curriculum Materials and Teaching Methods at the school for 1997-1998

1. How well does the reading level of your basal mathematics materials match your students reading level? The basal mathematics materials could be texts or workbooks that the school provided for your students. Indicate your answer by using a 1-10 rating scale. A 1 means a poor match between the reading level of the basal mathematics materials and your students' reading level and a 10 means an excellent match. _____

2. What is your overall level of comfort with the math program at your departmental level this last year? Use a 1-10 rating scale, where 1 represents the lowest comfort level and 10 represents the highest comfort level. _____

3. This last year, approximately how many of your lessons in a quarter (9 weeks) used mathematics curriculum materials that you would describe as including manipulatives or "active", hands-on work? _____

4. List the total number of parents you were aware of that came to the school this last year to assist the math program or participate in a math event. _____

5. How would you rate your knowledge of teaching mathematics? Use a 1-10 rating scale. A one (1) means "I do not feel knowledgeable about methods of teaching mathematics." A ten (10) means "I feel very knowledgeable about methods of teaching mathematics." Response_____

6. Please state the total number of different games that you used this last year in teaching mathematics. Response____

7. How would you rate the adequacy of supplementary resources other than a basic text or workbook this last year? Supplementary resources could have been those mathematical resources that were either provided by the school or those that came from other sources. Indicate your answer below by checking the approximate level of your needs that were met.
   - From 0- 10% of the time your supplementary needs were met._____
   - From 11-20% of the time your supplementary needs were met._____
   - From 21-30% of the time your supplementary needs were met._____
   - From 31-40% of the time your supplementary needs were met._____
   - From 41-50% of the time your supplementary needs were met._____
   - From 51-60% of the time your supplementary needs were met._____
   - From 61-70% of the time your supplementary needs were met._____
   - From 71-80% of the time your supplementary needs were met._____
   - From 81-90% of the time your supplementary needs were met._____
   - From 91-100% of the time your supplementary needs were met._____

8. What was the total number of assignments or projects that you used in mathematics classes that cooperatively involved students and parents this last year? Examples might be mathematical constructions that involved both student and parent or data collection activities in which the students interviewed the parents.
Response____

9. How would you rate the adequacy of computer software this last year? Indicate your answer below by checking the approximate level of your needs that were met.
   - From 0- 10% of the time your computer or software needs were met. _____
   - From 11-20% of the time your computer or software needs were met. _____
   - From 21-30% of the time your computer or software needs were met._____
   - From 31-40% of the time your computer or software needs were met._____
   - From 41-50% of the time your computer or software needs were met._____
   - From 51-60% of the time your computer or software needs were met._____
   - From 61-70% of the time your computer or software needs were met._____
   - From 71-80% of the time your computer or software needs were met._____
   - From 81-90% of the time your computer or software needs were met._____
   - From 91-100% of the time your computer or software needs were met._____

10. What is your level of need in receiving copies of articles related to LD students and mathematics? On each of the following topics indicate your level of need in having copies of articles on that topic. Use a 1-5 rating scale where a 1 means no need exists and a 5 means a need definitely exists.

    a) Factors associated with failure _____
    b) Characteristics of LD students _____
    c) Learning problems of LD students _____
    d) Curriculum for LD students _____
    e) Teaching strategies for LD students _____
    f) Methods of teaching various math topics _____
    g) Technology and the LD student _____
    h) Parent involvement in the schools _____
    i) Staff development in schools _____

11. How important do you consider the training after selection of texts and manipulatives? Use a 1-5 rating scale where a 1 means you do not consider the training important and a 5 means you consider it very important. _____

12. How many hours did you spend working on a school math fair for parents and students during the 1997-1998 school year? _____hours

13. How satisfied were you with the level of parent participation in the mathematics program during the 1997-1998 school year? Use a 1-5 rating scale where a 1 means you are not satisfied and a 5 means that you are satisfied. _____

14. How knowledgeable are you in using computer software to teach mathematics? Use a 1-5 rating scale where a 1 means that you are not knowledgeable and a 5 means that you are knowledgeable. _____

