An Evaluation of the Connected Mathematics Project

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ABSTRACT A formative, internal evaluation was conducted on the Connected Mathematics Project (CMP), a middle school reform mathematics curriculum used in Lafayette Parish, Louisiana, by the author (lead teacher of said project). Approximately 3,500 students in this public school system were enrolled in this program, and the district school board planned to expand the program to include all 12 public middle schools. An analysis of the Iowa Test of Basic Skills and the Louisiana Education Assessment Program mathematics data indicate that the program is working: The CMP schools significantly outperformed the non-CMP schools on both standardized tests. Questionnaires distributed to the teachers and to a sample of the students indicated that both groups believe the program is helping students become better problem solvers.

Key words: Connected Mathematics Project, high-stakes testing in Louisiana, middle schools

With the implementation of high-stakes testing in Louisiana, educators are introducing many new programs with varying strategies in the schools. Using these new programs, educators propose to produce more favorable outcomes than have been produced by traditional curricula. The state standards have been revised to reflect more critical thinking and application objectives, and intense professional development is emerging to train teachers to meet the challenge of Louisiana’s accountability program. Unfortunately, students in traditionally low-performing schools are still at the greatest risk of remaining at the low end of the schools’ “success” ratings, in part because of the different backgrounds and experiences they bring to the school setting (S. Caldas, personal communication, October 19, 2000). If new programs are to improve this situation, they must be workable solutions for all levels of students.

I conducted a formative internal program evaluation of the Connected Mathematics Project (CMP), a middle school reform mathematics curriculum used in Lafayette Parish, Louisiana. I designed this evaluation for my study of the viability of this program in improving achievement and meeting the standards in the area of mathematics in the middle schools in the parish. I collected and analyzed relevant information to determine the worth of the program. This evaluation should not be confused with traditional evaluation research, which according to Worthen, Sanders, and Fitzpatrick (1997), “employs rigorous social science research methodology” (p. 6). Formative evaluations are valuable for diagnostic purposes to provide information that could lead to program improvements. I have taught in Lafayette Parish for 17 years, and, as the lead teacher of CMP, am extremely familiar with the program and population involved in the study. Because I have access to, and a good working relationship with, the personnel and students involved, I can obtain data and gain insights that may not be available to an outsider. In addition, because the study is formative, “possible lack of objectivity is not nearly the problem it would be in a summative evaluation” (Worthen et al., p. 19).

Program Description and History

CMP is a standards-based, problem-centered curriculum designed for middle school students. The program is “devoted to developing student knowledge and understanding of mathematics that is rich in connections” (Lappan, Fey, Fitzgerald, Friel, & Phillips, 1996, p. v) to other mathematical concepts and to real-world applications. CMP began as a National Science Foundation grant project, which was developed at Michigan State University by five university faculty members and piloted by classroom teachers during a 6-year period. This ambitious undertaking stemmed in part from criticism rendered after the results of the Third International Mathematics and Science Study (TIMSS) were released. In the TIMSS project, mathematics and science achievement of more than half a million students from more than 40 countries was compared (Beaton, Mullis, Gonzalez, Kelly, & Smith, 1996). The authors of the TIMSS analysis harshly criticized the K–8 mathematics curriculum in the United States, pointing to fragmentation of knowledge and lack of attention to conceptual understanding and problem-solving strategies (Silver, 1998). The U.S. curriculum was found to be low level, repetitive, and too broad.

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CMP consists of 24 related units, each covering one major concept and its related topics in depth, using a "hands-on," problem-solving methodology (Lappan et al., 1996). All five major strands of mathematics (i.e., data analysis and probability, number sense and operations, geometry, measurement, and algebra) are addressed at all three grade levels. In the sixth grade, students spend between 5 and 8 weeks each on units covering data collection and analysis, fractions, decimals and percents, area and perimeter, properties of shapes and angle measures, and number theory (factors and multiples). They collect data and solve real-life problems in groups in a collaborative effort to discover patterns and relationships in mathematics (Lappan et al., 1996). The teacher introduces the problem but does not give students algorithms to memorize or copy. The students must think through a different but related problem each day and develop their strategies for solving it, using whatever concrete materials they need to "see" the big idea. The teacher's major role is to guide the students to their own discovery of a pattern or concept. Throughout each unit of study, students verbalize and explain their techniques, which foster greater understanding and retention of mathematical ideas (Lappan et al.). From problem to problem within a unit, from one strand to another, and from unit to unit within the entire curriculum, these mathematical ideas are connected to each other and to the students' real world outside of school.

