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ABSTRACT

This paper discusses learning outcomes resulting from three national curricular reform efforts in mathematics. Focus is placed on the College Board's Equity 2000 program which operates on the principle that all students are given the opportunity to demonstrate high levels of academic achievement in mathematics. Information is provided on the Equity 2000 program and its effectiveness is evaluated. Enrollment and achievement trend data are also presented in discussing the effects of the program. This paper emphasizes the limitations and challenges of measuring Equity 2000's effect on mathematics achievement and concludes that it continues to be effective in raising student achievement in mathematics. (ASK)

Effects of Equity 2000 on Student Achievement in Mathematics: Evidence from School Districts

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The College Board

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Introduction

This symposium discusses learning outcomes resulting from three national curricular reform efforts in mathematics. Our presentation focuses on the College Board's Equity 2000 program which operates on the principle that all students are given the opportunity to demonstrate high levels of academic achievement in mathematics. In practice, this requires that districts implement policies that allow all students access to high-level mathematics courses typically available only to the college-bound, starting with access to gatekeeper courses such as algebra and geometry. The districtwide nature of Equity 2000 represents a deliberate strategy to ensure that mathematics reform is more systemic -- that issues of policy and practice are addressed across the entire district, in all schools and classrooms.

In the demonstration districts prior to Equity 2000, district selection and tracking policies were in place, and only a small percentage of students had to access to the higher level mathematics. Enrollment and achievement trends in algebra and geometry over six years suggest that offering algebra and geometry to all students provides opportunities for more students to achieve in higher-level courses; many students who succeeded in algebra and geometry would not have been able to enroll in these courses before the Equity 2000 policy change. In fact, at the completion of the demonstration phase of the project in 1996, more students were passing algebra and geometry than were even enrolled in those courses prior to Equity 2000.

In evaluating the math achievement of this large scale reform effort, we found challenges and strategies that we are continuing to address in our ongoing program of research for Equity 2000. Among our research plans are collaborations with teachers and the Educational Testing Service to develop end-of-course exams in algebra and geometry to determine student achievement in these subjects. Our findings and plans may have implications for other large

scale mathematics reform efforts in secondary and middle schools as they address district course-taking policy, curriculum standards and content, and measurement of effectiveness.

Equity 2000 - A Districtwide Reform Program

From the standpoint of theory and practice, the College Board's Equity 2000 program is one of the more complex reform efforts underway in U.S. education today. As such, the project's goal is not only to bring about change in student achievement levels, but also to influence educational policies and practices with respect to tracking, professional development, guidance and counseling, and educational leadership within and across the participating school districts. With the goal of academic excellence for all students in mind, the Equity 2000 educational reform program was designed to test the hypothesis that enrollment and success in the gatekeeper courses of algebra and geometry will bridge the gap in achievement and college-going rates between minority/nonminority students and economically advantaged/disadvantaged students. To ensure that all students would have access to algebra and geometry, Equity 2000 requires districts to adopt a policy that all students will take algebra by the ninth grade and geometry by the tenth grade. Districts eliminate all lower level mathematics courses and algebra becomes the entry-level math course in high school.

Equity 2000 began in 1990 as a mathematics initiative in one school district in Fort Worth, Texas, and has continued to expand and evolve to include, by the end of the demonstration phase in 1966, six sites and 14 school districts. The six Equity 2000 sites are Fort Worth, Texas; Milwaukee, Wisconsin; Nashville, Tennessee; Prince George's County, Maryland; Providence, Rhode Island; and San Jose, California. For reporting purposes, the San Jose Consortium site is presented as two data sets: East Side Union (a 9-12 district) and San Jose Unified (a K-12 district). In 1996-97, Equity 2000 further expanded to eight sites and 16 school districts with the addition of Memphis, Tennessee and Fort Wayne, Indiana. Today, the Equity 2000 program continues to involve a growing number of districts. These districts' mathematics course

enrollment policies are based on the principle that all students enroll in rigorous, well-designed courses in algebra and geometry that provide them with the mathematical knowledge and skills to ensure success in college. The district implements Equity 2000 support components -- such as, professional development and student academic enrichment -- to strengthen the teaching and learning of mathematics.

