Mathematics Helping Corps

2001 Final Evaluation Report

January, 2002

Prepared for the
Office of Superintendent of Public Instruction
Olympia, Washington

Fouts & Associates, L.L.C.

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EXECUTIVE SUMMARY

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INTRODUCTION

The Mathematics Helping Corps (MHC) was established by the 1999 Washington State Legislature to provide assistance to elementary and middle/junior high schools to improve mathematics teaching and learning. The stated purpose of the program is "to develop a replicable, research-based model of school improvement in mathematics." In the autumn of 1999 eight Mathematics Helping Corps mentor teachers began working in 16 schools throughout the state. A ninth Helping Corps mentor was added to the program in 2000, bringing the number of schools served by the program to 18. The original eight mentors spent two years working in the same 16 schools, and this report is based on their experiences. The evaluation of the Mathematics Helping Corps Program focused on the following questions:

- What kind of assistance was needed in the schools?
- Was the assistance effective?
- What was unique about the assistance process/delivery in the school, and were those elements related to increases in student or achievement?

Program Description

The Mathematics Helping Corps Program began in the summer of 1999 with the selection of eight mentors with strong mathematics education backgrounds to serve as master teacher/mentors in a selection of 16 schools with low achievement based on WASL results. Each MHC mentor teacher was assigned to work with two schools two to three days a week. The program also included monthly training/support meetings for MHC mentor teachers, involvement in broader math improvement efforts in the state, and extensive collaboration.

Information gathered from MHC mentor teacher logs, interviews with the MHC mentor teachers, and interviews with teachers and principals at the MHC schools indicated that the MHC mentor teachers spent most of their time in the schools focusing on the following activities:

- **Building relationships/trust within the building**.
- **Aligning and focusing of the curriculum**.
- **Developing understanding in teachers of new content.**
- **Providing new teaching and assessment strategies for teachers.**

EVALUATION QUESTION 1: WHAT KIND OF ASSISTANCE WAS NEEDED IN THE SCHOOLS?

Evaluation results during the first year indicated the schools chosen for the MHC program had professional teacher cultures and approaches to math curricula and instruction that closely resembled a non-standards based model common prior to current reform efforts. In essence, the schools, at least in regard to the teaching of mathematics, had not adapted to a standards-based environment and professional culture. Teachers in many schools were relatively unfamiliar with the EALRs, the existing math curriculum was unfocused, assessment practices were not aligned with the expectations of the new state requirements, accountability for teaching the EALRs was limited, and teachers operated independently of each other. Mathematics instruction at the schools had not been a strong focus of professional development activities, and some teachers were not comfortable with the new math content and expectations.

Consequently, the schools selected for the MHC program needed assistance making the change from a traditional curriculum and professional environment to an environment in which the math curriculum is aligned with the EALRs, the sequence of instruction is established and adhered to by teachers, instruction is focused on problem-solving in addition to basic skills, assessment is consistent and on-going, and teachers share effective practices and information on student achievement.

The MHC mentor teachers faced a number of challenges over the two years of the program, including:

- Varying degrees of teacher support for the program.
- Varying degrees of a sense of urgency among teachers to change current practices.
- Limited teacher mathematical knowledge.
- Varying degrees of school starting points.
- Varying degrees of principal leadership.

EVALUATION QUESTION 2: WAS THE ASSISTANCE EFFECTIVE?

Changes in the Schools' Math Curriculum, Instruction, and Professional Environment

Evaluation evidence suggests that, generally, the MHC program was successful in making changes in teacher culture, professional development, and math curriculum and instruction that are associated with higher levels of student achievement in a standards-based environment. A higher percentage of the teachers reported that the EALRs were directing their curriculum decisions, that there was more curriculum continuity both vertically and horizontally throughout the grades, and that they were more collaborative in their approach in the teaching of mathematics. However, the results were not shared evenly by all of the schools, and some schools made considerable changes in these areas,

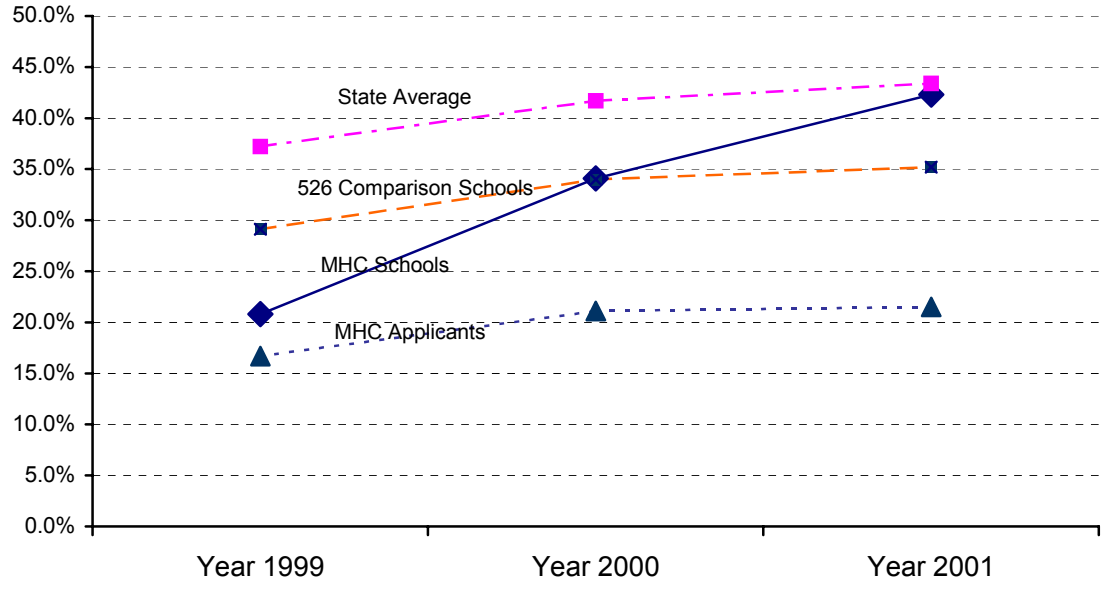
others made moderate changes, and some schools made few, if any, meaningful changes during the two years.

