Cooperation breeds Success in Chicago *

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More than 200 Chicago high school students were added to the pool of students taking a fourth or fifth (calculus) year of high school mathematics in the 1993-94 school year. These, mostly African-American and Latino students, are completing the fourth year of the College Preparatory Mathematics Program (CPMP). Led by Professors Baldwin and Dees, CPMP began as a joint effort between the University of Illinois at Chicago and seven Chicago Public High Schools to increase the number of students taking at least four years of college preparatory mathematics. The program now involves DePaul University, the University of Wisconsin at Parkside and an additional eleven high schools in two states. It has received funding from the State of Illinois, the National Science Foundation, the Harley-Davidson Foundation and the Chicago Community Trust.

CPMP stresses that improvement in mathematics instruction in the schools requires a major change in teacher and student attitude. Everyone must realize that mathematics is open to all who work to learn the material not just those blessed with a special 'math gene'. Teaching serious mathematics to a much larger percentage of the population than was dreamt of a generation ago demands a rethinking of high school mathematics education. New teaching methods are necessary for many students who have not reached the level of abstraction traditionally associated with college preparatory mathematics. Chief among these methods are: small group learning, use of manipulatives,

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and emphasis on graphical and numerical as well as algebraic representation of information.

The program unites research mathematicians, mathematics educators, high school teachers, counsellors and administrators to work with over 1000 students. The program has been strongly supported by Chicago Bureau of Mathematics Director Dorothy Strong, but in the spirit of Chicago school reform, CPMP works directly with individual high schools. Rather than trying to change an entire school in one fell swoop, a team of teacher leaders is gradually developed. From two teachers who use the methods part of the time, the program aims to spread through the mathematics department. That is, to create a cadre of teachers who not only use cooperative learning to bring out the best mathematics achievement of their students but are able to take leadership in education reform both at the school level and beyond. In this the fourth year of the program, a majority of the teachers at 5 of the 7 original schools have joined CPMP and almost half have at a 6th (the largest school). The key components of the program are the Summer Institute and continued support of students and teachers during the academic year.

During the Summer Institute teachers work with the university staff to develop new methods and materials in afternoon workshops. In the morning laboratory session they team-teach a CPMP class of students in their high school and try out these ideas. During the academic year, supported by the university staff, the teachers continue to employ these new approaches in at least one of their classes.

The project has an important impact on students, teachers, schools, and university faculty.

1. Students: The program attempts to create a peer group of students interested in mathematics.

2. Teachers: Teachers develop a new style of interaction with students through the CPMP discussions of mathematics, new materials, and techniques of cooperative learning.

3. Schools: The program works with teachers, counselors and administrators to increase student success in mathematics.

4. University faculty: University faculty contribute to the project expertise in mathematics and/or mathematics education.

Research mathematicians contribute in several ways: mathematically and administratively. The teachers appreciate their just being there. An analyst, David Tartakoff, has now taught several courses in cooperative learning. Several mathematicians have consulted during the summer with the teachers of the junior-senior level course (the only one taught at the university rather than the high school). This program has significantly affected teaching practices of affiliated research mathematicians. They have learned more about the actual attitudes and abilities of their students and have adjusted their classroom behavior. There are a number of peripheral effects on the lower level courses in the university as more university staff are acquainted with excellent high school teachers.

Several research statisticians are involved in the evaluation of the project which will include substantial data on student performance and reports on change in teacher methods and attitudes. Early results showed both superior performance (vis-a-vis comparison groups) on standarized examinations on mathematical content and vastly improved persistence in taking mathematics.

At one of the magnet schools, the year before CPMP the Calculus course contained only three minorities out of 25 students. This year about 1/2 of 90 calulus students are minorities. This reflects both a specific intervention with 30 students and a ripple effect on the entire school. At one entirely African-American high school the precalculus class jumped from 10 to 17 students after CPMP and for the first time four students are studying calculus. At all of the schools both students and teachers are discovering that minority students can succeed in mathematics.

The program has a similar impact on the involvement of teachers in professional activities. There has been a dramatic increase in the number of CPMP teachers not only attending but presenting at regional, national, and international meetings. Four of the teachers now work on staff development for the program.

These comments by teachers sum up the program, 'It's amazing what the students know! They were interested and excited about most of the activities.' 'Students work longer on harder problems'