Evaluation of Equity 2000's Effectiveness

A variety of strategies -- both quantitative and qualitative -- were used during the demonstration phase of Equity 2000 to evaluate the program and its effect on mathematics achievement. In this paper, we will concentrate on the algebra and geometry enrollment and achievement data from the Equity 2000 districts. These data were collected from 1991 through 1996 by Pelavin Research Center (PRC), and were reported annually to provide ongoing indicators of the effect of the program. We will also briefly present two excerpts from the qualitative work done by PRC that attempted to explain Equity 2000's effects on mathematics achievement. PRC directed a series of mathematics classroom observations across all sites and conducted focus groups with district teachers and counselors about mathematics achievement issues. We will also highlight the findings of Mayer's study of classroom practices in one of the districts.

When we look at the algebra and geometry enrollment and achievement trends over a six year period, we see evidence of the program's mathematics effectiveness in introducing more students to higher level math, and increasing their passing. According to the PRC final report, evidence suggests that the policy of full access to algebra I and geometry is narrowing the achievement gap between minority students and white students (Rodriguez, 1997). After the demonstration phase ended in 1996, the Equity 2000 program continued to monitor enrollment and achievement trend data. In addition to the 1995-96 data, whenever it is available, we present data in this paper from the 1996-97 school year. Equity 2000 mathematics reform was designed

to be institutionalized within the districts and not be dismantled with the ending of the demonstration phase. 1996-97 represents the first year of full district institutionalization and the data provide the first evidence of the sustainability of the math reform beyond the demonstration phase.

As context for the presentation of the enrollment and achievement findings, it is important to note that the districts varied with respect to when they implemented the program and when they expected to enroll 100 percent of their students in algebra and geometry. For ease of presentation, we will use 1991-92 as a baseline year across all sites and compare it to the enrollment and achievement data for the academic year 1995-96. As we examine this body of evidence, we will consider what district enrollment and achievement looked like in 1991-92 prior to Equity 2000 and what they look like in 1996 and 1997 after a five-six year policy of requiring all students to take algebra. In general, when a district moves to implement the Equity 2000 course-taking policy change it does so in ways that are compatible with its resources, structure, and culture. As such, we should expect to see some natural variation in the scope and pace of their implementation efforts, and we must view the evidence in that light. Sites followed different implementation timetables depending on the needs of their districts. One site implemented the program in 1990-91 (Fort Worth). The remaining five sites started the program in 1991-92.

After implementation of Equity 2000, sites set deadlines for ensuring that all students would be taking algebra I by the ninth grade and geometry by the tenth. Not all the sites set the same deadline. For example, three of the sites, East Side Union, Fort Worth, and Prince George's County, agreed to enroll all ninth-grade students in algebra in the 1994-95 year, while the other four sites agreed on the 1993-94 year. Providence agreed to enroll all students in geometry in 1993-94, while four sites chose 1994-95 and two decided on 1995-96. Keeping the varying enrollment targets in mind, we now present the enrollment and achievement trend data.

Changing Enrollment Trends

Algebra

Enrollment levels in algebra I and higher math courses were collected for all ninth graders in the fall of the school year, usually in October. Overall, the enrollment trends suggest the program approached its stated objective of 100 percent enrollment in algebra or higher by the ninth grade. Algebra I enrollment for ninth graders has increased since 1991 at all sites. In 1991-92, enrollment of ninth-grade students in algebra I or higher ranged from 31 to 69 percent. By the completion of the demonstration in 1995-96, enrollment in algebra 1 or higher ranged from 64 to 100 percent. These gains are impressive when placed in the context of the enrollment rates in this key course prior to the implementation of Equity 2000. Indeed, in 1995-96, three of districts reached the 100 percent enrollment target, Milwaukee, San Jose, and Providence. Although not at 100 percent, the trends for the remaining sites represented strong growth toward the goal during the demonstration period.

We do have enrollment data for the first year after the demonstration phase ended. In 1996-97, enrollment in algebra I or higher ranged from 63 to 99 percent across the sites. Two districts previously at the 100 percent enrollment target, Milwaukee and Providence, are now at 99%. Three other sites are in the 90 percent range, San Jose Unified (93 percent), and Prince George's County and East Side (90 percent). The growth trends for Fort Worth (83 percent) and Nashville (63 percent) remain strong. While many challenges remain for these sites, perhaps the greatest challenge for the sites in the 90th percentile range is to maintain consistent high enrollment without slippage.