Changes in Academic Achievement Levels

The 13 Mathematics Helping Corps elementary schools showed a larger increase on the 3rd Grade ITBS math scores than did a comparison group of 526 schools. The two-year mean gain for the MHC schools was 5.4 NCE points, compared to a two-year mean gain of 1.8 NCE points for the comparison schools. However, the gains were not equal across the MHC schools, ranging from a –7.3 to +16.5. Still, overall, the positive upward trend is an encouraging finding. This trend will need to be followed over several years before it can be attributed to the effects of the MHC program.

The positive growth in the passing rate on the 4th grade WASL for the MHC elementary schools outpaced the growth of the state average, the comparison group, and the other MHC applicant schools and is both statistically significant and substantial when compared to the comparison schools. The magnitude of the growth of the applicant schools not selected for the MHC suggests that the growth of the MHC schools is not due solely to the regression to the mean phenomenon. The trend of the passing rates on the 7th grade WASL for the 3 middle/junior high schools were mixed, at best, suggesting that the program had little impact on student achievement.

1999-2001 4th Grade WASL Math Passing Rates for Four Groups of Schools.



EVALUATION QUESTION 3: WHAT UNIQUE ELEMENTS, IF ANY, WERE FOUND IN THE ASSISTANCE PROCESS/DELIVERY IN THE SCHOOLS, AND WERE THOSE ELEMENTS RELATED TO INCREASES IN STUDENT ACHIEVEMENT?

The MHC mentor teachers were clearly more successful in some schools than in others in bringing about fundamental changes in the mathematics curriculum and instruction. The degree of success was dependent on several factors, including the individual expertise and personality of the MHC mentor teacher, the leadership ability of the building principal, and the nature of the school professional climate in which the MHC mentor teacher was placed. Any one or all of these factors interacting played a determining role in the degree to which MHC program was successful at a given school. In the aggregate, g*enerally*, the increases in test scores are more closely associated with those schools in which the MHC program appeared to have the most influence on teachers and classroom instruction. However, there is not a perfect correlation between apparent success in the changes in math instruction and teacher professional culture and improved student achievement. In one or two schools where the program apparently had little effect, test scores improved over the two years, and in one or two schools where the program appeared to thrive, student achievement increases were somewhat limited. This suggests that, while the elements of the MHC program can be important contributors to school reform in mathematics instruction, other factors at work must be considered.

CONCLUSIONS

- The basic tenets of the Mathematics Helping Corps Program are in close agreement with research proven professional development practices that provide a sustained opportunity for teachers to learn, experiment with and receive advice, and that provide opportunities for feedback and follow-up activities in a collegial setting.

- Schools selected for the MHC assistance in 1999 had not adapted to a standards-based environment and professional culture, at least in regard to the teaching of mathematics. *In addition,* some of these schools suffered from weak instructional leadership and/or some degree of a dysfunctional professional climate. In some schools teachers were not supportive of the program initially, did not understand the nature of the changes necessary to improve student achievement or the role of the MHC mentor teacher in facilitating this change. These factors at least partially determined the degree of success reported by the MHC mentor teachers and observed by the evaluators.

- Evidence from a variety of sources indicates that the *majority* of these schools have made considerable strides forward in changing the teaching professional culture, in

aligning the mathematics curriculum with the EALRs, and in how mathematics is taught in the classrooms. In a few of the schools, however, little if any improvement was observed.

- Overall, student achievement in the elementary schools participating in the Mathematics Helping Corps Program increased substantially, particularly as measured by the 4th grade WASL. Whether compared to increases in the state average or to two separate comparison groups, the improvements are considerable. However, achievement gains were not evident in two elementary schools and the program effects at the three middle/junior high schools appear to be minimal.

- Evidence from a variety of sources suggests that the Mathematics Helping Corps is a sound program for school improvement. However, it is most effective when it is combined with other factors, such as strong principal leadership at the school, teacher acceptance of the program, and an understanding on the part of the teachers as to the types of changes necessary to improvement student learning. In addition, evaluation results also suggest that it is not realistic to expect that the Mathematics Helping Corps program can overcome a number of existing factors in some schools that are handicapping the reform efforts.