The curriculum is spiral; that is, the mathematical ideas are revisited from unit to unit and grade to grade in successively sophisticated ways rather than repetitively (Lappan et al., 1996). In the seventh grade, students revisit fractions, decimals, and percents and study the topics of probability, variables and patterns, similarity and integers, and the use of graphing calculators, thus using rather than repeating the mathematical ideas and strategies they learned in the sixth grade. For example, the conceptual understanding developed in the sixth grade of what fractions and decimals are and how they relate to their own lives is applied in the seventh grade when students learn about experimental and theoretical probability, sales tax and discounts, and similar figures. These ideas are further expanded the following year when the students, as eighth graders, delve into proportional reasoning, quantitative variables, and the probability of dependent events (Lappan et al.). Also at this grade level, the students connect their previous understanding of area and perimeter to their study of the Pythagorean theorem and volume and surface area. They develop algebraic reasoning while analyzing linear and nonlinear functions, which begins as an understanding of variables and patterns developed in the seventh grade.

Although the curriculum is well mapped out and sequenced, there is some flexibility as to what units are taught and in what order. To some degree, with this flexibility, individual teachers, schools, and districts can adapt the program to fit their respective needs. Because units are taught for an average of 6 weeks each, one cannot cover all 24 books in 3 school years. Teachers may need to omit one or two units at each grade level. These units, such as transformational geometry and additional data analysis, are optional in regular classes and are categorized by CMP authors and teachers as enrichment topics (J. Fey, personal communication, February 26, 2000). Eighth graders who study Algebra I cover the books on symbolic algebra, exponential growth, and quadratic functions in lieu of the proportional reasoning and volume and surface area units taught in the regular eighth-grade classes.

G. Lappan (personal communication, June 15, 1998) said that the major goals of CMP are to foster a greater appreciation and understanding of mathematics, to improve critical thinking and problem-solving skills in mathematics, and to increase the ability to see and apply mathematics in everyday life. Ideally, the program is phased into a school beginning in the sixth grade, adding the seventh grade the following year, and the eighth grade in the 3rd year. This method allows students to adjust over time to the constant problem solving and in-depth learning of fewer topics. In addition, it provides teachers with "a deeper knowledge and a broader view of mathematics as well as a deeper knowledge of pedagogy based on inquiry" (CMP, May 26, 1999) so they can effectively implement the program. Professional development, or teacher training, then, is an important component of successful CMP implementation. The teacher becomes both a student and a teacher of mathematics so that he or she can identify the embedded mathematics in each problem the students solve (CMP, May 19, 1999).

CMP has proven successful in many areas around the country. Results of an evaluation in Texas, where the program is implemented in 22 sites, showed that, over a 3-year period, the combined average score increase on the mathematics portion of the Texas Assessment of Academic Skills (TAAS; the state's required standardized test) at these pilot sites was 9%, with some districts showing as much as 19% improvement. Similar results were reported when sixth- and seventh-grade Iowa Test of Basic Skills (ITBS) mathematics scores were compared for the same period at the same pilot sites (CMP, July 25, 1999). The authors of the program conducted an even more comprehensive study. The ITBS mathematics scores of more than 2,500 sixth-, seventh-, and eighth-grade CMP students from urban, suburban, and rural communities in various geographic regions were compared with the scores of comparable students in traditional (non-CMP) mathematics programs (Hoover, Zawojewski, & Ridgway, 1999). The results showed a significant difference in the scores of the CMP and non-CMP students at the eighth-grade level, with the CMP students advancing an average of 1.5 grade levels in mathematics from fall to spring testing. There was less difference in the sixth and seventh grades; the authors attributed this result to the newness of the curriculum for sixth graders and an increased learning retention factor as the students progressed through the 3-year program. Students also took the Balanced Assessment Test to assess their mathematical performance.
on open-response items demanded by new reform mathematics initiatives. CMP students outperformed non-CMP students on this test, showing twice as much growth from fall to spring testing at all three grade levels.