Geometry

Like algebra I, enrollment for geometry and higher math courses was collected for all tenth graders in the fall of the school year, usually in October. Note that geometry enrollments are largely dependent on achievement rates in algebra I. Thus, it is not unexpected to find that geometry enrollments are further from program targets. Given these caveats, the data suggest

that the Equity 2000 sites made good progress toward their enrollment targets. Geometry enrollment for tenth graders increased from 1991-92 to 1995-96 at all sites. In 1991-92, enrollment of tenth-grade students in geometry or higher ranged from 26 to 53 percent. By the close of the demonstration phase in 1996, enrollment in geometry or higher ranged from 57 to 73 percent across the sites. As noted earlier, two of the sites, Fort Worth and San Jose Unified, targeted 1995-96 as the year for reaching 100 percent enrollment in geometry. In their target year, the sites were steadily approaching their goal: Fort Worth made progress at 73 percent and San Jose had 59 percent. Most sites hovered around 59 percent. Like the algebra enrollments discussed earlier, these gains are impressive when placed in the context of the enrollment rates in these key courses prior to the implementation of Equity 2000. According to the most recent enrollment data from 1996-97, enrollment in geometry or higher ranged from 53 to 80 percent across the sites, a slight increase at the upper range from 1995-96..

Changing Mathematics Achievement Trends

Although the enrollment indicators are compelling, we also want to look at achievement rates as measured by both percentage of students passing the courses and percentage receiving grades of B or better. We present the findings on student achievement separately for ninth graders enrolled in algebra I and tenth graders enrolled in geometry.

Algebra Passing and B or Better

The algebra I course passing rates represent the percentage of ninth-grade students enrolled in algebra I who passed the course by the end of the school year. In 1991-92, those passing rates ranged from 62 to 88 percent across the sites. In contrast, the passing rates for 1995-96 ranged from 52 to 79 percent. Again, it is important to keep in mind that in 1991-92 a substantially smaller number of ninth-grade students were enrolled in algebra I than in 1995-96.

We found, however, that passing rates in this key gatekeeper course have remained relatively high despite the significantly larger number of students enrolled. In 1996-96, more than three-quarters of the students passed algebra I in Prince George's County (79 percent) and San Jose Unified (78 percent). Four sites were above 60 percent, Providence and East Side Union (67 percent), and Fort Worth and Nashville (62 percent). Although the percentage of enrolled students who passed algebra I after implementation of Equity 2000 was lower than before, a higher absolute number of students were enrolled in and passing the course in 1995-96 as a result of the program. When we revisit these trends in the 1996-97 year, we see that the range of passing rates is remaining relatively stable ranging from 53 percent to 74 percent.

Another indicator of the success of the program is the percentage of students receiving grades of B or better in algebra I. This indicator gives us a further sense of the extent of student learning and achievement in algebra. In more than half the districts, for example, about two of three students enrolled in algebra I in 1995-96 passed the course. Further, we estimate that nearly one in four of the students enrolled in algebra I in 1995-96 received a passing grade of B or better. Although there is some variation in both the passing rates and the proportion receiving grades of B or better among the sites, these data on student achievement are impressive, particularly when placed in the context of substantially increased enrollments in these courses at all sites. In Nashville, over half the students passing algebra I received a grade of B or better. Without more detailed information about the grading practices in the classrooms at each of the sites, it is difficult to make sound inferences and comparative statements about the nature and extent of student achievement that go beyond the data in hand. Like the enrollment rates reported earlier, these achievement data suggest strong evidence of the project's success in achieving its twin goals of Equity and excellence.