RECOMMENDATIONS

- As the Mathematics Helping Corps Program expands to new schools in the future, it is important that considerable effort be made *prior* to selection of the schools and implementation of the program to help the teachers and principals understand the nature and depth of the changes that the MHC teachers will be asking for.

- To maximize the likelihood of the success of the program, the selection process of schools for future involvement in the Mathematics Helping Corps program should take into account a school's current leadership and professional culture to ensure that certain prerequisite factors necessary for success are present.

- An additional goal of the program should be to develop the mathematic leadership role of one or more teachers in the school to replace the MHC mentor teacher at the conclusion of the program to help insure sustainability.

- Evaluation efforts in the future should focus on the degree to which the schools in the first MHC cohort were able to sustain the changes made in curriculum and instruction over the next several years.

Mathematics Helping Corps
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INTRODUCTION

The Mathematics Helping Corps (MHC) was established by the 1999 Washington State Legislature to provide assistance to elementary and middle/junior high schools to improve mathematics teaching and learning. The stated purpose of the program is "to develop a replicable, research-based model of school improvement in mathematics." In addition it was stipulated that, "the model will be continually evaluated and modified, based on evaluation data, to ensure quality, sustainability, and maximum results as measured by the Washington State Assessment System."

The stated goals of the program include:

1. To increase student proficiency and excellence in mathematics performance by building a foundation of understanding connected to the delight of exploration and discovery in mathematics.

2. To maximize educators' skills in mathematics through research-based training and support in mathematics content knowledge, exploration and discovery, instructional strategies for all students, assessments, and interpretation of assessment data.

3. To expand administrators' knowledge of effective mathematics instructional strategies, assessments, and interpretation of assessment data.

4. To develop and implement family and community involvement programs that assist students in achieving the mathematics essential learnings.

In the autumn of 1999 eight Mathematics Helping Corps mentor teachers began working in 16 schools throughout the state. A ninth Helping Corps mentor was added to the program in 2000, bringing the number of schools served by the program to 18. The original eight mentors spent two years working in the same 16 schools, and this report is based on their experiences. An interim report was prepared at the end of the first year. That report, *Mathematics Helping Corps Year 1 Interim Report*, provided information on the project during the first year, MHC intervention efforts, baseline data on the nature of the schools being served, achievement results, and recommendations for the program.

The math WASL passing rate for the selected schools in the year prior to receiving Helping Corps assistance ranged from 6% to 36%. Those schools are listed below.

Schools receiving 2 years MHC Assistance	District
East Port Orchard Elementary	South Kitsap
Clear Creek Elementary	Central Kitsap
McClure Middle	Seattle
Tolt Middle	Riverview
Whitman Magnet Elementary	Tacoma
Stewart Elementary	Puyallup
Seahurst Elementary	Highline
Highlands Elementary	Renton
Whitney Elementary	Yakima
Tieton Middle	Highland
Camas Elementary	Wapato
Union Gap K-8 School	Union Gap
Orchard Center Elementary	West Valley
Pratt Elementary	Spokane
Ridgeview Elementary	Spokane
Sunset Elementary	Cheney

Schools receiving 1 year of MHC Assistance	District
Kittitas Elementary/Middle	Kittitas
Walter Strom Middle	Kittitas

Program Description

The Mathematics Helping Corps Program began in the summer of 1999 with the selection of eight mentors with strong mathematics education backgrounds to serve as master teacher/mentors in a selection of 16 schools with low achievement based on WASL results. Each MHC mentor teacher was assigned to work with two schools two to three days a week. The program also included monthly training/support meetings for MHC mentor teachers, involvement in broader math improvement efforts in the state, and extensive collaboration. In addition, the MHC schools' principals and teachers were provided the opportunity to participate in a number of these activities.

To accomplish the program goals, MHC personnel were to provide the following types of assistance:

- Consultation on student mathematics learning and achievement;
- School improvement planning using data analysis;
- Alignment of curriculum with the essential learnings;
- Training in research-based mathematics instruction/assessment;

- Training in strategies for meeting the needs of diverse learners; and
- Family/community involvement in mathematics learning.

Information gathered from MHC mentor teacher logs, interviews with the MHC mentor teachers, and interviews with teachers and principals at the MHC schools indicated that the MHC mentor teachers did indeed provide many, if not all of these services to the teachers at the MHC schools. The MHC mentor teachers spent most of their time in the schools focusing on the following activities:

- **Building relationships/trust within the building.** This task was deemed vital by virtually all of the MHC mentor teachers. The degree to which this trust and acceptance was achieved within the building was one of the key factors to the success of the MHC program in a given building. This was particularly important during the first year of the program. The degree of acceptance of the MHC program differed considerably among buildings, and differed considerably among teachers within a given building. By the second year this trust had been established in most schools, allowing more focus to be given on curriculum and instruction efforts. It must be noted, however, that in a few schools, the degree of acceptance of the MHC mentor teacher by the building teachers was minimal.

