Peoria Urban Mathematics Plan for Algebra

Mathematics

Content

- high expectations for all students
- engaging students in worthwhile mathematical tasks
- using collaborative groups
- increasing student discourse about mathematics
- algebraic concepts

PROGRAM DESCRIPTION

Peoria Urban Mathematics Plan for Algebra (PUMP) is a systemic effort to increase the number of students, particularly minorities, in the algebra track. The project aims to use middle school math as the "pump" rather than the "filter" in the mathematics pipeline.

PUMP is a collaborative effort among teachers, students, administrators, community and business groups, and faculty and graduate students from Illinois State University's Department of Mathematics. The centerpiece of the project's work is a teacher enhancement program that features three intensive summer sessions for teachers with follow-up seminars and classroom-based support during the school year.

The philosophy is that through enhanced forms of instruction all students can learn a broader range of mathematics including procedures and concepts. The guiding instructional strategies are (1) having high expectations for all students, (2) engaging students in worthwhile mathematical tasks, (3) using collaborative groups, and (4) increasing student discourse about mathematics.

Context

- mid-sized urban city
- 55 percent minority student population
- high level of community and business support

PROGRAM CONTEXT

Peoria Public Schools serves 17,000 students within a middle-sized urban city. Student population is 55 percent minority, mainly African American. Only 27 percent of the African American student population was taking some form of algebra before the project, compared to 76 percent of the white student population. Strong community and business collaboration enhances the program. After-school tutoring programs, PUMP Algebra Club, Saturday enrichment activities, and summer PUMP Algebra programs for high-risk middle school students are supported by various community groups. This environment promotes and supports qualitatively different approaches to teaching and learning middle school mathematics and encourages more representative entry into the algebra track.

STAFF DEVELOPMENT PROGRAM

The professional development program focused on three components of improving teacher performance: teachers' content knowledge; teachers' pedagogical and professional knowledge; and classroom-based support for the implementation of new knowledge into practice.

Three-week institutes held each summer involved teachers in doing mathematics and reflecting on mathematics teaching and learning. Topics for the institutes included rational numbers and proportional reasoning in Year 1; algebraic thinking in Year 2; and geometry, probability and statistics in Year 3. In addition to their learning, teachers were given time to redesign and reorganize their mathematics program to incorporate enhanced forms of instruction. Part of each summer's assignment was to develop an instructional plan for the following school year. Following the summer institutes, six half-day seminars were held during the academic year to extend content, redesign typical textbook lessons to reflect the new instructional strategies, reflect on their practices, complete a specified task related to the instructional strategies, and to try instructional strategies with their students.

In addition to the seminars, classroom-based support was provided to the teachers. Site visits were made every other week to each school and included demonstration lessons, co-teaching, observing a lesson, and curriculum resources. Each support activity was discussed with the teacher following the activity to support reflecting on his or her own practice. Each year at least some of the schools received weekly visits. During Year 3, project staff support decreased and collegial support was encouraged to increase teachers'independent use of the instructional strategies.

Process

- training
- demonstrations
- remodeling lessons
- coaching
- reflecting
- observation
- co-teaching

Intended Audience

- representatives from all middle schools in the district
- entire department or team
- entire school

Mathematics

SUMMARY OF RESULTS

The PUMP Algebra program has increased student achievement at eighth grade, improved teachers' practices, and increased minority student partici-pation and representation in high school algebra.

EVIDENCE OF INCREASED STUDENT ACHIEVEMENT

Success Indicators

- state mathematics tests
- algebra enrollments at middle and high school
- minority student enrollment in algebra
- surveys

Peoria Urban Mathematics Plan for Algebra has impacted student achievement, teachers'beliefs, and instructional practices. Pre-project scores and annual scores of student achievement on the Illinois Goal Assessment Program (IGAP) were collected in March of each year. The sixth-grade scores, while demonstrating an overall increase in the district of 10 points, increased in seven of the 14 schools, decreased in six, and remained the same in one after only two years of implementation (most recent data available). Differences in scores were not statistically significant. At the eighth grade, scores increased in 13 of the 14 middle schools. The mean increase of 13.2 points across all schools was a significant ($p<.05$).

While the results at sixth grade are not yet significant, possibly due to the brief implementation time and the low number of sixth-grade teachers in the project, the increase at half of the schools shows promise for continued improvement. The strong results at the eighth grade demonstrate that the program has the potential to dramatically impro ve student achievement.

Overall algebra enrollments at the middle school increased slightly, with the minority population increasing slightly. However, at the high school the proportion of minority students enrolled in algebra increased from 42.5 percent to 54.3 percent, and the percentage of minority population actually enrolled in high school algebra increased from 15.7 to 22.6.

Survey results indicate that teachers reflect on their teaching and incorporate new instructional strategies into their practice. Statistically significant differences were found in instructional beliefs and practices in five of the eight clusters of the Mathematics Learning and Teaching Survey.

PUMP Algebra has increased student achievement in algebra at the eighth grade, improved teacher practices, and increased minority-student participation and representation in high school algebra.

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DOCUMENTATION

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