Geometry Passing and B or Better

The geometry course passing rates are defined as the percentage of tenth-grade students enrolled in geometry who passed the course by the end of the school year. In 1991-92 those passing rates ranged from 71 to 93 percent across the sites. The passing rates for 1995-96 ranged from 70 to 100 percent. Keep in mind that in 1991-92 a slightly smaller number of tenth-grade students were enrolled in geometry than in 1995-96. Passing rates in this key gatekeeper course have remained relatively high. The data show that all of the sites had passing rates for tenth graders near or above 70 percent. In fact, more than three-quarters of the students passed geometry in Providence (78 percent), Fort Worth (77 percent), San Jose Unified (87 percent), and Prince George's County (86 percent). East Side reported a 100 percent pass rate. From 1991-92 to 1995-96, with a slightly higher absolute number of students enrolled in the course, the number of students passing geometry across all sites remained stable. This trend took a slight dip in the 1996-97 year when the rates range from 69 percent to 81 percent. Most sites remained stable, but East Side's passing rate did drop to 75 percent.

If we look at the students passing geometry, we find that nearly four of five passed the course across all the sites in 1995-96. We estimated that nearly one in three of the students enrolled in geometry in 1995-96 received a passing grade of B or better. Again, there is variation in both passing rates and the proportion of students receiving grades of B or better among the sites. In Nashville, again, and San Jose Unified and Fort Worth, over half the students who passed geometry received a grade of B or better. At the other sites, slightly fewer than half the students who passed received a grade of B or better. Similarly, at the San Jose Unified site those passing were split almost evenly between grades above and below B. Looking at both the enrollment and achievement data across all the sites, the evidence suggests that the increased exposure to math, along with teachers' and counselors' more positive attitudes toward student capabilities (revealed in the qualitative evaluation evidence), is paying dividends in terms of student performance in the gatekeeper courses of algebra I and geometry.

Discussion of Enrollment and Achievement Data for the Demonstration Phase

The enrollment and achievement data reviewed here are compelling. According to the PRC final report of program impact, unprecedented numbers of students are taking and passing algebra I at the Equity 2000 sites. (Rodriguez, 1997) Equity 2000's policy change requiring detracking of the mathematics curriculum by eliminating lower-level mathematics courses and enrolling all students in algebra I, followed by geometry, led many to expect that student achievement would decline. In general, this has not happened and passing rates remain strong. Indeed, the evidence from the qualitative strand of evaluation data -- the case studies, focus groups, and classroom observations -- suggest that students are being exposed to rigorous course work both in algebra I and geometry. The next section of our paper briefly discusses additional sources of evidence for Equity 2000's effect on mathematics achievement in a school district: classroom observations, teacher focus groups, and a study of teaching practices at one site.

Supporting Strands of Evidence for Mathematics Achievement

The enrollment and passing rate indicators show that during the six year demonstration phase, Equity 2000 sites progressed steadily toward reaching the goal of algebra and geometry for all students. Now that more students are in algebra and geometry, program stakeholders and others are concerned that students are learning the skills and knowledge that will give them access to college. During the demonstration phase, evidence of student learning and increased skill acquisition can be found in reports of classroom observations and from teacher focus groups. Although this information is observational and often anecdotal, it does provide us with additional sources of evidence of the program's effectiveness. Pelavin Research Center conducted ninety-two observations of algebra and geometry classes over two years (1993-94 and 1994-95) which provide some evidence of changed teaching and learning. Since Equity 2000 supports and uses National Council of Teachers of Mathematics (NCTM) content and teaching standards, observers

looked for classroom practices that were consistent with those standards. The observations included references to specific pedagogical strategies, techniques, and materials recommended by the Equity 2000 National Math Committee and NCTM. The observational data show that geometry and algebra I teachers at the sites are using a variety of NCTM and Equity 2000 instructional methods in their classrooms. The data show that very few rely solely on a single instructional approach. Overall, the data indicate that geometry classrooms were much more interactive than the algebra classrooms.

In the focus groups conducted by PRC, specific improvement in teacher-instructional leadership strategies and classroom teaching strategies were attributed to Equity 2000. Overall, teachers stated that students were engaged in a qualitatively different and positive experience with mathematics as a result of the NCTM emphasis on hands-on concrete activities, real-world approaches, and the integration of manipulatives, calculators, and computers. For example, most teachers reported strong and positive experiences with cooperative learning approaches over traditional approaches. Similarly, few said that the instructional approaches to teaching algebra and geometry learned through the project were incorrect approaches to teaching these subjects. Those who did tended to be the individuals with negative beliefs about most of the project. At each site there were teachers who said that the pedagogical approaches emphasized in Equity 2000 had improved their mathematics instruction. In general those in the focus groups believed that each behavior in the classroom directly affects students acquisition of the skills and knowledge needed for high levels of academic achievement. Moreover, teachers generally acknowledged that the innovative teaching approaches promulgated through Equity 2000 had improved their math classes.