- **Aligning and focusing of the curriculum**. In all of the MHC buildings, this task was identified as being of paramount importance during the first year of the program. The results of the *Knowledge and Use Survey* and the results of the building teacher and MHC mentor teacher interviews indicated that this had not been done in the buildings previously. The MHC mentor teachers reported that there were varying degrees of understanding on the part of the building teachers as to the need for this to be done. The evaluation results from the first year indicated that there was much left to be done in this area during year 2 of the MHC project, and during the second year of the project, this was a major focus in most schools. By the end of the second year, most MHC mentor teachers believed that progress had been made in this area, but that there was still much left to do.

- **Developing understanding in teachers of new content**. For many teachers, math has been the content area that they are least comfortable teaching and least knowledgeable in terms of the content. There are indications from the interviews and the results of the *Knowledge and Use Survey* that this is true with the building teachers in the MHC schools. This was a particularly challenging area for the MHC mentor teachers.

- **Providing new teaching and assessment strategies for teachers.** The math EALRs reflect new content involving problem solving, and are assessed with methods that require students to explain in writing their answers. The MHC mentor teachers spent considerable time providing strategies and techniques to receptive teachers on how best to teach these new requirements.

To accomplish these tasks, the MHC mentor teachers ran multiple types of inservice activities, modeled classroom lessons, consulted with teachers, provided new teaching materials, and worked with parents. The amount of time spent on each of these activities differed from school to school based on the local need, the receptivity of the teachers to the program, and the amount of resources (principally release and planning time) the school leadership was willing to allocate to the program. These activities were in alignment with the stated expectations in the project's design.

Evaluation Activities During Years 1 and 2

The evaluation of the Mathematics Helping Corps Program focused on the following questions:

- What kind of assistance was needed in the schools?
- Was the assistance effective?
- What was unique about the assistance process/delivery in the school, and were those elements related to increases in student efficacy or achievement?

During Year 1 of the program (1999-2000) baseline data on the 16 schools involved in the Mathematics Helping Corps Program were collected throughout the school year. The data were obtained by means of the Student Mathematics Survey for grades three through seven; the Knowledge and Use Survey and the School Indicators Rating for certificated school staff; mentor teacher logs; and one-on-one interviews with a selection of 80 building teachers, all 16 building principals, and all of the Helping Corps mentor teachers. External evaluators conducted interviews at the building sites during April and May 2000. The interviews focused on the nature of the school's math curriculum and instruction status, development of the MHC grant application, activities during the first year, teacher and principal support of the program, as well as program successes and challenges faced during the first year. In addition, building ITBS and WASL scores were analyzed for 1999 and 2000.

During the second year of the program (2000-2001) a second round of data collection included monthly mentor teacher logs; the administration of the Knowledge and Use Survey and the School Indicators Rating in May and June; and interviews with 80 building teachers, 16 school principals, and all eight of the second year MHC mentor teachers. Once again, the interviews focused on the nature of the school's math curriculum and instruction status, activities during the second year, teacher and principal support of the program, as well as program successes and challenges faced during the second year. In addition, building ITBS and WASL scores were analyzed for 1999 through 2001.

CONTEXT: NATIONAL REFORM EFFORTS AND PERTINENT RESEARCH FINDINGS IN WASHINGTON STATE

Recent Research

It is important to view this project in the context of the overall school reform efforts and recent research efforts going on in the state. The current efforts at educational reform in the state of Washington were begun formally in 1993 by the passing of Engrossed Substitute House Bill 1209 (HB1209), also known as the Washington State Education Reform Act. In an effort to improve the schools and to increase overall student learning, HB 1209, among other things, established a performance-based educational system with specific learning standards, encouraged decentralized decision-making and teacher empowerment, and attempted deregulation to allow individual school flexibility. Specific components of HB 1209 established the Commission on Student Learning, charged with the development of learning requirements and assessment and school accountability procedures, while other components encouraged school-to-work transition, business partnerships, parental involvement and teacher training.

The reform efforts within Washington State generally reflect the school restructuring efforts that are currently progressing at various speeds throughout the United States. There are a number of "common threads" among the national contemporary school reform efforts, which include collaboration among teachers, administrators, parents and others addressing the purposes, goals and process of restructuring; clear student learning outcomes tied to revisions in assessment practices; curriculum and pedagogical revisions providing for basic skills and higher level thinking in "real-life" situations; systems of accountability; and a recognition of the importance of systemic changes for restructuring success. *It is in this context that it is important to consider Mathematics Helping Corps evaluation results.*

Over the last several years researchers have identified the types of changes being made in the nation's schools and the relationship of these changes to student learning. The research results in Washington State have generally reflected the findings in other parts of the country. In spite of diverse research methodologies, measures of student achievement, sources of data, and school samples, findings have been very consistent and therefore instructive. Recent studies suggest that successful restructuring is possible within Washington schools, and is the result of careful planning, collaboration, and teamwork among teachers, principals and parents, clear and common goals, redirected resources including time, and an ownership and belief in the restructuring process. These things are believed to be brought about by strong instructional leadership from the building principal. Increased academic achievement follows from these efforts, and is not the result of any specific set of curriculum materials or teaching practices. A brief summary of the research projects is shown in Table 1.