15. How many hours of training have you had using the following types of software? To the right of each, list the hours of training that you have had, either in a class, or workshop, either formal or informal.
    a) database _____
    b) spreadsheet _____
    c) information organizers _____
    d) basic graphing and statistical tools _____
    e) software that teaches various math concepts, possibly in a game format _____

16. What is your level of need in having training on using the following types of software? Use a 1-5 rating scale, where a 1 means no need exists and a 5 means a need definitely exists.
    a) database _____
    b) spreadsheet _____
    c) information organizers _____
    d) basic graphing and statistical tools _____
    e) software that teaches various math concepts, possibly in a game format _____

17. What is your level of confidence that the curriculum review process during 1997-1998 met the needs of both students and teachers? Use a 1-5 rating scale where a 1 means you have no confidence and a 5 means that you are very confident.

    _____

18. How many hours of training have you had in teaching mathematics, as in a workshop on a specific topic or a methods course in teaching mathematics?

    _____hours

19. What is your level of need in having training in methods of teaching mathematics, such as how to teach basic facts, fractions, or decimals? Use a 1-5 rating scale where a 1 means no need exists and a 5 means a need definitely exists. _____

20. What is your level of knowledge of using supplementary materials in teaching mathematics? Use a 1-5 rating scale where a 1 means you do not consider yourself knowledgeable at all and a 5 means that you consider yourself very knowledgeable.

    _____

21. How confident are you that your teaching methods meet student needs in the teaching of mathematics? Use a 1-5 rating scale, where a 1 means that you are not confident and a 5 means that you are confident. _____

    If <u>your department selected basal mathematics materials</u> during this last year, please respond to # 22-26.

22. How pleased were you with the basal text materials that were purchased this last year? Use a 1- 5- rating scale, where a one (1) means completely dissatisfied with the text and a five (5) means completely satisfied with the text. Response____

23. For the mathematics text that was purchased this last year, what was your level of confidence that it had the appropriate reading level for your students? Use a 1-5 rating scale where a 1 means you had no confidence at all that the text had the appropriate reading level and a 5 means that you were confident that it had the appropriate reading level for your students. _____

24. How confident were you that the basal text materials that were selected this last year met student needs in the areas of computational skills and problem solving? Use a 1-5 rating scale where a 1 means that you completely lacked confidence that it met their needs and a 5 means that you had complete confidence that it met their needs.
    a) Computational skills ____
    b) Problem solving ____

25. How many hours of in-service training were provided for teachers after purchasing mathematics texts and manipulatives during the 1997-1998 school year?
    _____hours

26. How satisfied were you with the amount of training that you received to use the texts and manipulatives that were purchased? Use a 1-5 rating scale where a 1 means you were not satisfied with the amount of training and a 5 means that you were satisfied with the amount of training. _____

    If you <u>were involved in the selection</u> of the basal mathematics materials for your department this last year, then answer questions # 27-32.

27. How many texts were compared at your teaching level. Response____

28. How many texts at your level were piloted before one text was selected?
    Response____

29. How many weeks were spent discussing basic texts before selection?
    Response____

30. How satisfied were you with the amount of curriculum material that was available <u>to compare</u>? Use a 1-5 rating scale where a 1 means you were not satisfied and a 5 means that you were satisfied. _____

31. How satisfied were you with the amount of curriculum material that was available <u>to pilot?</u> Use a 1-5 rating scale where a 1 means you were not satisfied and a 5 means that you were satisfied. _____

32. How satisfied were you with the <u>amount of time</u> taken to evaluate curriculum materials and texts? Use a 1-5 rating scale where a 1 means you were not satisfied and a 5 means that you were satisfied. _____

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Signature:	Position: Curriculum Director
Printed Name: Kirk D. Quistorff	Organization: New Horizon School
Address: 13930 Silven Ave. NE Winbridge Island, WA 98110	Telephone Number: (206) 842-3127
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