Across the sites, mathematics teachers were well versed in their content areas. The majority of those interviewed were certified in mathematics and held Masters' degrees in mathematics. These teachers said that the greatest impact of Equity 2000 for them was the

enhancement of their own knowledge of the subject matter and the availability of better instructional materials. Again, the belief expressed by the teaching faculty is that their increased knowledge of mathematics, combined with newly developed curricular materials, will improve student learning.

A major concern, however, was related to the availability of appropriate assessments to accurately gauge student learning. Most teachers spoke of the difficulty of providing assessments for some students, given the different approaches to course sequencing and pacing. This issue is particularly problematic in districts that now require algebra for high school graduation and that have initiated a variety of course formats, e.g., semester and block scheduling. The new curricular sequences in mathematics often result in a rapid rise in mathematics course variations, both in the way the courses are taught (i.e., timing, sequence, and scheduling) and the scope of content coverage. Thus, we see that these modifications to the ways in which algebra and geometry are taught at Equity 2000 sites present challenges to the development of assessments that foster student learning and promote achievement in mathematics.

It appears from the observations and focus groups that students are being exposed to new and creative ways of learning algebra and geometry with instruction at the Equity 2000 sites changing and moving in the direction of the NCTM standards. Teachers and students are grappling with what it means to rethink teaching and learning in algebra and geometry. We are witnessing more widespread use of cooperative learning and other collaborative techniques in these classrooms. These changes suggest that students at the sites are, in general, being exposed to improved forms of mathematics instruction and to the skills and knowledge that will better prepare them for postsecondary education. The program has also been able to identify challenges that were not as evident before, including the need for improved assessments, new course formats and schedules, and alternative forms of instruction to address the learning styles of all students.

Let us keep the classroom observations and focus group comments in mind as we briefly look at a study of the efficacy of teaching and learning at the Prince George's County site conducted from 1995 through 1996. Mayer attempted to measure extraordinarily complex practices and teaching styles and relate them to NCTM standards and student learning. He aimed to quantify the effects of NCTM teaching practices in an Equity 2000 site. In brief, his findings were that: (1) NCTM teaching does not appear to have impact on high school math achievement; (2) NCTM teaching has a positive impact for junior high algebra students and high GPA ninth graders; and (3) some NCTM activities appear more effective than others. Mayer suggested that in searching for effective approaches, one should look beyond the Standards, while considering that there are aspects of the Standards that are effective. Mayer's study is a good example of a small study in which thoughtful attention is given to an issue that is manifested in a single site but which may have implications for the entire project. Also, this study was the only study in the evaluation of the demonstration phase that attempted to measure individual mathematics achievement. This brings us to our next topic, the limitations and challenges of evaluating a program's effectiveness on student achievement. In the next section we will discuss the limitations of the research during the demonstration phase. Following the limitations and challenges section, we will address the next phase of research for Equity 2000 in which our studies will be more precisely planned to measure student achievement in mathematics.

Limitations and Challenges of Measuring Equity 2000's Effect on Mathematics Achievement

An analysis of existing research data for Equity 2000 was conducted in 1997 by the Equity 2000 Research Advisory Committee. (A list of committee members is provided in Appendix A). Limitations and challenges in evaluating the effects of programmatic reforms on mathematics achievement were discussed from many perspectives in papers and committee meetings. One major limitation in measuring Equity 2000's effects on mathematics achievement

was that individual student data were not collected; enrollment and achievement data were collected by cohort for each academic year. While the PRC report provides useful information about the extent to which students are enrolled in algebra and geometry classes and rates of course completion, further research is needed to understand what instruction the students received and what impact the program has on their performance or subsequent education. And while the classroom observations and focus groups point to changes in teacher attitudes and pedagogy resulting from Equity 2000 workshops, we need more evidence about change in the quality and or appropriateness of instruction.