Table 1: Recent Research Reports in Washington State

Study	Methodology	Sample findings
School Restructuring and Student Achievement in Washington State: Research Findings on the Effects of House Bill 1209 and School Restructuring on Western Washington Schools. 1999. Jeffrey T. Fouts Sponsor: School of Education, Seattle Pacific University	Quantitative data obtained from 2,197 teachers from 111 schools, and 16 school districts in Western Washington. Student achievement measure: CTBS results from 1993 to 1997.	• The degree to which a school is restructured is the single best predictor of achievement gains, and works independent of a school's ethnic or socioeconomic status and size. • Restructuring defined as the degree to which teachers, parents, and administrators have worked together to define the goals, beliefs, and expectations for the school, along with a belief and commitment to the restructuring process.
Making Standards Work: Active Voices, Focused Learning. 1999. Robin Lake, Paul Hill, Lauren O'Toole, and Mary Beth Celio Sponsor: Center on Reinventing Public Education, UW Graduate School of Public Affairs & the Partnership for Learning.	Qualitative data obtained from 30 schools whose 4th grade WASL test scores had improved significantly from 1997 to 1998, and 10 control schools. Student achievement measure: 1997 and 1998 WASL	• Effective changes in teaching methods and materials are focused and school-wide and represent a philosophical shift. • Improving schools operate as teams, with students, parents, and community taking responsibility for improvement. • Professional development time is used strategically. • Improving schools were no more likely than other schools to receive new funding. Available funds were focused on instruction.
Organizing for Success: A Study About Mathematics Assessment Results in Washington State. 1999. Terry Bergeson, Cheryl Mayo, David Kennedy, Mary Jo Johnson, and Beverly Neitzel Sponsors: Office of the Superintendent of Public Instruction; Commission on Student Learning.	Qualitative data gathered from 53 buildings and 20 school districts that showed significant gains in percentage of 4th grade students meeting or exceeding mathematics standards from 1997 to 1998. Student achievement measure: 1997 and 1998 WASL mathematics.	• Attitude, commitment, and focus of teachers and administrators were key to success in student learning. • Professional development was essential to improve classroom instruction to impact student learning. • No specific program or supplementary program made the difference.

Table 1 (cont)

Study	Methodology	Sample findings
Organizing for Success: Improving mathematics Performance in Washington State (Updated). July 2000. Terry Bergeson, Rosemary Fitton, Pete Bylsma, and Beverly Neitzel Sponsor: Office of the Superintendent of Public Instruction and the Commission on Student Learning	Qualitative data from teachers in schools serving fourth and seventh grade students that made significant gains in math achievement during 1998 and 1999. Student achievement measure: 1998 and 1999 WASL	There is no single curriculum, text, or strategy that helped these schools and districts make significant increases in the number of students meeting the mathematics standards. Greater improvement occurred because the schools made a combination of changes that, together, affected the education that was provided. Examples: • A strong leader who helped develop a clear and shared vision. • High standards and expectations for all students. • Quality staff with positive attitudes. • Curriculum alignment with EARLs • Teamwork • Identification of student needs • Focused professional development • Parental involvement • Long-term approach.
Making Standards Stick: A Follow-up Look at Washington State's School Improvement Efforts in 1999-2000 Robin Lake, Maria McCarthy, Sara Taggart, and Mary Beth Celio Sponsor: Center on Reinventing Public Education, UW Graduate School of Public Affairs & the Partnership for Learning.	Qualitative data gathered from 56 elementary and middle/junior high schools to determine the strategies used to improve and to know whether schools could sustain gains in performance, and what it takes to do so Student achievement measure: 1998 and 1999 WASL	Successful schools: • Focused instruction on key student learnings. • Operated as a school-wide team, not as a random association of individuals • Identified and addressed unique needs of school and staff. • Identified students who need extra help and gave it to them. • Targeted energy and resources toward key goals. • Recognized that attitude matters. Schools that sustained improvement made deeper and more consistent changes.

Table 1 (cont)

Study of the Grade 4 Mathematics Assessment Final Report. September 2000. Terry Bergeson, Cheryl L. Mayo, Rosemary Finton, and Pete Bylsma Sponsor: Office of the Superintendent of Public Instruction	Questionnaire data from 38 schools showing the most improvement on the 4th grade math WASL from 1997 to 1999. Student achievement measure: 1997, 1998, and 1999 WASL	Teacher identified factors attributing to the schools success included: • Improved mathematics instruction • More time on mathematics instruction • More team work and collaboration among staff • More time preparing for WASL • Improved alignment of curriculum with EARls • Improved mathematics curriculum