In addition, CMP was evaluated by a national panel of qualified experts and practitioners, who determined that it was the only middle school mathematics program worthy of “exemplary” ratings (Eisenhower National Clearinghouse, 2000). They felt there was strong evidence that the program significantly affected students’ mathematical reasoning, problem solving, and mathematics application ability. Four similar programs at the elementary and high school levels also achieved this status, showing that reform mathematics curricula is the choice of this national panel, in keeping with the National Council of Teachers of Mathematics’ newly developed standards. Schoen, Fey, Hirsch, and Coxford (1999) agreed, suggesting that more treatment of personal problem solving and curricula integration and less emphasis on pencil-and-paper operations are necessitated by the emergence of available technology, such as affordable graphing calculators, for numeric and graphic mathematics.

The cost of books and materials for the implementation of CMP is less expensive than traditional curricula. For example, equipping a sixth grade comprised of 200 students would cost approximately $6,200, which includes student texts (six separate units per student), teachers’ manuals, and a materials kit, which is necessary for the hands-on group activities. With a traditional program, the cost ranges from $8,000 to $10,000 for the textbooks alone (T. Tate, personal communication, September 21, 2000). A major cost that must be figured into CMP is for professional development. Teachers receive intensive training to learn about the program, the mathematics, and how to teach the units before they use CMP in the classroom. They also attend regular monthly inservices and receive weekly instructional classroom support from a lead teacher, coach, or mentor. It is here that the additional cost lies. CMP requires more personnel than traditional programs because of this training and on-the-job mentoring. Having worked with teachers in the program for 10 years, the authors of CMP contend that this professional support is critical to the success of the program (Bouck, Keusch, & Fitzgerald, 1996). In addition to the salary of the lead teacher, the teachers are paid stipends when they attend the regular inservices outside of the school day. However, to adequately teach the new standards in the classroom, teachers need modeling and instruction provided by the lead teacher. The collaboration with colleagues, interaction with experts, and opportunities to study make up 3 of the 10 crucial elements necessary to implement standards-based mathematics (Bay, Reys, & Reys, 1999).

**Connected Mathematics in Lafayette Parish**

Lafayette Parish is located 40 miles north of the Gulf of Mexico in southwestern Louisiana. Its population is almost 191,000 (Taylor, 2001); over 29,000 children attend its 40 public schools (Benjamin, 2000). Lafayette is the “Heart of Acadiana,” a unique area initially settled by White Catholics of French heritage. The French and the Catholic influences are still prevalent in this region, from the language spoken to the Cajun food and music, from the many festivals to the agriculture, and even in the law (Louisiana Travel Promotion Association, 1997). The parish is approximately 73% White, with a poverty rate 4% lower than the state average of 24%. Twenty-three percent of its residents hold a college degree—a 7% increase over the state average and 3% higher than the national average (Caldas & Bankston, 2001). The demographic make-up of the public school population differs somewhat from the parish statistics in that its overall racial make-up is 60% White; 37% African American; and 3% Asian American, Hispanic, or American Indian (Benjamin, 2000).

The total number of students in this reform mathematics curriculum was approximately 3,500, with a demographic make-up ranging from 86% White in two of the schools to 9% White in the lowest performing school (Benjamin, 2000). Six of the nine middle schools in CMP are majority White, and the remaining three have minority populations ranging from 56% to 91%. Lafayette Parish employs 84% White teachers overall, and CMP teachers in the middle schools have the same racial balance (J. Caruthers, personal communication, March 14, 2001). Of the 34 teachers in CMP, 7 hold master’s degrees and the remaining 27 have bachelor’s degrees. The teaching experience of these teachers varies; some are in their 1st year of teaching, and others are 30-year veterans.

Lafayette Parish is the only school district in Louisiana to implement CMP to the extent that it has. A few parishes have one or two teachers who teach one or two units, whereas Lafayette Parish has four public middle schools with full implementation (i.e., in the sixth, seventh, and eighth grades, and, to some extent, in the eighth-grade Algebra I classes). However, not all of the middle schools offer Algebra I classes; of those that do—and have CMP through the eighth grade—three use CMP as their main Algebra I curriculum and supplement traditional drill problems from a traditional text. Four schools voluntarily piloted the program 7 years ago. In three of these schools, CMP is also taught in the alternative education mathematics classes, which are modified regular education classes for students who do not learn well in a traditional setting. In one of the schools, CMP is implemented in the special education resource classes. Another five middle schools in the parish are in the process of implementation at this time: Teachers in two of the schools are using the program in the sixth and seventh grades, and, in 2000, the mathematics teachers in three other schools began using the program with sixth-grade students. In one of these schools, CMP is also taught in the resource mathematics classes.

