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ABSTRACT

Prior to an extensive literary and active research, the researchers hypothesized that the Comprehensive School Mathematics Program (CSMP) would be effective only if implemented on a school-wide, uniform manner that followed the strict CSMP guidelines. Two extensive surveys on teacher attitudes concerning CSMP were administered to teachers in a rural elementary school. One survey questioned CSMP teachers, and the other questioned non-CSMP teachers. Results indicated that a varied approach to CSMP can exist successfully in a school, despite some shortcomings with the CSMP program. A detailed description and history of the CSMP program and important details gathered from the extensive 15-year pilot trial of CSMP are included. Appendices include the surveys used in the study. Contains 25 references. (Author/MKR)

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A Study of the Effectiveness of the Comprehensive School Mathematics Program

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ABSTRACT

Prior to an extensive literary and active research, the researchers hypothesized that the Comprehensive School Mathematics Program (CSMP) would be effective only if implemented on a school-wide, uniform manner that followed the strict CSMP guidelines. Two extensive surveys were administered to teachers in a rural elementary school. One survey questioned CSMP teachers, and the other questioned non-CSMP teachers. The researchers gathered results on teacher attitudes concerning CSMP from these surveys. The results indicated that a varied approach to CSMP can exist successfully in a school, despite some shortcomings with the CSMP program.

CHAPTER ONE

THE PROBLEM

A Study of the Effectiveness of the Comprehensive School Mathematics Program

Need

During the researchers' experience in a rural elementary school, they were introduced to the Comprehensive School Mathematics Program (CSMP). They were interested in learning more about the many facets of CSMP. At the time of their student teaching, the school was involved in a decision making process about the use of CSMP throughout the five grade levels. The researchers believe that by obtaining both literary and active research on the program, they will contribute to the school's formulation of a mathematics curriculum.

The research will contribute greatly to the understanding of the art of teaching math at the particular school of study. The CSMP program suggests to its users a specific and uniform method of teaching and organization of materials. In contrast, within the particular school of study, the teachers were given the freedom to use CSMP within any framework that they found successful within their classrooms. Teachers were also given the choice to not use CSMP in any form in the classroom. Because this school's teachers do not

use the uniform CSMP approach, it is necessary to examine and summarize the variations of CSMP within each classroom and grade level. This information is imperative for the school to explore before reaching a final decision about a universal mathematics program.

Purpose

The purpose of the study will be to gather various teacher attitudes concerning the overall effectiveness of the CSMP math program in the school of study. The study will compare the similarities and differences of teacher attitudes concerning CSMP in order to make recommendations for a worthwhile mathematics program. The researchers are interested in discovering whether CSMP is effective only if performed according to CSMP's strict and uniform teaching guidelines or if it can also be effective when taught less formally.

Hypothesis

In the study, the researchers expect to find that CSMP is effective only if performed according to CSMP's strict and uniform teaching guidelines. This effectiveness will be based solely on teacher's attitudes and personal opinions about what is effective.

Overview

The project will include various aspects - all of which will be necessary to reach the intended conclusion. Chapter Two will delve into the literary research that exists on CSMP. The chapter will include a detailed description and history of the CSMP program and important details gathered from the extensive 15 year Pilot Trial of CSMP. Chapter Three will provide information pertaining to the specific environment of the school of study. In addition, this chapter will also provide information on the precise method of the active research. Chapters Four and Five will summarize the results and conclusions obtained through the literary and active research.

CHAPTER TWO

A REVIEW OF THE LITERATURE

History and Description of the CSMP Program

In the late 1960s and early 1970s mathematics teaching began a sort of metamorphosis in all parts of the world. The experimentation aimed at adjusting and improving mathematics programs around the world and focused on modernizing the curriculum. In 1963, several prestigious mathematics committees from the United States and abroad called for research on the topic of modernizing the already existing mathematics programs. In response to these suggestions, the CSMP program emerged. In 1966, Southern Illinois University adopted the Comprehensive School Mathematics Program and developed a proposal for a long-range curriculum development project which was introduced to The Central Midwestern Regional Educational Laboratory (CEMREL). CEMREL felt that the CSMP program, even in its draft stage, possessed the necessary potential for modernizing existing mathematics programs. By the spring of 1967 CEMREL had officially incorporated CSMP into its master program (Kaufman, 1971).

Burt Kaufman, the CSMP Director at this time, was responsible for the comprehensive development of the core framework of the CSMP program for grades K through

6. He focused his efforts not only on the kind of mathematics that was to be taught but the manner in which it was to be taugnt (CEMREL,Inc., 1978). Kaufman and his associates observed that the learning process occurred through many interrelated experiences. Because of this finding and many other related observations, CSMP was established on the basis that no single lesson will be an end in itself. Additionally, the CSMP curriculum was created so that lessons would vary from day to day instead of remaining the same until mastery of the particular concept being studied was obtained. (CEMREL,Inc., 1978).

The CSMP developers called the above mathematics philosophy a "pedagogy of situations." They described their philosophy that constantly stimulates students.

> CSMP does not lack a pedagogy that provides for continued intellectual involvement of children in the learning process. The CSMP field experiences lead us to believe it is possible to create situations that continue to stimulate intellectual involvement at all levels of mathematical sophistication (Kaufman and Haag, pg. 287, 1977).

The developers of CSMP believed that the difficulties

found in many of the already existing elementary school mathematics programs could be linked to the verbal-language skills and abilities of these students. It was believed that some students were unable to understand the mathematical language being used in their mathematics curriculum. Therefore, this language needed to change. The CSMP curriculum answered the call for an altered mathematical language in elementary programs. As a result, CSMP developers based their K through 6 curriculum on a system of nonverbal languages (Woodward, 1980).

At first glance the nonverbal languages upon which the Comprehensive School Mathematics Program is based may not only appear quite unusual but also somewhat unconventional in terms of "regular" mathematics. The first nonverbal language is the language of strings. In the CSMP curriculum "strings are used to classify and to sort objects according to various attributes. An object is either in or out of a string" (first grade teacher, 1993). The pictures that are created by using strings enable a student to record and communicate various classifications. Skills such as classifying, reasoning, and extracting information are useful and

important skills for young minds to know. String pictures allow the thinking process of classification to occur long before a student's verbal skills permit him or her to do so (first grade teacher, 1993).

The second language, that of arrows, can often be viewed as "the most important teaching aid in the CSMP curriculum" (CEMREL pamphlet pg. 3). Relations in mathematics are often presented to mathematics students in ways that may seem abstract or elusive (CEMREL, Inc., 1978). Also, mathematic relations tended to be associated with a formal, mathematical language. The introduction of arrows into the CSMP Program eliminated this apparent necessity of a formal language. By using arrows to illustrate functions in mathematics, students literally draw the particular relation with arrows instead of speaking about it verbally. Therefore. "this language enables youngsters to study the ideas of relations, functions, operations, and permutations in situations that are natural to them" (Woodward, pg. 21, 1980).

Finally, the language of the minicomputer "enables children to study 'big numbers' and intriguing numerical ideas at a very early age"

(Woodward, pg. 21, 1980).

> Young students are able to become familiar with numbers and numerical operations before they are able to work with them on paper. Later, the Minicomputer is used as a vehicle for posing situations involving mental arithmetic and for examining the workings of arithmetic operations. It provides the necessary experience so that, rather than memorizing an algorithm and applying it to situations, the situations give rise to the algorithm (CEMREL pamphlet pg. 3).

All three nonverbal languages are vital in CSMP and together make up the nucleus of the program itself.

Another important aspect of the Comprehensive School Mathematics Program deals directly with the CSMP philosophy. One element of the CSMP philosophy is that "we learn through many interrelated experiences . But no experience is an end in itself" (CEMREL, Inc.,1978). The CSMP developers felt that because students learn a "pedagogy of situations" through many interrelated experiences, they should be taught in the same manner. CSMP developers named their approach to teaching and learning the spiral approach and instructed teachers of

CSMP to follow a specific spiral development in their teaching methods:

> CSMP introduces an idea in one lesson, then another in the next lesson, then another. Later the first idea reappears in a slightly new setting or in a slightly expanded version; then a second topic reappears; and so on. Each of the many times that a particular idea or area of study reappears, it is treated in a different manner and at a slightly higher level than the last time. Rather than continuing on and on with a topic until so called "mastery" has occurred, the spiral development gives each student a new chance to "catch on" at each stage (CEMREL, Inc., pg. 25, 1978).

Implementing the spiral approach involves patience on the part of the teacher - especially if he/she is more comfortable with the "mastery" teaching approach.