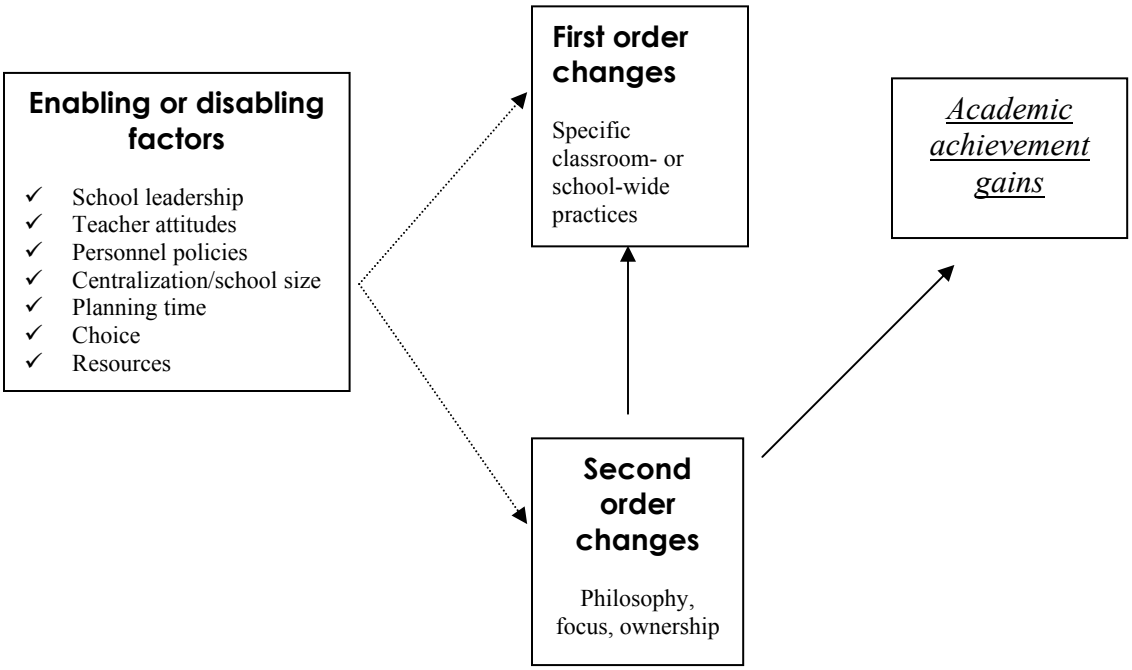
An important theoretical framework for understanding the desired school changes is explained in the 1999 study released by Fouts through Seattle Pacific University. In this study the researchers identified a restructured school as one that had undergone changes that reflect second order or fundamental changes in school philosophy and practice, and where those changes are driven by a collaborative process and clearly defined goals. They attempted to distinguish between simply changing school or classroom practices (first order change) and the broader concept of restructuring a school (second order change). The former can be done without the latter, and in fact has been done repeatedly throughout the recent history of American education. An example of this was the finding that a number of schools had operating site-based councils, but low collaboration. However, restructuring schools implies a new vision, a rethinking and changing of the very philosophy about education, student learning and how schools should operate on a day-to-day basis. From this will flow naturally changes in school-wide and classroom practices.

The most significant finding in this 1999 study was that achievement gains were greater in the elementary and middle/junior high schools where restructuring had taken place than in those schools where it had not. The best predictor of achievement gains was the Total Restructuring Score, and this was true regardless of the school's socioeconomic status, ethnic composition, or size. While the more highly restructured schools were more likely to have implemented certain educational practices (first order changes) than were the less restructured schools, those more common practices alone were found to be less important than the ideas and actions embedded in the concept of restructuring.

In this research the Total Restructuring Score (second order/fundamental change) was a measure of the degree to which teachers, parents, and administrators had worked together to define precisely what their school will be; that is, what goals would be

pursued, what beliefs would drive the decisions, what would be expected of the students, and how these ideas would be implemented. It was also a measure of the commitment to and ownership of the changes, and belief on the part of the teachers that what they were doing is important and that it will make a long-term difference in their classrooms and in the lives of their students. These findings showed that actual collaboration is more important than a site-based council. Clear and agreed-upon goals are more important than increased technology. Building a learning community is more important than rearranging classroom schedules. In short, in the restructured schools a new ethos had emerged, and specific school-wide or classroom practices took a back seat to this important component of changing education. Where the new ethos and philosophy had emerged since 1993, student achievement had increased. A graphical representation of these findings is presented in figure 1.

Figure 1: Relationship of first and second order changes to academic achievement gains



Schools that had experienced second order change were more likely to have experienced achievement gains. They were also more likely to have implemented certain first order changes than had other schools. However, there is no line connecting the first order changes, such as increases in the use of technology, group projects, or cooperative learning, to achievement gains because no relationship was found. These findings, supported by other research, suggest that achievement gains are dependent on second order or fundamental change, and not on the implementation of specific educational practices. Certain specific educational practices may be important, but only in conjunction with or being preceded by second order changes. *It is important to note that these findings have been supported by the other studies that focused on student achievement mentioned in Table 1.*

A related Washington state research study released in May 2000 sought to identify the factors that prevent second order/fundamental change from taking place. In *The Reality of Reform: Factors Limiting the Reform of Washington's Elementary Schools*, the researchers interviewed 40 highly successful principals from around the state to determine why this type of change was so difficult to make in the schools. The principals believe lack of leadership and vision are the most significant barriers to the implementation of school reform in Washington State. In addition to lack of leadership, principals believe that lack of support (in terms of both money and time), teacher reluctance to change, and negative attitudes are also strong reasons. Principals fear that, without sufficient time for collaboration, planning, team building, and aligning instruction with the EALRs, teachers will be unable to accomplish all that is being asked of them.