Specifically, from the report of the Equity 2000 Research Advisory committee, and from a number of interesting questions raised by the evaluation, we see several possible areas that warrant further research: (1) issues concerning access to algebra, geometry, and higher level mathematics; (2) development of a consistent measure of the quality of mathematics offered high school students in the pilot districts; (3) study and analysis of the alignment of Equity 2000 with district and state goals and policy -- the challenge for the program is to remain flexible enough to respond to differences in state goals and outcomes, and variations in district contexts and goals; (4) a capacity study -- in the Equity 2000 evaluation we see that capacity to teach to and support higher standards and high-quality, rigorous instruction can be limited; (5) study and analysis about what works and does not work to improve student learning; (6) answering the unanswered question of Equity 2000 --"what difference did it make in a student's life?" (7) study of policy issues such as how to create incentives for less motivated teachers to change practice; and (8) testing the untested proposition that if more stimulating courses are offered, this will motivate students to attend school, study hard, and learn the material. This raises the question of student motivation -- what are the competing factors in students' lives?

In addition, Mayer's interesting study raises a number of questions about the NCTM Standards. As they played out in the Equity 2000 sites and evaluation, the in-service work with teachers, and the assessment of whether their practice had changed, the teachers seem to have

focused more on the form of their practice and of student activities than they did on what was being taught in the courses. Also, the form of learning that the Standards promote may well be a more effective way to help students come to a deeper understanding of mathematics and be able to apply what they have learned more effectively in new and complex situations, but we need to more research to determine if this in fact the case. Also there is the danger of the teaching-testing gap -- if traditional approaches are what is tested, Standards-based approaches may show no advantage over more traditional approaches. We also need more research to determine if Standards-based approaches work differentially better for disadvantaged students.

Need for Future Research

The framework of the research program for Equity 2000 is drawn from specific needs for educational research identified in current literature and by limitations of previous research and questions raised during the ongoing implementation of Equity 2000. The College Board's vision of teaching and learning, and its actual experience of implementing reform in school districts, provide a pragmatic foundation for the research program. From a planned series of research studies we hope to learn more about issues critical to teaching and learning: policy, pedagogy, individual differences, and achievement measurement. The broad, interrelated lines of research include:

1. study of college-going and first year college achievement in school districts that adopted a policy of algebra and geometry for all students;
2. study of instructional variation and effectiveness in mathematics;
3. study of individual differences in mathematics achievement; and
4. development and implementation of end-of-course assessments and accompanying instructional materials for algebra and geometry.

These four strands of research will provide evidence for the efficacy of Equity 2000. The Equity 2000 sites, as the practitioners of institutionalizing policy change and instructional supports in their districts, are the major participants in the research program. By the conclusion of the research program we will know:

- whether poor and minority students from the sites are attending college at a higher rate than before the program was implemented;
- how classroom practices and instruction influence student learning and teacher effectiveness;
- the extent to which student learning and success are influenced by educational experiences outside of Equity 2000;
- whether helping students understand what they know and what they do not know about algebra will make them better learners of algebra;
- why some students fail algebra despite all of our best interventions, and what role(s) individual differences play in the learning of algebra and geometry;
- whether Equity 2000 students have the same skills as non-Equity 2000 students; and
- whether we can construct a valid and reliable math assessment instrument that helps us evaluate the quality of math instruction, as well as strengthen math instruction.

Measuring Mathematics Achievement

The Equity 2000 Research Advisory Committee reached consensus that end-of course assessments in algebra and geometry should be pursued as a first priority, and the College Board, with Educational Testing Service and a group of mathematics educators, is currently developing end-of-course assessments, curricula, and materials that will change classroom instruction and enable students to acquire a sophisticated understanding of content knowledge, higher-order thinking abilities, and problem-solving skills in algebra and geometry. Building on the results of past small scale pilot efforts, a field test will be conducted at the Equity 2000 sites in

Spring 1998, with feedback available in Summer 1998. The continued development of the assessment and instructional materials will build on the findings of the field test.

The vision for the end-of-course assessments is that they will reflect NCTM standards, and alignment to district and state standards and other assessments, especially high school exit exams, including progressive systems moving toward more integrated math sequences. Plans are to accommodate this diversity through development of a "system" of exams on a modular basis, with separate exam forms for each of the "big topics" covered in algebra and geometry. In this manner, exams can be tailored to the structure of a particular course the schools have chosen. Research shows that assessments alone will not improve teaching; thus other kinds of professional development must accompany new assessments. Teachers will be trained in their instructional use and will participate in scoring activities.