The CSMP philosophy does not find assessment necessary on a daily or even weekly basis. The program offers freedom to the teachers in the area of assessment, suggesting some sort of regular monitoring method(s) that the teacher is entitled to choose

(CEMREL, Inc., 1978). The spiral approach of CSMP can actually serve as a useful and readily available assessment device. There are workbooks which supplement the very detailed teacher's guide to the program and CSMP suggests using the workbooks as one method of monitoring student achievement. The workbook includes material for both the slower mathematics students and the advanced students.

The CSMP developers also defined what they felt was appropriate teacher training. The program requires beginning CSMP teachers to undergo teacher training in their particular grade levels. The lower elementary teachers are not required to participate in as many hours of training as the upper elementary teachers. This difference in training hours is due to the fact that in the higher elementary levels, the level of mathematical difficulty and amount of material covered is greater. Therefore, it is essential to require adequate training in order for the program to be successful. In each district where CSMP is used there is, or should be, a trained CSMP facilitator who runs workshops and/or training sessions. The facilitator is responsible for informing the school system(s) of any

current changes in the program as well as simply keeping the district abreast on all CSMP related matters. The job of the area facilitator is an important one, for it is his/her responsibility to maintain the strength of the program in a particular district. Often, the failure of CSMP is blamed on the inadequacies of the facilitator to provide his/her district with necessary workshops, materials, and encouragement. Likewise, the success of CSMP in a particular district or area can be the direct result of a qualified coordinator.

The Extended Pilot Trial Program

Although a large amount of research on the CSMP program has not been published, a significant study was conducted by the program's owner, CEMREL, now known as the Mid-Continent Regional Educational Laboratory (McREL). Beginning in September, 1973, CSMP began an Extended Pilot Trial of its elementary program that would cover the first 15 years of implementation. Being longitudinal in nature, the study followed the progress of teachers and students who began using CSMP materials in kindergarten or first grade in 1973-74. The company contends that the Pilot Trial was intended

to be reasonably comprehensive and non-technical so as to be desirable for a wide audience. While covering numerous areas of the implementation, the study does not attempt to widely explore some of the related research issues (Herbert, 1-A-3, 1974).

The Extended Pilot Trial Program was conducted in a variety of settings. Many of these districts are similar to the school that will be examined later in this project. Because of the moderate publicity of the CSMP Extended Pilot Trial, 29 school districts in the St. Louis area agreed to take part in the program by using the kindergarten and first grade curriculum. These school districts would then add a new grade to their program each year the district continued to use CSMP. The St. Louis area school districts were designated "local", and they tried out the materials in fairly well controlled circumstances with standardized training, comparison classes and considerable observation. In addition to the 29 "local" districts, other school districts designated "outer ring" areas also participated in the trial program; however, these sites implemented the program in a much less restricted setting (Herbert, 1-A-3, 1974).

The Extended Pilot Trial Program had specific requirements for school districts, particularly for the "local" districts. All districts were required to pay the cost of producing the necessary instructional materials, to provide or allow for the collection of relevant evaluation data and to provide a coordinator for the program within the district. The coordinator was responsible for overseeing the implementation of the program. This job included training the pilot teachers and acting as the liaison between CSMP and the district. "Local" districts had additional conditions such as providing a suitable comparison class for each CSMP class for the collection of data, being accessible for more evaluating than "outer ring" districts and training all of the pilot teachers together in a one-week summer workshop conducted by CSMP (Herbert, 1-A-3, 1974).

Throughout its 15 years of study, the Extended Pilot Trial Program used a variety of measurements to study all areas of implementation. Some of the measurements used included teacher questionnaires, teacher and student interviews, cognitive tests, Mathematics Applied to Novel Situations Test Data (MANS

Tests) and classroom observations (Herbert, 4-A-1, 1977). While using different measures for some years, the Pilot Program measured many of the same areas of implementation such as teacher training, local coordinators, classroom management of materials, style of teaching, student interest, student achievement, adaptions for different ability levels, parent reactions and overall teacher judgements on the program.

Looking in depth at the Pilot Trial in its various stages of researching these areas is vital to making suggestions for the implementation of CSMP in current school districts. The first and second years of the program are important in showing how to successfully put CSMP into action where no previous knowledge of the program exists. These years also provide insights on potential problem areas. Subsequent years of the study reveal what adjustments can be made to make the program more successful. Also these years are essential to understanding how a program evolves and continually educates new teachers and parents on CSMP. During the later years of the Pilot Trial, a specific series of tests were administered to students within the CSMP

program. This is important in showing specific achievement levels of CSMP students. Current school districts can use this in their decisions about how beneficial CSMP is in the classroom. The final years of the study are important in perceiving the benefits and disadvantages of a mature CSMP classroom. By looking at all of the years of the study, one can also discern areas where change could have been made to make the program more effective.

The First Year of the Pilot Trial

The results of the first year of the Pilot Trial provided important insights on good and negative aspects of the program. The negative aspects that are observed during the first year of the program continually presented problems for CSMP programs during the following years of the Pilot Trial. In addition to revealing some of long-range problems, the first year of the study was important because it provided insights on problems that current school districts could encounter with initial implementation of the CSMP program. By examining this information, current school districts can see ways to avoid similar situations.

Teachers' attitudes towards their training showed

that the program required a significant dedication to the initial training needed to start a program. As with any new program, more efforts are needed in giving people excellent training to carry over into the following years. As stated previously, "local" teachers were trained by CSMP in a summer workshop. Teachers agreed that this was necessary. However, teachers also stated that a better overall picture of the program was needed, and that they should be instilled with more confidence in their ability to teach the program. In the same way that CSMP workshops did not provide "local" teachers with enough appropriate training, the Pilot Trial also suggests that teachers in the "outer ring" districts did not receive sufficient training. These teachers, trained by their local coordinators, responded less positively to certain items than did CSMP-trained teachers (Herbert, 1-A-3 1974).

CSMP presented itself as even more difficult math program to initially implement because of its need to train local coordinators in addition to teachers. The training of the coordinator was vital because these were the individuals responsible for training future

teachers in the school districts. The coordinators received only the same one-week summer workshop that teachers had (Herbert, 1-A-3, 1974).

The first year of the Pilot Trial also showed that certain types of coordinators were better able to make the CSMP program work more effectively in initial implementation. The coordinators could be placed in four categories: teachers (thus, dual roles), principals, college based personnel in schools and district wide coordinators. The latter type of coordinator achieved the most impact for a successful CSMP implementation. In cases where there was such a coordinator, there was a dramatic increase in the number of pilot classes (Herbert, 1-A-3, 1974).

Within the CSMP classes, teachers asserted that more time was needed in teaching the CSMP program, particularly with the first year. Although it might be difficult to separate what is common in increases in efforts in any new program, teachers definitely agreed that they spent more time teaching math in the classroom. Many of these same teachers saw this as a positive aspect of the program. However, many teachers had trouble with the recommended pace. Yet,

those who moved along with the brisk pace encountered fewer problems and tended to be happier with the overall program. Although teachers spent more time in teaching the curriculum, most of them thought that the time required for daily preparation, compared to their previous math program, was either less or about the same (Herbert, 1-A-3 1974).

While preparation time did not seem to be a problem for the first year, the management of materials and curriculum posed problems that would continue within the CSMP program. Roughly one third of the teachers felt that the ability to manage the materials in a CSMP classroom was poor. Many of these complaints referred to the actual display of worksheets and workbooks. The biggest complaint lay in the area of managing the content of the curriculum. Many teachers felt that the CSMP curriculum lacked in its teaching of basic computational facts. As a result, about half of the teachers felt the need and did provide supplements in the areas of counting and number concepts. As the program continued, this posed a constant problem that will need to be thoroughly examined by current school districts (Herbert, 1-A-3, 1974).

In contrast to problems with classroom management, teachers gave overwhelmingly positive remarks about the CSMP style of teaching. Thus, CSMP presented itself as an appealing fresh approach for teachers. Over half of the teachers said that the teaching techniques and questioning techniques were good. Most of the teachers liked the variety of the lessons and did not find difficulty in presenting the material (Herbert, 1-A-3, 1974).

One of the most appealing aspects of CSMP surfaced immediately within the first year. Overall student interest and achievement in the program were high. Teachers commented that students were enthusiastic and interested about the material. Most of the teachers listed more areas of increased accomplishment than areas of decreased accomplishment. Many attributed this to the variety in the lessons. Tests given to the students showed that CSMP students scored higher, though not significantly, than the comparison classes. However, CSMP students had higher mean scores in relational thinking and analytic reasoning (Herbert, 1-A-3, 1974).

Though most students performed well under the CSMP

curriculum, the program showed itself as a potential problem for lower ability students. CEMREL designed the program purposely so that the nature of the curriculum would be appropriate for all ability levels. In contrast, about half of the teachers expressed concerns that the program was too hard for low ability students. Most agreed, however, that their slow students were learning "as much as ever" (Herbert, 1-A-3, p.18 1974).