The findings in Washington State are not unique. Similar findings have been reported in other states that are attempting to implement *standards-based systems* with *high expectations* for all students. Much of the research elsewhere focuses on student achievement in a multiple areas, and not just math. Nonetheless, the results are instructive. For example, researchers in Texas found that high achieving schools work very hard at creating a new school culture in which the building leadership (consisting of the principal and teacher leaders) focuses efforts on student achievement and accepts no excuses for poor performance. They employ a unified and common curriculum and continuously assess student progress and intervene immediately when students or teachers are struggling. They make high-quality teaching and research-based instructional practice the top priority and collaborate extensively, both inside and outside the school. (See Just for the Kids, 2001, *Promising Practices: How High Performing Schools in Texas Get Results).*

A much broader of study has been conducted in high achieving districts, rather than schools. The researchers began by looking at "high achieving organizations" in general and found:

> These organizations focus on clear standards, and they have developed procedures to assess progress toward these standards. They have restructured the system to place accountability in the hands of the people closest to the products, and they typically have adopted a "no excuses" mentality.

High achieving districts had these same characteristics in addition to the following three traits related specifically to schooling:

1. Extensive efforts to align instruction with the test content.
2. Detailed analysis of student responses to the tests or assessments designed to parallel these.
3. The provision of immediate and appropriate corrective instruction for individual students as indicated by that analysis.

(See Cawelti, G. & Protheroe, N. 2001, *High Student Achievement*: *How Six School Districts Changed into High-Performance Systems,* Educational Research Service).

Changing School and Teacher Culture

What does all of this research suggest? The demand for higher standards and a school environment where all children are learning at high levels will require changes that are more than just superficial; that is, more than just first order changes of new schedules, new computers, or new committees. These research findings suggest that there must be more fundamental changes in the school and teacher culture to provide the best chance for all children to be successful. While there are a number of second order changes that may be necessary, the findings from this variety of studies indicate that both the school and teacher culture must be fundamentally changed in the schools, as shown in Table 2, before substantial improvement in math achievement is likely.

The two models presented in Table 2 are contrasting approaches to curriculum organization and the role of the teacher. The two models are opposite ends of a spectrum, and seldom are schools on these extremes. However, the model is useful for explaining the nature of the school culture that exists in many schools currently, and the school culture that research suggests produces the best results in a *standards-based environment*.

Prior to the current standards-based reform movement in the state, the model found in many of the schools in Washington more closely resembled the model in the left column than it did the model in the right column. State guidelines did provide learning goals, but school districts were able to develop their own goals independent of the state's goals, and these, therefore, could be quite diverse from district to district. It was not unusual for a student who changed districts during the school year to find the new district's goals, and therefore the curriculum for that grade, considerably different than the district from which she just left. Compounding this problem was the limited accountability for teachers to teach the district or school curriculum that *had* been adopted. Many teachers included and excluded topics and skills from the curriculum with little monitoring from the administration. Although done with the best of intentions, this often resulted in gaps between grades at a school (vertically) and within a grade level at a school (horizontally).

Traditionally, large-scale assessments often focused on generic basic skills, which may or may not be tied closely to the state's learning goals or the local district's curriculum. Teacher accountability for teaching the district curriculum was often minimal, and school accountability for student success was not formalized. Professional development was often left to the individual teacher. Lastly, and maybe most importantly, the teacher professional culture of the school has been one of considerable independence. What to teach and how to teach it was oftentimes left to the individual teacher to decide, and little time was spent in team planning, sharing successful teaching practices, and aligning the curriculum with the assessment.

Table 2 Traditional vs. Standards-Based Model of School Culture

	Prior or Current Model	Standards Based Model
Learning Goals	General Diverse	Specific Uniform for state
Curriculum	<u>Between grades</u> Potential sequence gaps <u>Within grade</u> Potential for considerable variation	<u>Between grades</u> Tight sequence <u>Within grade</u> Limited variation
Assessment	Traditional generic basic skills and/or knowledge May or may not be tied to district goals and curriculum Periodic	Higher order skills (basic skills) Closely tied to state learning goals On-going
Accountability	<u>Teacher</u> Low accountability on what to teach <u>Student</u> Social promotion <u>School</u> Low accountability for student performance	<u>Teacher</u> High accountability on what to teach <u>Student</u> Performance-based <u>School</u> High accountability for student performance
Professional Development	Teacher controlled Individualized	Focused on building need Collective decision
Teacher Role	Independent	Collaboration