One of the remaining three Lafayette Parish middle schools began using CMP at the first phase (sixth grade) in the 2001–2002 school year (T. Tate, personal communica-
tion, August 1, 2000); the other two are slated to begin in the 2002–2003 school year. The two lowest performing at-risk minority middle schools in the parish were mandated in 1999 to begin using this curriculum in the hope that this reform mathematics program would help improve their test scores, especially the Louisiana Educational Assessment Program (LEAP 21) scores (M. Zolkowski, personal communication, June 12, 1999). It will be 2003 before this hope can be realized because of the phasing-in implementation process. Iowa Test of Basic Skills (ITBS) scores for sixth-grade students new to the program in these at-risk schools were scrutinized in 2000 and 2001 to determine whether CMP helps to increase mathematics understanding and application. To date, all of the CMP teachers have undergone training, but some of them received an abbreviation of the week-long summer training session because they were hired after the beginning of the current school year. I am a coordinating lead teacher employed by Lafayette Parish to train and assist the teachers in the classroom. I am based at the lowest performing at-risk school but schedule weekly visits to all the CMP classrooms to provide as much help as possible for the mathematics teachers using CMP.

Method

I analyzed and conducted an internal, formative evaluation of the Lafayette Parish CMP using several measures. After a thorough review of the literature on CMP and similar programs, I obtained LEAP 21 data and ITBS scores from the Lafayette Parish School Board on all middle schools in the parish for the school years 1998–99 and 1999–2000. Test scores before these 2 years were not comparable because the Louisiana Department of Education changed the standardized tests that were administered to all schools in the 1998–99 school year. Before this time, the seventh graders piloted the LEAP 21 test, the eighth graders piloted the revised ITBS, and the sixth graders took the previous form of the ITBS. This means that the tests taken in 1998–99 were the first standardized tests reflecting the reformed curricula in Louisiana. The 1999–2000 LEAP and ITBS scores will serve as the new baseline data for the schools from which to compare future student and school progress and to calculate individual school report cards (Picard, 1999). I used these data in a quantitative comparison of growth of CMP schools and in a comparison of CMP school scores with non-CMP school scores in the parish.

To obtain qualitative data, I interviewed the Lafayette Parish School Board superintendent and the mathematics/science supervisor about connected mathematics in the parish. I conducted weekly site visits to CMP schools, spending between 30 min and 1 hr in each mathematics classroom. Interviews were conducted with the participating teachers at all grade levels. As the lead teacher, I observed and participated in classroom mathematics activities, occasionally teaching the lessons, answering questions, and helping with the group work. This direct interaction with the teachers and students in all of the CMP schools provided additional qualitative data for this study. I also obtained valuable information from the discussions held at the beginning and end of each of the monthly teacher inservices. During these meetings, the teachers openly discussed problems they were having with the material, pacing, or classroom management and what seemed to be working well. I used information from my anecdotal records and from teacher interviews in the evaluation. In addition, I gave questionnaires relating to the attitudes and opinions about CMP to all of the mathematics teachers in the program in September 2000, with the exception of the new teachers who had been teaching it for 2 weeks or less (see Appendix A). Selected students were given a similar questionnaire about their feelings toward CMP (Appendix B).

A stratified random sampling process was used to select which students would fill out the questionnaire. Each teacher was assigned a number for each mathematics class that he or she taught, using consecutive numbers at each grade level in each school. Numbers representing classes were chosen randomly from these subgroups. This ensured that one class from each grade level at each school would be polled. Random sampling was not chosen as a method because I wanted to be sure to get the opinions of students at all grade levels in the low- and high-performing schools to see if there were any significant differences in their attitudes toward the program. As a follow-up to the written survey responses, I systematically met with each teacher participant in the program, giving him or her an opportunity to clarify and expound on the survey responses that he or she gave.

Results

A comparison of the 1998–99 ITBS total mathematics scores showed that the average of the scores of the four schools using connected mathematics that school year was 16% higher than non-CMP schools at the sixth-grade level and 9% higher than non-CMP schools at the seventh-grade level. The average CMP total mathematics percentage score was also 10% higher than the parish average at the sixth-grade level, 7% higher than the parish average at the seventh-grade level, and 16% higher than the state average ITBS score at both grade levels. A comparison of the same four CMP schools the following year, 1999–2000, showed that the seventh graders taking the ITBS scored 10% higher in mathematics than those in the non-CMP schools in the parish. A similar comparison for the six schools using the program in the sixth grade in 1999–2000 showed an average ITBS score of 58% correct, which was 10% higher than the average sixth-grade mathematics total percentages of non-CMP schools and 5% higher than the parish average. However, one of the CMP school’s scores also includes students in the gifted–talented program, who were in an accelerated but traditional mathematics program.