Overall, teachers and coordinators saw positive and negative aspects during the first year of the program, both specifically and generally. Some of the best aspects included lessons that used games, rods, A-Blocks and other manipulatives. Teachers also saw student interest and achievement as positive. Nevertheless, certain negative aspects presented problems such as lessons with the use of arrows. The other primary negative aspects were in material and curriculum management, teacher training and appropriateness for lower ability level students. Another area of concern for implementation was cost. In comparison to other math programs at the time, CSMP was more expensive than most while cheaper than some.

The initial costs of teacher guides, manipulatives, teacher training, etc. can be necessary in many math programs. However, because the CSMP student worksheets and workbooks were consumable items, cost increased. These items also tended to be the most expensive of the materials. This problem can be a crucial factor in current school districts' adoption of the CSMP program (Herbert, 1-A-3, 1974).

The Second Year of the Pilot Trial

The second year of the Pilot Trial is important to examine because it discloses more specific kinds of information about the implementation of a CSMP program. By the end of the second year of teaching CSMP, much of the "novelty effect" had disappeared for teachers. Teachers were more comfortable and informed with providing suggestions (Herbert, 2-C-3, 1975). This year of the Pilot Trial was particularly extensive in receiving such feedback through many interviews in the first and second grades. The most important information about CSMP that is revealed in the second year relates to the spiral approach, parents' reactions, supplemented materials and apprcpriateness for all ability levels in the classroom.

Teachers' feelings concerning training improved during the second year of the program. Eighty percent of the teachers thought that their training was sufficient and the percentages were roughly equal at each grade level (Herbert, 2-C-1, 1975). This percentage is interesting considering that 40 percent of the teachers received less than ten hours of teacher training, or less than half of the recommended time (Dougherty & Herbert, 1975). However, most of the teachers that were greatly satisfied with their training tended to come from "local" districts where they had been trained by the CSMP-run workshop during the first year. In addition, those teachers trained by their CSMP coordinator tended to be more dissatisfied with the amount and quality of training (Barozcz, 1975). Thus, school districts today can learn from this fact that coordinators were the pivotal point for the success of the CSMP program in a school district.

As was the case with the first year of the program, coordinators played a key role in the second year. As Dougherty and Herbert (p. 20, 1975) found in the Final Summary Report, a local coordinator was "quite essential for the smooth adoption of the program

in a system." The report also reiterated the idea that the best coordinators tended to be those who were district supervisory personnel. However, the study also showed that other types of coordinators had been successful. Thus, the study opened the idea about the best coordinator qualifications to having a wide variety of math background and having power within the school district (Dougherty & Herbert, 1975).

More class time in teaching CSMP proved to be one aspect that was not just a result of being a new program. Like the first year in teaching CSMP, teachers taught longer than usual math classes. Significant numbers of teachers taught math for over one hour per day. While many saw this mostly as a positive aspect of the program during the first year, more teachers in the second year expressed concern about the amount of time for the overall program. Although preparation remained the same or less as for other math programs, many second and third grade teachers did not make sufficient progress at finishing the minimum requirements of the curriculum. Teachers with CSMP experience had an easier time with the pace, but the overall pace and time of the program presented

a problem (Dougherty & Herbert 1975).

Experienced teachers had an easier time with other areas of managing CSMP within the classroom. Interviews with experienced teachers showed that the management of the materials did not present any serious problems (Barozcz, 1975). Yet, almost a quarter of all the teachers surveyed in the second year of the program "rated the ease of managing CSMP materials as either 'poor' or 'unsatisfactory' and over half thought that a better bookkeeping system was needed for monitoring student progress" (Dougherty & Herbert, p.14, 1975).

While less teachers found a problem with managing the materials, more teachers had concerns about the management of the curriculum. Seventy-seven percent of the teachers surveyed supplemented mostly drill and computational facts (Herbert, 2-C-1, 1975). Thus, most teachers still felt that CSMP was lacking in certain areas of math instruction.

Teachers also seemed to be divided over the use of the spiral approach in teaching math. Overall, most responded positively to the approach. Those with experience felt more comfortable with using it in their second year. As one first grade teacher stated in an

interview,

> I am a teacher that wants to feel that everyone has gained, has learned and I know that will never be in any class. I work towards that goal. It wasn't terribly frustrating. I'm more relaxed this year. I have had to adjust my own thinking along that line (Herbert, 2-C-3, p.23, 1975).

However, many teachers expressed concerns with the spiral approach's effectiveness with slower students. While they agreed that the approach kept the students' interests, many believed that it was too fast and abstract (Barozcz, 1975).

All sources of the Pilot Trial revealed that the issue of appropriateness for all ability levels continued to be the most controversial aspect of the CSMP program (Dougherty & Herbert, 1975). As compared to the first year of CSMP, teachers in the second year started to express the belief that a traditional math program would be better for slower students in the classroom. As one teacher stated,

> I think that the slow students would be better off in a traditional program. Particularly now. I always have to speak with the understanding that I

> know they are not going on to CEMREL in second grade. These children just need reinforcement on ones and tens concept and just addition and subtraction facts so that they can go into [the other math program]. I think the slower ones need much more of that kind of work so that they can proceed as far as they can in second grade. I'd have a different outlook if I knew CSMP was going [to continue with these children] (Herbert, 2-C-3, p.15 1975).

This response also reveals the concerns that teachers had about instructing children in CSMP for only one year. There are potential problems in using it for students who require longer periods of instruction to understand such a program.

Slower students, like all students, continued to have high interest in the CSMP program. The questions that teachers were asked about student interest level and attitude had "the clearest, most unequivocal responses" (Herbert, 2-C-1, p.22, 1975). Most importantly, teachers felt that students' achievement was higher with CSMP than compared to previous years with other math programs (Herbert, 2-C-1, 1975). Thus,

student interest, attitude and achievement were excellent reasons for implementing a CSMP program.

Parents also responded to the CSMP program with positive interests and attitudes. The overall parent reactions received by teachers was favorable towards the program. Only a few parents responded negatively. Some of these parents felt that their children were having to rely on the minicomputer too much and their children were "being used as guinea pigs" (Barozcz, p.42, 1975). Other parents responded well to the program but had a few concerns with the appropriateness for slower students (Barozcz, 1975).

Teachers had overall concerns for the program which they expressed in questions concerning the best and worst aspects of the program. Areas that were listed as the best aspects included: student interest and enthusiasm, development of thinking skills, variation in curriculum, better understanding of material, workbooks, use of manipulatives and student involvement. Many of these areas were also listed in the first year of the Pilot Trial. However, new areas were listed as worst aspects of the program. Some of these areas included: spiral approach for lower ability

levels, overall appropriateness of the program for slower students, absence of student evaluation, minicomputer use, abstract curriculum, absence of a grading guide and heavy emphasis on teacher directed lessons (Herbert, 2-C-1, 1975 & Barozcz, 1975).

Fourth Year of the Pilot Trial

The fourth year of the CSMP program represented an important year in the implementation process. Many of the teachers had completed four years of teaching experience, and they were excellent evaluators of the program. Many of the negative aspects of the program were very well known to CEMREL because of the extensive results of the research studies. While CEMREL did modify some parts of CSMP according to teachers' suggestions, many of the more important negative aspects started to become a permanent flaw in the program.

While teacher training had not been a serious problem in CSMP, it did not in the fourth year. Most teachers felt reasonably well prepared for CSMP after their training, but a sizable minority disagreed. Teachers also started to rely more on meeting with each other for help, rather than on meeting with the

coordinator. Although the coordinator's role remained important for a successful program, teachers needed more training and advice from those who had experienced CSMP first-hand in the classroom (Herbert & Small, 1977).

Due to CEMREL's help and to teacher experience, teachers were better able to manage materials and time in the classroom. There were fewer references to difficulties in managing materials. In contrast to the second year of the program, most teachers followed the schedule and expected to complete it by the end of the year. Yet, teachers still needed more time for math instruction. Fewer teachers, however, saw this as a negative part of CSMP (Herbert, 4-A-1, 1977).

One of the biggest concerns that was not addressed by CEMREL was the management of the curriculum. Many teachers found it difficult to grade students in their work. Many suggested that CSMP provide assessment measures. Almost all teachers in the fourth year found the need to supplement materials. Most teachers did so everyday or 2 to 4 times per week throughout the year. As in the years past, basic computational skills was the area teachers agreed needed the most supplementing.

However, new areas such as measurement, money and time were supplemented. Teachers also supplemented their own assessment items. This problem will be a very important issue for teachers today to look at when deciding on the most effective implementation of a CSMP program.