These assessments will provide needed measures of what students are learning in high school courses and will help Equity 2000 define what algebra and geometry should include. Appropriate assessments will improve our knowledge about the impact of Equity 2000 not only on course-taking and completion, but on the knowledge and skills that students acquire in those courses. The latter is needed to counter the charges that enrollment of more students leads to watered-down courses and lower standards of performance.

Conclusions

Evidence from the school districts participating as demonstration sites for the College Board's Equity 2000 program suggest that as Equity 2000 continues to be effective in raising student achievement in mathematics.

The final report of the Equity 2000 demonstration phase concludes that Equity 2000 is an effective way to increase the number of students taking and passing algebra and geometry. In

fact, by the end of the 1995-96 demonstration phase, more students were enrolled and passing algebra 1 in the ninth grade and geometry in the tenth grade than were even enrolled in those courses, at those grade levels, at the start of the project. The report also states that Equity 2000 has achieved considerable success, with minority student achievement in mathematics, with more African-American, Hispanic, Asian, as well as white, students enrolling in and passing algebra I (in ninth grade) and geometry (in tenth grade) than were even enrolled in these course five years earlier." (Rodriguez, 1997) The PRC report concludes that the Equity 2000 initiative demonstrates that minority, disadvantaged, and poor students can rise to high levels of academic performance in algebra and geometry when barriers to educational opportunity are removed, and if district-wide policy is directed toward enhancing educational opportunity. (Rodriguez, 1997)

Further, data collected one year after the demonstration phase has ended indicate that enrollment and passing rates are holding steady. This is an encouraging sign of Equity 2000's continuing effectiveness. Additional evidence of Equity's role in mathematics achievement comes from classroom observation and focus groups in which mathematics instruction seemed to be improving.

We are aware however, of the limitations of the research thus far. To that end we have analyzed our challenges and created a program of research that goes beyond what we attempted to do in the demonstration phase of the project. We are moving forward with an active research agenda and are now ready to delve more deeply into the research of individual student achievement. We have already entered the next phase of Equity 2000 research with the Equity 2000 sites as our partners and field sites in data collection.

The evaluation of Equity 2000's effectiveness on mathematics achievement continues as we attempt to learn more about college-going and first year college achievement in school districts that adopted a policy of algebra and geometry for all students; as we study instructional variation

and effectiveness in mathematics; as we study individual differences in mathematics achievement; and as we develop and implement end-of-course assessments to measure algebra and geometry achievement.

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Appendix A Advisory Committees

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Appendix B Presentation Outline

Effects of Equity 2000 on Student Achievement in Mathematics: Evidence from School Districts

Paper presented at the Annual Meeting of the American Educational Research Association, San Diego, April, 1998
(Presentation 25.18)

I. Introduction

II. Equity 2000 - A District wide Reform Program

III. Evaluation of Equity 2000's Effectiveness

IV. Changing Enrollment Trends
Algebra
Geometry

V. Changing Mathematics Achievement Trends
Algebra Passing and B or Better
Geometry Passing and B or Better

VI. Discussion of Enrollment and Achievement Data for the Demonstration Phase

VII. Supporting Strands of Evidence for Mathematics Achievement

VIII. Limitations and Challenges of Measuring Equity 2000's Effect on Mathematics Achievement

IX. Need for Future Research

X. Conclusions

Appendix C Presentation Materials

Everson, H.T. and Dunham, M. (1996). Signs of success: preliminary evidence of effectiveness. New York, NY. The College Board.

Marabel, A. (1998). Enrollment Graphs from the Equity 2000 1996-97 data collection. Presentation to Equity 2000 Site Superintendents in Washington, D.C. Unpublished raw data.

Rhodes, D. and Durkin, E. (1998). The spring 1998 algebra end-of-course examination: grounded in the fundamentals, preparing students for the future, a description, sample questions, and solutions. (Available from Educational Testing Service, mail stop 30-E, Princeton, NJ 08541).

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