These results are charted in Figure 1, which shows that the sixth-grade total percentages went down 3%, and the
seventh-grade CMP schools’ average scores were 1% lower in the 2nd year of the data. Several factors could have contributed to this finding. There were two new schools participating in CMP at the sixth-grade level in the latter year, and 2 sixth-grade teachers and 1 seventh-grade teacher were on maternity leave for several months of the 1999–2000 school year, during which time substitutes with a minimum of training taught the program. The scores of the students in these classes may have been affected by this changing of teachers during the school year and by the substitutes’ lack of training and experience with CMP.

An analysis of individual school ITBS scores showed growth in all but one CMP school over the same 2-year period in the sixth grade. Three of the four CMP schools dropped by between 1% and 5% in seventh-grade ITBS scores during this period, and the non-CMP school scores increased by an average of 3%.

Similar 2-year comparisons of CMP and non-CMP schools were done with eighth-grade LEAP 21 mathematics data because the ITBS is not given in eighth grade (see Figure 2). The four CMP schools had fewer unsatisfactory (failing) scores than did the non-CMP schools, even when including the special education students who took LEAP but were not in connected mathematics.

CMP schools averaged an 87% passing rate (40% or more correct), which ranged from 79% to 90% of the students at the individual schools passing. The non-CMP passing rate average was 73%, with individual school rates ranging from 42% to 88% of the students passing the mathematics portion of the LEAP 21 test. The majority of the eighth-grade CMP students in this comparison had been in the program for 3 years.

The results of the 28 returned teacher questionnaires revealed some interesting insights to me (see Table 1). There

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**Figure 1. Iowa Test of Basic Skills Score Comparison**

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<thead>
<tr>
<th></th>
<th>CMP 6th Grade</th>
<th>Non-CMP 6th Grade</th>
<th>Parish Avg.</th>
<th>CMP 7th Grade</th>
<th>Non-CMP 7th Grade</th>
<th>Parish Avg.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998-99</td>
<td>61%</td>
<td>45%</td>
<td>51%</td>
<td>60%</td>
<td>51%</td>
<td>53%</td>
</tr>
<tr>
<td>1999-00</td>
<td>58%</td>
<td>48%</td>
<td>53%</td>
<td>59%</td>
<td>49%</td>
<td>52%</td>
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</tbody>
</table>

**Figure 2. Average Louisiana Education Assessment Program Passing Rate**

<table>
<thead>
<tr>
<th></th>
<th>CMP Schools</th>
<th>Non-CMP Schools</th>
<th>Parish Avg.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998-99</td>
<td>86%</td>
<td>70%</td>
<td>75%</td>
</tr>
<tr>
<td>1999-00</td>
<td>87%</td>
<td>77%</td>
<td>80%</td>
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</table>
were five questions with a rating-scale response, and four with open-ended responses. I used Glaser and Strauss’s (1967) constant comparative method to analyze this information, along with interview data, as I looked for patterns and commonalities in the teacher responses. For purposes of this analysis, “strongly agree” and “agree” responses were combined, as were “strongly disagree” and “disagree” responses.

The first question rated whether the teachers liked CMP better than they liked other mathematics programs they had taught. Ninety-three percent of the teachers agreed with this statement, with the remaining 7% saying they had no opinion. These 2 teachers were new to the program and said that they did not have enough experience with CMP to determine the answer to this question (Anonymous, personal communication, October 4, 2000). One of the new teachers expressed discontent with changing curricula, saying that if she “had not been forced to do so,” she would not teach CMP (Anonymous, personal communication, September 26, 2000). She has since told me that she is pleasantly surprised with the program and its results in her classroom and “would not go back to teaching the old way” (Anonymous, personal communication, December 12, 2000). I have encountered similar resistance to change from several other new teachers. To date, 2 of them are still displeased with having to change their curriculum and their methods, objecting most strongly to the “noisy” groups and the length of time it takes to plan lessons.