Another important issue that started to surface in the fourth year was teacher attitude concerning the pedagogy of CSMP, specifically the spiral approach. Although teachers had expressed concern with the approach in previous years, most of these concerns had been in relation to slower students. Teachers in 1977 had a significant drop in their overall positive attitude towards the approach. In 1976, 65 percent of the teachers gave definitely positive responses. In 1977, only 44 percent gave such responses. Thus, as teachers became more experienced with the program, they became better able to get a closer look beyond the high student interest and attitude. This is also reflected in the drop in overall impressions of the program. In 1976, 90 percent of the responses were generally positive towards CSMP, with about one third of those responses indicating reservations. In 1977, only 86

percent were positive, and nearly two thirds of the responses expressed some reservations (Herbert & Small, 1977).

One of these reservations was the problem with lower ability students. Almost two thirds of the teachers continued to express that the program was not appropriate for these students. More importantly, almost two thirds felt that CSMP was less appropriate than their previously used math program. Some teachers in previous years had made this suggestion, but 1977 showed a dramatic increase in this belief . However, at the same time, achievement tests showed that low ability CSMP students generally did as well, or better than, low ability non-CSMP students (Herbert, 4-A-1, 1977). The Pilot Trial labels this the low ability student discrepancy. Nevertheless, CEMREL had not made changes in its program for ability levels, and teachers continued to list this as one of the biggest problems.

In contrast, student interest and achievement remained on the best aspects list for CSMP. Teachers also liked the way the program taught children to think and be creative. They found the program to be challenging in the way it promotes logic and variety in

thinking skills. Many teachers listed the spiral approach as one of the best aspects of the program, as far as higher ability students were concerned (Herbert & Small, 1977).

Teachers continued to list many of the same problems with the program. However, the fourth year did see an increase in the intensity of these discontents. The biggest problems were that CSMP did not have enough drill for basic skills and that the program was not appropriate for slower students. As mentioned, other concerns included the need for better training and assessment items (Herbert & Small, 1977).

The Fifth Year of the Pilot Trial

In 1978 the pilot program continued with a teacher questionnaire and interviews. Forty-eight fourth grade classes taught by 42 teachers were involved in this year's study. The particular study focused on those classes that had utilized CSMP before and those that were just beginning with the program. The 29 classes that had used the Comprehensive School Mathematics Program before were named the "veteran classes" while the 13 other classes were named the "entry classes". The veteran classes used the regular CSMP text: CSMP

Mathematics for the Intermediate Grades, Part 1 and 2 while the entry classes followed a special one-semester Entry Module, first then the regular CSMP text: CSMP Mathematics for the Intermediate Grades, Part 1. The 1978 teacher questionnaire and interviews consisted of either a verbal interview and a three page written questionnaire for each teacher or, if the interview was impossible to perform, a six page questionnaire was administered (the interview questions were distributed in questionnaire form for teachers who did not receive a verbal interview). The interview questions and/or questionnaire dealt with five main issues: teacher experience, teacher training, implementation of the program, comparisons of CSMP with other mathematics programs, and the overall evaluation of CSMP (Small and Herbert, 5-C-1, 1978).

The results of the 1978 interviews and questionnaire were quite interesting. Out of 29 teachers (combination of veteran and entry teachers), before implementing CSMP in their classrooms: 11 attended just one workshop, six of the teachers attended more than one workshop, seven had between 20 and 30 hours of training, two had between 10 and 20

hours, and one teacher had no CSMP training prior to adopting the program for his/her classroom (Small and Herbert, 5-C-1, 1978). During the actual school year, out of 32 teachers (veteran and entry combined) 19 teachers received no additional training, four received between two to eight hours, eight received between 10 and 20 hours, one teacher who had received no prior training received 30 hours, and another teacher simply watched a class taught by developers the previous year (Small and Herbert, 5-C-1, 1978).

Several specific comments about the CSMP training received by the teachers who responded are rather poignant. As one teacher stated:

> Training was not extensive enough. Too rushed. They went through the lessons very quickly, and left me with many questions. I thought some of them would be answered as the semester went on, but I did not find this to be true. Some of my questions still were not answered (Small and Herbert, 5-C-1, pg. 30, 1978).

The majority of the other responses concerning teacher training seemed a bit more positive - a second teacher responded: "Liked it - easy to understand - in fact

boring at times because of repetition" (Small and Herbert, 5-C-1, pg. 30, 1978). In general, the interviews and questionnaire revealed the following about teacher training:

> There were no real differences between the responses of veteran and entry class teachers on the questions dealing with training. It can be seen that most teachers received at least 20 hours of training before the school year began (the recommended amount is 30 hours) and that most but not all of the teachers seemed satisfied with the training they received (Small and Herbert, 5-C-1 pg. 8, 1978).

Thus, it is clear that CSMP training was extensive in 1978.

The amount of time spent in the classroom each day on mathematics, whether CSMP or another program, reveals that in general, more time is spent when conducting CSMP. In fact, 19 teachers compared the time they allotted for math pre-CSMP versus time spent on CSMP. Of these 19 teachers, 12 spent more time teaching CSMP and seven spent the same amount of time on mathematics (Small and Herbert, 5-C-1, 1978). Out

of 32 teachers (combination of veteran and entry teachers) questioned, 15 spent 60 minutes a day utilizing CSMP, six spent 46-59 minutes, and 11 spent 40-45 minutes conducting CSMP lessons. Interestingly, when 19 teachers were asked how much time they spent on mathematics each day before CSMP, only four teachers spent 60 minutes, four also spent between 46 and 59 minutes, ten spent between 40 and 45 minutes and one teacher spent only 40 minutes on pre-CSMP mathematics instruction (Small and Herbert, 5-C-1, 1978). While approximately the same number of teachers, both during CSMP instruction and during pre-CSMP instruction spent between 40 and 45 minutes on math (11 using CSMP and ten using another math curriculum), it is important to note that 15 teachers using CSMP spent 60 minutes per day on mathematics instruction and only four teachers using a different math curriculum could admit to such a great mathematics time block (Small and Herbert, 5-C-1, 1978).

A total of 25 teachers were asked if they used supplementary materials while teaching with CSMP. The general pattern of supplementing within the CSMP program appears to be incorporating teacher-made

worksheets covering basic facts anywhere from once a week to two to three times each week. In addition to teacher made worksheets, several teachers reported using other math texts as well as commercial worksheets to supplement their math classes (Small and Herbert, 5-C-1, 1978). The report concluded that entry classes spent more time on mathematics instruction than the veteran teachers "and more of this time was devoted to supplementary work" (Small and Herbert, 5-C-1, pg. 10, 1978). In the early stages of CSMP instruction, it is likely that the entry classroom teachers were less confident in CSMP as well as in their own abilities to teach the program. Supplementing their students with outside mathematics sources could have alleviated some of the entry classroom teachers' anxieties about teaching the new program to their students.

When asked specifically about the spiral approach and its effectiveness, 14 of 31 teachers questioned reported that the spiral approach worked "well" with their students. Eight responded that this approach worked "so-so", and nine reported that the spiral approach worked "not well" with their students. Additionally, the teachers were asked whether or not

they deviated from the spiral approach. Eight teachers did not deviate at all, nine either repeated a lesson or reviewed a concept, two teachers used a couple of lessons in a strand a few days in succession, two more teachers reinforced a lesson(s) with additional worksheets, two spent more time on a particular lesson than recommended and finally, three teachers reported using something "other" than what they were instructed to use. The report found that the teachers of the entry classes were more frustrated with the spiral approach than the teachers of the veteran classes (Small and Herbert, 5-C-1, 1978). Further analysis of the responses to the questions concerning the spiral approach led Small and Herbert to conclude that:

> The judgement of how well the spiral approach went was one of the two questions on the questionnaire which drew the most diverse responses. Teachers of higher grade levels seemed less sold on the spiral approach, and most fourth grade teachers used one way or another of ensuring greater student understanding of a lesson, before going on in the schedule (5-C-1, pg. 20, 1978).

The spiral approach still proved to be a very

controversial aspect of CSMP.

The teachers were asked a few questions concerning their perceived opinions concerning students' achievement with CSMP. Fifteen teachers were asked to rate their students' overall achievement of the usual math skills and concepts with CSMP. When asked what this level of achievement is: no teacher responded "far less", two responded "a little less", four responded that their students achieved "about the same", seven teachers responded that their students achieved "a little more", and only two answered "far more". Twenty-five teachers were asked a second question concerning student achievement: The level of students' ability to do logical reasoning with CSMP. Zero answered "far less", "a little less", and "about the same". Eight answered that their students' ability was "a little more" and 17 answered "far more" (Small and Herbert, 5-C-1, 1978). The above responses show quite a bit of achievement for the students using CSMP as compared to the students before using CSMP. Twenty-one teachers were asked a similar question concerning their students' facility in solving word problems with CSMP. No teacher answered "far less", two teachers answered

"a little less", four answered "about the same", ten answered "a little more" and five teachers responded that their students ability to solve word problems with CSMP was "far more" (Small and Herbert, 5-C-1, 1978). Although no teacher reported feeling that his or her students were "far less" able to succeed using CSMP, there were a few responses that fell into the "a little less" category. Keeping this point in mind it is also important to note that the greater number of responses concerning student achievement using CSMP did fall into the categories such as "a little more" and " far more", illustrating that CSMP obviously does have its benefits.

One major aspect of the CSMP curriculum that appeared to be a controversial issue throughout the pilot program was the appropriateness of CSMP for different ability levels. The trend shows that many teachers feel that CSMP is not appropriate for low ability students. In 1978, when 26 teachers (of both veteran and entry classes) were questioned concerning the appropriateness of CSMP for low ability students as compared to other mathematics programs the following responses emerged: seven teachers responded that CSMP

was much less appropriate, five responded that CSMP was slightly less appropriate, eight said that CSMP was as appropriate, four answered that CSMP was slightly more appropriate, and two responded that CSMP was much more appropriate than other mathematic programs (Small and Herbert, 5-C-1, 1978). The breakdown of these responses in terms of entry level teachers versus veteran teachers was: "teachers of veteran classes tended to rate CSMP less appropriate for low ability students but higher in overall quality than teachers of entry classes" (Small and Herbert, 5-C-1, pg. 12, 1978).

The above findings and statistics are very telling of the pros and cons associated with CSMP in 1978. When teachers were given the opportunity to respond to a free-response question concerning their overall evaluations of the program, "virtually all teachers gave what might be called generally positive responses, but about one-third of the responses contained major reservations or qualifications" (Small and Herbert, 5-C-1, pg. 20, 1978). Below are some of the positive responses/attitudes that the teachers gave/had concerning the Comprehensive School Mathematics

Program. A veteran classroom teacher responded:

> Emphasis on thinking, deemphasis on rote computation and behavior. Teaching mathematics to kids who will live in an entirely different world - one automated and computerized and desperately in need of humans who will perceive clearly, analyze, synthesize, search out alternatives, weigh consequences, and above all , make logical, reasoned decisions. Hopefully the logic, intuition and reasoning skills learned in the math program will be guided by carefully thought out and evaluated human values nurtured in humanities programs (Small and Herbert, 5-C-1, pg. 36, 1978).

A second veteran teacher responded briefly: "Practical application, reasoning skills, and mental computation are noticeably improved" (Small and Herbert, 5-C-1, pg. 36, 1978).

The entry classroom teachers also had many positive things to say about the program: "I think it's super that the 'concepts' part of testing has improved over the 'computation' part - it used to be the other way around" (Small and Herbert, 5-C-1, pg. 36, 1978).

A second entry classroom teacher responded: "There is a high interest level maintained through the tight spiral approach and through the many motivating techniques used to present concepts. A variety of ability levels is provided in the written work" (Small and Herbert, 5-C-1, pg. 37, 1978).

When both groups of teachers were given the opportunity to respond to the question, "What do you think are the worst aspects of CSMP?", there was not a shortage of responses. One veteran teacher answered:

> Ways to convince the administration of its value. I'm very sorry to say that our administration has cut the program in 4th Grade after just one year. They realize the value of the program in teaching concepts, applications, reasoning, etc. from K to 3, but feel that we must concentrate on computational skills from that point. I can't convince them that computation skills are being taught in the program. They also don't want to be out the expense of training two more teachers 40 hours each. I am more than willing to teach all three sections of math, but the other two 4th Grade teachers and the administration want us in

> self contained classrooms with all teachers teaching all subjects (Small and Herbert, 5-C-1, pg. 38, 1978).

Another veteran classroom teacher responded:

> Entrance of new students and exit of CSMP students to other programs appear to be the most serious problems about CSMP math. The spiral technique could also bother some people; I was not faithful about following it - I went over problems before proceeding (Small and Herbert, 5-C-1, pg. 38, 1978).

A third response:

> Very little allowance made for slow learners in math. The different level worksheets are not enough for the students who can not even grasp the basic concepts taught in the lesson. The whole lesson has to be geared down for them (Small and Herbert, 5-C-1, pg. 39, 1978).

Thus, teachers had many different responses for this question.

The entry classroom teachers felt the same way about the inappropriateness of the program for low ability students: "The materials for the individual

lessons do not take into account the ability levels of low functioning students. Perhaps a book below 1 star would be appreciated" (Small and Herbert, 5-C-1, pg. 40, 1978). Similarly: "Children with visual problems would have a difficult time with many lessons. There could be more emphasis on basic facts and the standard algorithms for computation" (Small and Herbert, 5-C-1, pg. 40, 1978). One teacher commented specifically on the assessment procedure for CSMP: "I wish there were easier ways of checking. And we have to give better grades. I give numerical grades on workbooks" (Small and Herbert, 5-C-1, pg. 40, 1978).

By 1978, The Comprehensive School Mathematics Program had come a long way. Nevertheless, there were still areas of the program that needed to be reviewed and adjusted. As the pilot study continued, so did the development and mastery of CSMP.

A Rapid Implementation Model of the CSMP Program

Between 1978 and 1980, a Rapid Implementation Model of CSMP was created and tested. Two schools were used to test the Rapid Implementation project. One was located in a large, Southern city and the other was in a medium sized, Midwestern suburb (Herbert, 7-B-6,

1980). The basics of the Rapid Implementation Modal are described below:

> A series of tests was administered in the spring of 1978, 1979, and 1980. The purpose was to compare, at a given grade level, the performance of students: before the introduction of CSMP (1978), after a year's experience with CSMP (1979), and after two year's experience with CSMP (1980). The tests were administered in grades 2-4 (Herbert, 7-B-6, pg. 2, 1980).

It is interesting to note that CSMP was originally developed to be introduced sequentially to one grade at a time. The previous interviews and questionnaires were gathered from teachers who taught CSMP in the sequential fashion. In this particular part of the pilot study, several grades were introduced to CSMP concurrently in order to "compress the implementation effort into a single year of concentrated effort" (Herbert, 7-B-6, pg. 3, 1980).

The participating schools in this "concurrent implementation" model should be detailed further. School A: an inner city school in a southern city, grades K-6 with 150-200 students per grade level,

student and teacher population virtually all black, rather low student achievement; mean percentile ranks of 35-40 on standardized achievement tests, used two resource teachers to train teachers in the regular classrooms over the course of the year (Herbert, 7-B-6, 1980). School B: a school in an older suburb of a large midwestern city, grades K-5 with 70-90 students per grade level, student population mostly white, though the district is more than 50 percent black, generally very high student achievement; mean percentile ranks of 75-85 on standardized achievement tests (Herbert, 7-B-6, 1980). The CSMP functions within each of these schools were studied and tested over the course of three years. The results, and how they were gathered, are quite interesting and surprisingly similar within both schools.

There were three methods of testing the CSMP progress within both schools: a) The math subtests of whatever standardized tests were routinely used by the district. The data was provided by the respective school districts. b) The MANS tests, a series of short test scales designed for previous evaluation studies by CEMREL's Mathematics Research and Evaluation Studies

program. Most of these tests were intended to assess some of the underlying thinking skills of CSMP without using any of the terminology or problem situations of the program. c) The reading comprehension test of standardized test used by the district. The data from these tests served as an indicator of whether or not the various groups of students to be compared were of similar ability levels (Herbert, 7-B-6, 1980).

The first spring that the Rapid Implementation Program was in effect (1978), testing was performed on the students that had no CSMP experience. In the spring of the second year (1979), the students who were completing their first year of CSMP were tested. In the spring of the third year (1980), the students who were completing their second year of CSMP were tested.

The results of the Rapid Implementation Model were gathered over the course of three years using three different methods of testing. Herbert concluded the following:

(1)On the MANS tests, there was from 1978 to 1980 significant improvement at every grade level and this improvement was very consistent with CSMP/non-CSMP comparisons made previously with the

same tests. (2)At second grade this improvement took place in the first year, from 1978 to 1979, with no further change from 1979 to 1980. At third and fourth grades, there were modest gains the first year and further gains the second year. (3)The kinds of tests on which the 1980 students did relatively best - number relationships, mental arithmetic and estimation - were also ones for which there had been a demonstrated CSMP superiority in previous studies. And finally, on standardized tests, at second grade, there was virtually no change at either school in math scores relative to reading scores. At third and fourth grades there was usually a small decrease in the first year of CSMP followed by a more-than-compensating gain the second year; scores on the Concepts tests always increased relative to Computation scores (Herbert, 7-B-6, p. 2, 1980).