The experienced teachers liked CMP better for a variety of reasons. Several stated that the program had many side benefits. For example, not only did the students’ problem solving and higher level thinking skills improve but also their communication and reading skills improved. All of the teachers agreed that the students were actively engaged in learning, and, even though CMP problem solving is more difficult than the traditional drill or rote method the students formerly used, it caused less stress for them because there can be more than one correct answer. The students can succeed in this program even if their basic skills (like multiplication facts) are deficient (S. Nelson, personal communication, January 20, 2001). That one topic is studied for an extended length of time allows the students to assimilate the information at their own pace. Some students discover the “big idea” of a unit within the first or second investigation, and others may not see the relevance and application or learn the algorithm until the end of the entire book. “Everything ties together in the end. I had to get used to not having closure each day, or even each week sometimes, but it is rare that a kid fails to get the idea at all” (Anonymous, personal communication, October 14, 2000).

The second question rated whether the teachers felt they had a better understanding of mathematics through teaching this program. Again, 93% responded either “strongly agree” or “agree.” The remaining 2 teachers who disagreed with the statement were Louisiana Systemic Initiative Program teachers (LaSIP; a state-funded program for training teachers in problem-solving methodology) trained before teaching CMP. These teachers told me that the LaSIP training focused on problem solving and understanding mathematical concepts using an approach similar to that of CMP (Anonymous, personal communication, October 4, 2000). Other teachers said that by teaching CMP, they learned why some of the formulas they already knew worked and how these formulas were developed. In summary, all of the teachers who agreed with this question said that CMP has helped them in some way with a basic understanding of important mathematical concepts.

The third question on the questionnaire asked if the teachers felt their students were becoming better problem solvers; 93% of the respondents said they did. The remaining 7% were new to the program and felt it was “too early to tell” (Anonymous, personal communication, September 28, 2000). One teacher said she knew it was working when her resource students began their 2nd year of CMP and could remember from the previous school year what area and perimeter were (L. Cockrell, personal communication, September 13, 2000).

When asked whether the teachers felt the program was more challenging than previous mathematics programs, 90% agreed and 3 of the 28 had no opinion. The challenges for the teachers included learning new methods of teaching mathematics, managing groups, and “giving up the total control” in the classroom that the teachers previously possessed (Anonymous, personal communication, October 14, 2000). The teachers noted that for the students, the major challenge was thinking through problems to arrive at solutions without being instructed on how to solve the problems beforehand.

The last rating question asked how the teachers felt about the CMP training they received. All of the respondents replied that it was beneficial for them. All of the teachers interviewed agreed that they could not do a good job of teaching CMP without the training, adding that they “would not have understood the philosophy of the program” without the regularly scheduled inservices and discussions. The new teachers felt that the input from the experienced teachers at these sessions was invaluable and that they needed the lead teacher in their classrooms each week to model lessons and answer questions for them (Anonymous, personal communication, October 14, 2000).

There were common answers to all of the open-response questions at the end of the questionnaire. When asked what

| Table 1.—Teacher Questionnaire Results (in Percentages) |
|----------------|----------------|--------------|
| Question       | Agree | No opinion | Disagree |
| 1 (prefers CMP) | 93    | 7           | 0         |
| 2 (understanding) | 93    | 0           | 7         |
| 3 (problem solvers) | 93    | 7           | 0         |
| 4 (challenging) | 100   | 0           | 0         |
| 5 (training)   |       |             |           |

According to the teachers, the CMP program improved students' abilities to solve complex problems and understand the mathematical applications taught in CMP. Four teachers (14%) indicated that they had trouble managing the groups during the various activities in the program.

In response to Question 8, the teachers noted that they spent between 10 min per day and 5 hr per week planning their lessons, with more than 50% needing 3 or more hr per week to prepare. When asked for suggestions, 75% of teachers asked for lower class sizes and more supplemental basic skills for the students. The new teachers said they did not have enough experience to critique the program at that time.

A similar questionnaire was administered to 300 students in the program. The results were tallied separately by grade level but were combined for the purpose of reporting results. Additional anecdotal information obtained from my direct contact with the students in the classroom was also examined. Representative comments were included in this evaluation. The students' Question 1 asked if they liked connected mathematics more than they liked other mathematics programs they had been taught. They agreed with all three of these questions. Even though 21% of the eighth graders did not like the program as well as other mathematics programs they had been taught, they agreed that they did have to think more and were becoming better problem solvers with this program. Only 9% of the eighth graders disagreed with Question 3.

Some sixth-grade students felt that "math is hard" (Anonymous, personal communication, November 14, 2000). This response was not as common among the seventh- and eighth-grade students. Those seventh- and eighth-grade students appeared to have little difficulty facing the task of daily problem solving, whereas the sixth-grade students developed more confidence in this area during their first year in the program. A few parents of the sixth-grade students had also said that the material is difficult and different from "the math I learned" (Anonymous, personal communication, September 21, 2001). Specifically, they were distressed because their children's grades in mathematics were lower than the grades of the previous year.