The Rapid Implementation Model, in its fleeting existence, provided a good deal of useful information for the CSMP team to further ponder.

The Ninth Year of the CSMP Program

CEMREL continued its pilot program and in 1982

administered a series of mathematics tests to 26 sixth grade classes using CSMP and to 37 classes using more traditional mathematics programs. The published report included the test data and also some non-test data such as teacher attitudes and the ways in which CSMP was implemented. Many of the findings in 1982 are valuable and worth discussing (Marshall and Herbert, 9-C-1, 1982).

To begin, it is important to note the characteristics of the participating schools. Except for two districts, all of the CSMP classes had studied CSMP since kindergarten or first grade. The two districts that did not begin CSMP in K or 1st grade began in the 3rd grade and 5th grade. The 37 non-CSMP classes were slightly higher in ability than the CSMP classes. However, both the CSMP and non-CSMP classes "tended to be far above average in ability, with approximately half of them scoring above the 75th percentile on the vocabulary test for both CSMP and non-CSMP" (Marshall and Herbert, 9-C-1, pg. 2, 1982).

The teachers in all the schools, both CSMP and non-CSMP, were given questionnaires similar to those administered in 1978. On the 1982 questionnaire, the

questions dealt primarily with the following issues: teacher experience, classroom data, lesson coverage, teacher attitudes, and overall evaluation of the program being used. Unlike the results of the 1978 questionnaire, which focused on the differences between a veteran CSMP classroom and an entry CSMP classroom, the results of the 1982 questionnaire dealt specifically with the differences between a CSMP classroom and a non-CSMP classroom. The differences that appear between these two situations in some instances will appear more vast and polar than in the 1978 results because of the circumstances of the setting.

The following results concerning the implementation of the program were gathered from the responses of 22 CSMP teachers, representing 27 CSMP classes and by 26 non-CSMP teachers, representing 31 non-CSMP classes (Marshall and Herbert, 9-C-1, 1982). Many of the initial classroom characteristics show similarities between the CSMP and non-CSMP classrooms:

> CSMP teachers are similar in teaching experience to non-CSMP teachers. In both groups, more than seventy percent of the teachers surveyed had more

than ten years experience and neither group had first year teachers. However, while a quarter of the CSMP teachers have taught only sixth grade, versus four percent of the non-CSMP teachers, only four percent of them have taught sixth grade plus higher grades, versus almost a quarter of the non-CSMP teachers" (Marshall and Herbert, 9-C-1, pg. 4, 1982).

Another similarity between the CSMP and non-CSMP classrooms pertained to the actual classroom data of each classroom: CSMP and non-CSMP teachers were similar in that roughly half their classes were ability grouped, homework was regularly assigned to a majority of their classes, and few had aides regularly assigned. However, three times as many CSMP classes as non-CSMP classes used hand calculators (Marshall and Herbert, 9-C-1, 1982).

The mean number of minutes spent on mathematics in the CSMP classes was 54. In the non-CSMP classes, the mean number of minutes spent on mathematics was 51. Again, there was a similar characteristic between the two types of classrooms (Marshall and Herbert, 9-C-1, 1982). There was, however, a difference between the

percent of this time spent on teacher-led work versus individual work or small group work. In the CSMP classrooms, 67 percent of the mathematics time was spent on teacher-led work and in the non-CSMP classrooms 44 percent of the time was spent on teacher-led work. In the CSMP classrooms, 11 percent of the time was spent on individual work and 22 percent on small group work. In the non-CSMP classrooms, 19 percent of the time was spent on individual work and 37 percent was spent on small group work (Marshall and Herbert, 9-C-1, 1982). There were, therefore, dissimilar break-ups of time within the similar mathematics means of time allotted for mathematics.

Like the results of the 1978 questionnaires indicated, the 1982 questionnaire also showed that a large percent of the CSMP teachers supplementing their lessons in some way or another (93 percent). The 1982 results showed that 100 percent of the non-CSMP teachers supplemented their lessons as well. The majority of CSMP teachers who supplemented their lessons did so in the areas of basic operations/computation, basic operations with fractions, and decimals (Marshall and Herbert, 9-C-1,

1982). The non-CSMP teachers seemed to "supplement over a broader array of topics including many that could be called 'enrichment' (Marshall and Herbert, 9-C-1, pg. 8, 1982). The supplementing in CSMP classrooms usually occurred for a few minutes about every day. Non-CSMP teachers tended to supplement more freely and for longer lengths of time (Marshall and Herbert, 9-C-1, 1982).

Again, like in the 1978 questionnaire, the teachers were given the opportunity to comment on their perceptions of the best and worst aspects of CSMP. The following are some of overall positive comments from the teachers of CSMP:

> It challenged students, fostered the development of analytical thinking, and encouraged creativity. To CSMP teachers the fact that CSMP stressed more than basic skills was a strong point, and they also mentioned that their students were enthused and motivated by the program (Marshall and Herbert, 9-C-1, pg. 18, 1982).

Marshall and Herbert (9-C-1, 1982) found that the non-CSMP instructors believed their programs provided for individualization and ability grouping. They thought

their programs benefitted average and below average students more than many programs, and commented on the organization and logical presentation of their texts. The teachers of CSMP, in the 1982 questionnaire did not ever specifically comment that they felt the program was beneficial for below-average students. Again, it can be seen that perhaps CSMP does not suit the needs of the low-ability students like some other mathematics programs do.

In responding to the question of "what are the worst aspects of your present program and what changes in content do you recommend?" the following was a response from a CSMP teacher:

> Dealing with low students on lessons that are heavy in logical thinking. Hard to reteach; help to have extra examples on strategies for low ability students with their shorter attention span, we need more explanation to help us prepare lessons (Marshall and Herbert, 9-C-1, pg. 28, 1982).

Interestingly, one non-CSMP teacher responded to the same question: "I prefer the spiral approach of CEMREL. Our present program masters one topic before moving on"

(Marshall and Herbert, 9-C-1, pg. 29, 1982). There were many varying responses to the opinion questions about the best and worst aspects of CSMP and the other mathematics programs being used. While some teachers were dissatisfied with CSMP, other teachers not using CSMP wished that they were. The question seems rather a matter of opinion and perhaps more choice should be offered within particular school systems in order to obtain the most positive and beneficial mathematics achievement in all classrooms.

Final Evaluation Report of the CSMP Program

In 1984, Martin Herbert drafted a Final Evaluation Report of the Comprehensive School Mathematics Program. In order to avoid repetition, the details of his findings will be omitted and listed here will only be the major, most important findings of his report. The first portion of his report focused on the effects of CSMP on the students. Herbert stated:

> The most important conclusion is that CSMP does teach problem solving skills better than the standard textbook curricula. This could be the result of many factors: the special languages, the CSMP content and organization, or the classroom

methods espoused in the teacher training and prescribed in the Teacher's Guides (Herbert, pg. 159-160, 1984).

Secondly, Herbert concluded that

> The original CSMP belief that merely doing computations as part of the problem activities will develop computational skills as well as the traditional program does is not justified by test data - CSMP students fall somewhat behind their peers (Herbert, pg.159-160, 1984).

Herbert's third conclusion was the following:

> The CSMP belief that emphasizing problems in a group setting and posing problems directly in the CSMP languages will develop adequate skills in word problems is justified by test data (Herbert, pg. 159-160, 1984).

Fourth, Herbert suggested that "there are two ways in which the evaluation results, particularly in the upper grades, probably underestimate the CSMP effects on students (Herbert, pg. 159-160, 1984). One reason for this was that the teachers were not adequately experienced in CSMP, and the other reason was that students probably know more mathematics than the

evaluation results indicated. Herbert's fifth conclusion concerning the effects of CSMP on students was that CSMP has positive effects on students at all ability levels.

> The gains for higher ability students are somewhat higher than for lower ability students which seemed to serve as the assumption that the program was not adequate for these low-ability students (Herbert, pg.159-160, 1984).

Herbert's final conclusion concerned the spiral approach:

> The overall effect of CSMP's spiral curriculum, in combination with CSMP's other distinctive characteristics, is positive, but not enough is known about how the mechanics of the spiral curriculum affect student learning at different points in time (Herbert, pg. 159-160, 1984).

Herbert's extensive work with CSMP during the 15 year Pilot Trial Program led to many important CSMP conclusions. After the 15 year pilot trial program, CSMP gained popularity in other states around the country.

CHAPTER THREE

DESIGN OF THE STUDY

Sample

The researchers were fortunate enough to find a sample of teachers who were enthusiastically willing to assist in the active research. Being all female, these teachers' ages ranged from approximately 25 to 45 years. The majority of the teachers surveyed had their Master's Degrees, and all of them had been in this particular school system for more than one year. The school is nestled in a rural county in central Virginia and serves a diverse socio-economic population of students. It is interesting to note that this is one of 14 school districts in Virginia currently using the CSMP program (National Diffusion Network, 1993). Of the ten surveyed teachers, seven are trained users of the CSMP program. The three remaining teachers currently utilize another mathematics program of their choice.

Measures

All ten teachers were given one of two types of extensive long-answer surveys. The format of these surveys was based on similar questionnaires and interview questions from the Extended 15 Year Pilot Trial of CSMP. The teachers using the program were

appropriately given a CSMP-based questionnaire. A second survey was created for those teachers not implementing CSMP. This second survey focused on understanding the reasons why these teachers chose to not use the program. A complete copy of each survey can be found in Appendix I (See Appendix IA and IB).

Design

The researchers followed a simple four-step design in order to complete the study. First the researchers drafted, revised and finalized both surveys. Second, these surveys were given to the appropriate teachers within the school of study. Lastly, the surveys were returned and then analyzed.

Analysis

Both surveys were analyzed separately. Further, each survey was organized so that each question fell into a particular category. This format enabled the researchers to tabulate the results of each question within both surveys. By following this process, the researchers were able to draw relevant conclusions from the data.

Summary

Chapter Four will elaborate on the results of the analysis. The chapter will reveal how the information obtained from the surveys was contrary to the original hypothesis. In addition, the researchers will explain why and how a diverse and varied use of CSMP within a classroom and across classrooms can be effective. Evidence will show how the active research agrees with the literary research in showing that there are specific flaws within the originally designed CSMP program. Finally, the researchers will analyze the ways in which a diverse, school-wide mathematics program can compensate for pre-existing flaws in the CSMP program.

CHAPTER FOUR

ANALYSIS OF RESULTS

Before beginning the analysis, it is necessary to restate the original hypothesis in order to make a worthwhile comparison with the results. In the study, the researchers had expected to find that CSMP is effective only if performed according to CSMP's strict and uniform teaching guidelines. This effectiveness was measured solely on teachers' attitudes and personal opinions about what was effective.

The measurements were based on the teacher responses gathered from the extensive CSMP-based surveys. Because the focus was on one specific school, the respondents were few in number. All seven of the teachers using CSMP in the classroom completed the surveys. In addition to these seven, three teachers familiar with, but not using the program, completed a separate survey. The analysis of these non-CSMP teachers will be discussed at the end of the analysis. Thus, the results discussed in this chapter are primarily those gathered from the CSMP teacher surveys.

All surveyed teachers received the same amount of original CSMP training, and most were pleased with this preparation. Prior to their instruction of CSMP, each teacher received a two day inservice lead by their

school math coordinator. In addition to the original two day inservice, two surveyed teachers had received ten to fifteen additional hours of CSMP instruction since they began teaching the program. Most of the teachers were satisfied with their CSMP training and felt confident in teaching CSMP. Thus, it appears that the two days of training is ample time for CSMP teacher preparation. As one teacher mentioned in her survey, "without the two day inservice, I would not have been adequately prepared to teach CSMP." In comparison to the teachers surveyed throughout the literature review, these surveyed CSMP teachers received far less training, yet they felt this preparation was sufficient.

The teachers' time and management of their mathematics curriculum were similar with one another; however, there were some differences worth discussing. Every teacher spent an average of 40 minutes a day on math instruction. Within this 40 minute mathematics period, there were vast differences in how many actual minutes were devoted to CSMP instruction. While some teachers spent the majority of their math period on CSMP, others used CSMP for only one hour during the

week. The teachers were similar in that they all supplemented their CSMP instruction. The amount of supplementing varied from 30 minutes a week to every day. Some of the most mentioned supplemented topics included place value, multiplication and pencil and paper skills. Other topics listed included money and time. It is interesting to note that the need to supplement CSMP with pencil and paper skill practice also appeared in the Pilot Trial.

The teachers found that the CSMP materials provided an adequate means of assessing student progress. Teachers usually agreed that the CSMP workbooks, worksheets and manipulatives illustrated enough evidence of student progress. However, teachers often preferred to supplement CSMP materials with their own assessment tools. Some of these assessments included observation and pencil and paper tests. While teachers found that the CSMP materials were effective, they were equally divided over the issue of managing the materials. Some teachers found the amount of CSMP-related materials overwhelming, while others found them easily manageable.

Because the teachers in the school of study are

given the freedom to vary within the CSMP framework, it is only logical that teachers will cover different amounts of the CSMP curriculum throughout the year. Teachers freely omit or repeat specific lessons and topics from the recommended guidelines. These specific lessons and topics varied widely among all teachers. Thus, it would follow that the teachers do not all use the spiral approach which is the core of the CSMP philosophy.

Like the teachers surveyed in the literature review, these CSMP teachers also found inherent problems and shortcomings with the spiral approach. Some found it perfect for fast-paced students, while other teachers found that their special needs students struggled with the approach. Teachers responded that special needs students needed more mastery of topics before proceeding with the rest of the mathematics curriculum. As one teacher commented: "The spiral approach does not work well with special needs students. These students need a little more repetition of concepts and skills." Thus, the teachers feel they make the program effective by providing various forms of help for these students. This help is given in the

form of small group help, individual help with the teacher, use of a lower than level CSMP teaching guide and peer tutoring.

There were a variety of skills that the students in the surveyed school lacked at the beginning of each year that the CSMP program seemed to expect of them. Teachers listed the following skills as ones their students were lacking: the use of the minicomputer, critical thinking skills, place value, and better understanding of multiplication. At the first grade level, it is particularly important to note teacher responses to this question. CSMP assumes that early age students are familiar with number recognition and number writing, and this assumption presented a problem in the surveyed school. One first grade teacher responded that her students laked "concept of addition, numeral recognition and the mechanics of writing numerals."

While teachers found that the CSMP program contained these problems, the majority of the surveyed teachers were satisfied with the quality of CSMP in comparison to the other programs that they had used. Like teachers in the literature review, these teachers

found that students were a little more interested and involved with CSMP than with other math programs. Teachers also found that their CSMP students were a little more successful in the overall achievement of the usual math skills and concepts. Additionally, teachers believed that the CSMP students were a little more able to perform logical reasoning in comparison to their previous non-CSMP students. While teachers were divided on the degree to which CSMP students were able to successfully solve word problems, none felt that students solved word problems less successfully than any of their previous non-CSMP students. Like the literature review, the opinions of the teachers concerning the appropriateness of CSMP for lower ability students was evenly distributed ranging from much lower to much higher. However, the teachers did agreed that the overall quality of CSMP is slightly higher than their previous mathematics programs.

Similarly, those teachers surveyed who are not using the program commented that the CSMP reputation was quite positive throughout the school. Although they had positive opinions about the program, they did not use CSMP for three specific reasons. These reasons

were not related to the quality of CSMP but rather to the lack of time, scheduling and training. It is important to also note that these teachers were content and satisfied with their personal programs.

The final question of the survey enabled CSMP teachers to respond to the open-ended questions concerning their opinions on the best and worst aspects of the CSMP program. Teachers had many positive comments about CSMP. One of the most frequently listed aspects involved the promotion of good thinking and logical reasoning skills. Some of the other listed areas included motivation resulting from mental math and the challenging fast-paced material.

Like the teacher responses in the literature review, these teachers listed some of the same worst aspects of the CSMP program. These areas included: difficulty for lower ability students, lack of word problem practice, lack of paper and pencil practice, deficiencies in lessons concerning time, money, measurement and place value, and overabundance of CSMP materials.

There are overlapping themes both in these survey results and the results from the literature review.

There are similar positive and negative aspects of CSMP listed by both groups of teachers. The teachers surveyed in the literature review were following the strict and uniform guidelines of the CSMP program. These teachers, because they were offered freedom within the framework of CSMP, were able to compensate for the negative aspects that they encountered in the program. This compensation was achieved by omitting and supplementing lessons, topics and parts of the spiral approach. This liberal method of instruction counterbalances the inherent flaws in CSMP. Thus, a varied approach to CSMP can exist successfully in a school.