Some of the seventh- and eighth-grade students commented that the materials and activities were important to the problem-solving process; without them, they would have had more difficulty understanding the concepts in the units. Only 8% of the students surveyed felt the activities were not helpful.

When asked how much time per week was spent on homework, the responses were almost equally divided between "0–30 minutes" and "over 90 minutes," with the remaining 8% of the students in all three grade levels choosing either "31–60 minutes" or "61–90 minutes" as their answers. More than 45% reported that they spent less than 30 min per week on homework, indicating that many of the students were not doing their assignments because the average amount of homework assigned by the teachers (and recommended in the program) would take more than 1 hr per week to complete.

The students also had an opportunity to write what they liked best about CMP, a majority wrote that it is interactive and improves critical thinking and communication skills. More than 90% said the students enjoyed it and learned why something works instead of just memorizing an algorithm. As previously stated, the teachers also liked the support provided by the lead teacher and the program itself. Eighty-two percent of the teachers wrote that CMP makes the students think and they discover the concepts on their own (with teacher guidance).

"Grading papers" was the most common answer to the next question, what the teachers liked least; this response was given by 6 of the 28 (21%) respondents. Some also commented that they felt the program needed more basic skills review/drill because these skills had not yet been mastered by the students when they began CMP. Further questioning of some of the teachers about this comment revealed interesting information. These teachers wanted the students to have mastered basic skills, but some did admit that it did not hinder the students' abilities to solve complex problems and understand the mathematical applications taught in CMP.

<table>
<thead>
<tr>
<th>Table 2.—Student Questionnaire Results (in Percentages)</th>
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<tbody>
<tr>
<td>Question</td>
</tr>
<tr>
<td>1 (prefer CMP)</td>
</tr>
<tr>
<td>2 (calculator usage)</td>
</tr>
<tr>
<td>3 (problem solving)</td>
</tr>
<tr>
<td>4 (think more)</td>
</tr>
<tr>
<td>5 (helpful activities)</td>
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Note. N = 300. CMP = Connected Mathematics Project.
ier to remember what was learned, and many of them said they liked using calculators in the classroom.

What the majority of the students liked least was the homework and the tests, saying they were “hard.” Many said there were no explanations or examples to follow and no shortcuts to solving the problems. Five students said they did not like the reading involved in the program.

When asked for suggestions to make CMP better, the students reiterated their answers to what they liked least. Approximately 10% of the sixth graders asked for examples in the books as well as less homework. (Examples are intentionally not given in CMP because its philosophy is that students need to struggle through the problems and find their own ways to solve them.) Some respondents asked that the teachers go slower when teaching the lessons. The responses to the question asking for program suggestions were somewhat different among students in various schools. Students in the higher achieving schools asked for examples; this was not mentioned by students in the lower performing schools. The seventh- and eighth-grade students did not suggest examples nearly as often as the sixth graders did. Some sixth graders also qualified this suggestion with “for my parents.” This response may indicate that the parents of the sixth graders in the higher performing schools spent more time on homework with their children than did the parents of those in the lower achieving schools. In addition, some of the sixth-grade students wanted more mathematics drills like they used to have (presumably in the fifth grade).

Discussion

CMP is a standards-based reform mathematics program for the middle school grades. In this program, students tackle real-life problems every day in class, using calculators and a variety of materials to solve the problems with any strategy they can discover. The program has received high ratings from prestigious educational entities, including “exemplary” status from the U.S. Department of Education. Connected mathematics was piloted in Lafayette Parish 7 years ago in four middle schools. In this evaluation, I compared ITBS and LEAP 21 scores for all of the middle schools in the parish.

The results of student achievement in the four pilot schools show that the program has helped the students understand mathematical concepts well enough to put these schools ahead of the other middle schools in the parish. Because of this success, the Lafayette Parish School Board has expanded the use of CMP to five additional middle schools. Those schools have begun using CMP, but it is not yet fully implemented in all three grades. More time is needed to assess whether the program will help to raise test scores and students’ mathematical reasoning ability in these schools, because it is a 3-year curriculum. It is recommend that a follow-up study be done at the end of each of the next 3 years using test data to compare growth in these schools in the area of mathematics.

Questionnaires were distributed to all CMP teachers and 300 randomly selected students concerning their feelings toward connected mathematics. The results of the teacher surveys showed that an overwhelming majority of the teachers liked the program. Although it is not perfect and most of the teachers feel they still need to supplement some basic skills, they see results in the classroom. Their students are becoming better critical thinkers and problem solvers, discovering concepts, and formulating algorithms through their activities. According to the responses, the teachers are becoming better mathematicians from teaching CMP to their students.

The students like the program as well and admit that, even though the homework and tests are challenging, they, too, are developing a better understanding of mathematics concepts. Positive comments from the teachers and the students may also add value to the program, because if the teachers enjoy what they are doing and can see the benefits of a program they are teaching, they will be more enthusiastic about it. Likewise, if the students like what they are doing in class, they will be more likely to attend to the lessons, which would facilitate more learning.

Almost all of the new teachers liked this curriculum, although it seemed to be more challenging for them than for those experienced in CMP. The conclusion drawn is that it takes teachers at least a year to become comfortable with the material and the methodology. This finding was confirmed in several interviews with teachers. One teacher in her 2nd year of CMP said, “I am doing a much better job this year. Last year, I had to go through a book to see the closure at the end, and now that I have done that, I understand my role better and what not to tell the students along the way” (Anonymous, personal communication, October 2, 2000).

A further suggestion is to administer another questionnaire to the new teachers closer to the end of the school year to determine whether they have a different outlook on the program after having taught it. In the questionnaires, many teachers wrote that they like the support and training provided by the lead teacher in the CMP. This seems to be an integral part of this curriculum, as recommended by the authors of connected mathematics and from opinions of the teachers involved. Many have said that all of the teachers need to be trained; it is almost impossible to do a good job of teaching and understanding the philosophy without the training.

Because of Louisiana’s increased accountability and more stringent mathematics standards, state officials, along with Lafayette Parish educators, school board, and businesspersons, have demanded a changing curriculum, one that could raise standardized test scores and increase students’ abilities to understand and solve more involved situational problems. In the search for more challenging content, methods, and materials that will help in this complex endeavor, Lafayette Parish has turned to the CMP. Is it the answer? CMP may not be the all-encompassing panacea; however, in Lafayette Parish it is addressing the concerns of the stakeholders of mathematics education. In the ongoing debate about stan-
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REFERENCES


**APPENDIX A**

**CMP TEACHER QUESTIONNAIRE**

Grade__________________________

School_________________________

Date___________________________

Number Years Teaching CMP _______

For Questions 1–5, please circle the number that best represents your answer.

Key: 5 means Strongly Agree
      4 means Agree
      3 means No Opinion
      2 means Disagree
      1 means Strongly Disagree

I like Connected Mathematics better than previous mathematics programs I have taught.

5 4 3 2 1

I have a better understanding of mathematics concepts from teaching Connected Mathematics.

5 4 3 2 1

My students are becoming better problem solvers from working in Connected Mathematics.

5 4 3 2 1

Connected Mathematics is more challenging than other mathematics programs I have taught.

5 4 3 2 1

The training I received was beneficial to my understanding and teaching of CMP.

5 4 3 2 1

What do you like the best about Connected Mathematics?

What do you like the least about Connected Mathematics?

What suggestions would you give to make this mathematics program better?

**APPENDIX B**

**CMP STUDENT QUESTIONNAIRE**

Grade__________________________

School_________________________

Date___________________________

Teacher_________________________

Male_____Female_____ (optional)

White_____Black_____Other_____

For Questions 1–5, please circle the number that best represents your answer.

Key: 5 means Strongly Agree
      4 means Agree
      3 means No opinion
      2 means Disagree
      1 means Strongly Disagree
I like Connected Mathematics better than previous mathematics programs I have been taught.
5 4 3 2 1

I use a calculator more often in Connected Mathematics than I did in previous mathematics programs.
5 4 3 2 1

I am becoming a better problem solver from working in Connected Mathematics.
5 4 3 2 1

Connected Mathematics makes me think more than in other mathematics programs I have been taught.
5 4 3 2 1

The activities in this mathematics program help me to understand the mathematics concepts.
5 4 3 2 1

On the average, I spend ___(amount of time) per week on mathematics homework.
0–30 minutes 31–60 minutes 61–90 minutes over 90 minutes

What do you like the best about this mathematics program?
What do you like the least about this mathematics program?
What suggestions would you give to make this mathematics program better?