CHAPTER FIVE

SUMMARY AND CONCLUSIONS

Through the extensive literary and active research dealing with CSMP, the researchers have completed a number of important and noteworthy processes. Initially, they formed a general hypothesis about the effectiveness a regimented use of CSMP in the classroom. Their belief was that CSMP would be effective only if performed across all grade levels and within each classroom of a school. The goal in this project was to determine the validity of this hypothesis. In the extensive literature review, the researchers were able to note specific pros and cons associated with the strict use of CSMP according to CSMP guidelines. They created their own long-answer style survey similar to those in the literature review in order to gather teacher opinions in their school of study concerning teacher styles in implementing CSMP. The survey was the result of a need felt by the school of study to determine the existing attitudes about CSMP. From the survey the researchers were able to not only obtain data but also compare the data to the survey results found in the literature review. At this point, the researchers are able to make some overall relative conclusions about the effectiveness of CSMP in

a setting that does not adhere to the regimented CSMP guidelines. The conclusions are based solely on teacher opinions and attitudes within the school of study.

Conclusions:

1. CSMP can be effective when used fairly sporadically throughout the school year and throughout the school itself.

2. The program presents a problem in its use with lower ability students. However, when given the freedom to supplement and vary the program, teachers are able to compensate for this weakness.

3. Teachers felt that the CSMP curriculum to failed to stress certain concepts and skills that they find as important and necessary parts of a mathematics program. Primary among these concepts are paper and pencil skills, money, multiplication and place value.

4. Teachers felt that CSMP provided excellent development of critical and logical thinking skills.

5. Both users and non-users of CSMP in the school of study found the quality of the program to be above average.

6. Teachers were satisfied with less than the CSMP

recommended training time. They felt confident and prepared after a two day CSMP inservice.

7. Teachers reached a general consensus that the spiral approach was too fast paced for lower ability students who need more immediate repetition of concepts and a feeling of concept mastery. Thus, teachers did not always rigidly follow the spiral style that is the core the CSMP guidelines. Further, the researchers conclude that the spiral approach does not have to be strictly followed in order to obtain successful results.

The active research was able to provide ample information from which the researchers could make many conclusions within one particular school. While this information is quite valuable, a need still exists to further the study on the effectiveness of CSMP. The researchers believe their results could be made more or less valid with a study examining student opinions, attitudes and achievement levels while using CSMP. This study should closely examine the effects of a student's varied exposure to CSMP throughout his/her elementary years. Nevertheless, the researchers feel that the quality of CSMP is worthy of continual efforts to successfully implement this program in schools.

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APPENDIX I

APPENDIX IA

I. Background Information

1. Name:_____

2. School:_____

3. Grade:_____.

4. Have you taught CSMP before this year?_____ If yes, what grades and how many years?_____

II. Teacher Training

1. How many hours of CSMP training did you receive before beginning to teach CSMP? _____

2. Have you received any additional training since you began teaching CSMP? If yes, how many additional hours?

_____

3. Describe the type of training you received prior/during your teaching of CSMP. Please include the person(s) who were responsible for your training?

_____

_____

_____

_____

4. Do you feel that your training adequately prepared you to teach CSMP? Please give reasons for your answer.

_____

_____

_____

_____

5. What do you think is the minimum preparation a teacher would need to successfully teach CSMP?

_____

_____

_____

_____

III. Time and Management

1. How many minutes per day do you devote to math instruction?

_____

2. How many of those minutes are devoted to CSMP instruction?

_____

3. Have you increased or decreased the amount of time you spend on math since you started using CSMP in your classroom? If so, by how much? Or has your mathematics time remained the same?

_____

4. Do you supplement your CSMP program in any way?

_____

_____

If yes, how often do you supplement? (For example - 10 minutes a day, 3 times a week, 2 months)

_____

_____

_____

If yes, are these primarily:

some other math text? _____

commercial worksheets? _____

teacher made worksheets? _____

other? _____

other manipulatives? _____

Covering what topics?

_____

_____

_____

_____

5. Do you find that CSMP requires more or less time in teacher led work with the whole class than other math programs you have used?

_____

_____

_____

6. Do you like this aspect of CSMP? Why or why not?

7. Do you find that CSMP teacher preparation time is more or less or the same as with other math programs?

IV. Management of Materials

1. In what ways do you assess your students' achievement within the CSMP program?

2. Do the workbooks, worksheets and manipulatives tell you enough for you to make evaluations of the students' progress?

3. Is there enough information from workbooks, worksheets and class activities to help you decide when a student needs individual help? If not, how do you decide who needs extra help?

4. Should tests be built into the materials at certain places? Why or why not?

5. Do you find it to be a problem to keep track of program materials (workbooks, worksheets, manipulatives)? Please explain.

V. CSMP Scheduling

1. How far in the CSMP schedule do you think you will get by the end of the school year?

2. What changes if any have you made in the schedule:

Omitted lessons:

Repeated or extended lessons:

Rearranged the sequence of the lessons:

Other:

VI. Student Skills

1. Were there any skills that your students lacked at the beginning of the year that the CSMP curriculum seemed to expect of them? If yes, in what areas were your students lacking?

2. Are there any skills that your CSMP students do not have now that you think that most of them should have? If so, what skills?

_____

_____

_____

_____

VII. Spiral Approach

1. In the CSMP spiral approach, the teacher goes on to the next lesson in the strand, even though it may appear that not all the students may have understood the lesson.

How does this approach seem to work with your students?

_____

_____

_____

In what ways, if any, do you find it necessary to deviate from CSMP's spiral approach?

_____

_____

_____

VIII. Lessons

1. For which of the following strands do you think there are too many lessons in the Guide? Too few lessons?

	Too Many	Too Few	About Right
World of Numbers	☐	☐	☐
Languages of Strings & Arrows	☐	☐	☐
Geometry & Measurement	☐	☐	☐
Probability & Statistics	☐	☐	☐

IX. Comparison of CSMP to Other Programs

1. **Compared to previous mathematics programs you have used**, how does CSMP compare on the following items? (please circle)

a) Student interest and involvement with CSMP is:
far less a little less about the same a little more far more

b) Students' overall achievement of the usual math skills and concepts with CSMP is:
far less a little less about the same a little more far more

c) Students' ability to do logical reasoning with CSMP is:
far less a little less about the same a little more far more

d) Students' facility in solving word problems with CSMP is:
far less a little less about the same a little more far more

e) Overall quality of CSMP is:
much lower slightly lower about the same
slightly higher much higher

f) The <u>appropriateness</u> of CSMP for lower ability students is:
much lower slightly lower about the same
slightly higher much higher

X. Students Having Lower Mathematical Abilities

1. What type of special help do you give to slower students?

_____

_____

_____

2. How appropriate is the spiral approach for slower students?

_____

_____

_____

3. Which of the CSMP lessons do you find most appropriate for slower students?

Least appropriate?

XI. Parent Reactions

1. What types of parent reactions have surfaced since the implementation of CSMP in your classroom?

2. Have there been any presentations/workshops for parents/and or community groups? If yes, please describe the attendance and success rate.

XII. Best and Worst Aspects of CSMP

1. What do you think are the best aspects of CSMP?

2. What do you think are the worst aspects of CSMP?

3. What is your overall evaluation of CSMP?

APPENDIX IB

I. Background Information

1. Name: _____
2. School: _____
3. Grade: _____
4. What is your current mathematics program?

_____

_____

II. Comprehensive School Mathematics Program (CSMP) Knowledge

1. Are you familiar with the CSMP program? If so, how did you become knowledgeable of the program?

_____

_____

_____

If so, what are your opinions of the program?

_____

_____

_____

_____

If so, why did you choose not to use CSMP in your classroom? (this can include strictly opinions as well as other specific reasons why you were not able to use CSMP)

_____

_____

_____

_____

_____

_____

_____

III. Your current mathematics program

1. Briefly describe what areas in your program (ex. geometry skills, computational skills, logic skills, basic facts, etc.) you feel your students understand well.

2. Describe those areas which you feel your students have not adequately mastered.

3. How are students assessed within your current math program?

Are you satisfied with this assessment routine? Why or why not?

4. Were you required to attend any training sessions/workshops before implementing your current math program? If so, please describe the type and length of training.

IV. Time and Management

1. How many minutes per day do you devote to math instruction?

Do you feel that you spend too little time, adequate time or too much time each day for math instruction?

2. How much time do you spend preparing each day's math lesson?

Do you feel that you spend too little time, adequate time or too much time in preparation for each day's math lesson?

IV. Student Attitudes

1. Do you feel that your students are adequately interested and involved with your current math program? Please explain.

V. Students Having Lower Mathematical Abilities

1. What type of special help do you give to slower students?

2. Are you able to adjust your program to suit the needs of your lower ability students? If so, how?

VI. Parent Reactions

1. What types of parent responses, if any, have you received concerning your current math program?

2. Have you received any parent interests in the CSMP curriculum? If so, please describe.

3. Have there been any presentations/workshops for parents on your particular math program? If so, please describe.

VII. Best and Worst Aspects of Your Math Program

1. What do you think are the best aspects of your program?

2. What do you think are the worst aspects of your program?

3. What is your overall evaluation of your program?