In contrast, in a standards-based model in which all students are expected to achieve at high levels (right column of Table 2), there is a narrowing of the curricula to *essential learnings* that all students are expected to master. This expectation requires a type of curriculum uniformity across districts, across schools, and across given grade levels in the schools. It also requires a tight sequence from grade to grade as a student progresses through the system to insure all essential learnings are taught and mastered. In this state, the essential learnings have been defined in such as a way as to require considerable higher order thinking skills, with the assumption that the generic basic skills are at least a component of those skills, if not a prerequisite. The ordered sequence of the curriculum requires continual classroom assessments on the part of the teacher to determine mastery, with higher stakes assessments taking place periodically. However, for this model to be effective, the professional culture of teachers must change from one of working in isolation, to one of extensive collaboration with colleagues to insure curriculum alignment with the assessments, to maintain appropriate sequence of the curriculum, and to identify successful teaching strategies and techniques necessary for the more difficult requirements of the essential learnings. Professional development is often a collective area based on the overall need of the school rather than the desire of the individual teacher. In this model, teachers are expected to teach the required curriculum and to monitor student progress, students are expected to be promoted on the basis of successfully demonstrating competence, and schools are held accountable for student performance.

What is important to note about two models of school and professional culture is that research is indicating that schools and districts that are demonstrating the largest increases in student achievement as measured by the state assessments are successfully making the transition to the standards-based model from the traditional model of education. The research suggests that these schools are *not* accomplishing these increases by adopting new curriculum materials, schedules, programs and other *first order changes* alone. The schools most successful in increasing student achievement are driven by *second order changes* in philosophy and approach to the their curriculum, instruction, and professional culture similar to the model on the right side of Table 2.

Finally, research on successful professional development for teachers is important to consider. Newmann & King (April, 2000, *Phi Delta Kappan*) argue that conventional professional development has not substantially improved teaching. Research findings, they maintain, demonstrate that teacher learning is greatest when they are able to focus on instruction and student outcomes in the *actual context in which they teach.* Unfortunately, this is not the context in which most professional development takes place. The contrast between the traditional professional development model and research proven practices is shown in Table 3.

Table 3: Traditional vs. Research-Proven Professional Development Activities.

Traditional Professional Development Practices	Research Proven Professional Development Practices
Brief workshops, conferences, university or extension courses	Sustained opportunity to learn, experiment with, and receive advice
Little or no follow-up activity	Opportunities for long-term feedback and follow-up activities
Individual participation	Team effort with professional peers within and outside the school

Summary: The Mathematics Helping Corps in this Context

Research evidence has shown that schools can take steps to improve student achievement, sometimes dramatically. To accomplish this, educators must make a fundamental change in their instructional philosophy and professional culture, develop a common curriculum and instructional focus through a collaborative effort, and create learning communities for both teachers and students. Successful principals in the state suggest that it is their role to provide the leadership for this transition, but that in a number of places it is not happening. Research evidence also suggests that with the proper professional development opportunities, teacher behavior and instructional practices can be changed. The optimal situation includes focused learning opportunities that are directly relevant to the classroom. In addition, these opportunities should occur over an extended period of time, should include ample follow-up, and should take place in a collaborative environment.

In the context of these research findings, the attainment of the stated program goals of "maximizing educators' skills in mathematics" instruction, and increasing student achievement in mathematics will arguably depend on the degree to which the MHC model aligns with research proven professional development practices, and the degree to which the Mathematics Helping Corps mentor teachers can help bring about second order or fundamental change in the school mathematics instructional environment.

EVALUATION QUESTION 1:
WHAT KIND OF ASSISTANCE WAS NEEDED IN THE SCHOOL?

The Mathematics Helping Corps Schools' Math Curriculum, Instruction and Professional Environment

Two surveys were administered to teachers at the beginning of the 1999-2000 school year that provide interesting baseline data on the learning and professional environments of the schools in which the Mathematics Helping Corps mentor teachers were placed. The *Knowledge and Use Survey* asks a series of questions about school leadership, knowledge of the EALRs, and curriculum alignment. The results of the Knowledge and Use Survey are summarized below.

- In 12 of 14 HC schools—33% or more of the teachers were either unsure if the math curriculum was sequenced across grade levels, or if it was sequenced, the curriculum was not tied to the EALRs.

- In 10 of 14 HC schools—40% or more of the teachers said the mission statement was not used or used only occasionally for decision-making, staff development, or other school improvement efforts.

- In 9 of 14 HC schools—40% of more of the teachers said their staff had not reviewed or studied the research on the characteristics of improving schools, or if they had, had not applied it to their school at this time.

- In 9 of 14 HC schools—30% or more of the teachers said the staff was not familiar or only somewhat familiar with the 4^{th} or 7^{th} grade EALRs.

- In 9 of 14 HC schools—36% or more of the teachers said the EALRs were not utilized in the development of their math curriculum, or were uncertain if they were used in the development of their math curriculum.

- In 9 of 14 HC schools—33% or more of the teachers said they were either unsure or their math curriculum did not specify grade level expectations.

- In 8 of 14 HC schools—33% or more of the teachers were either unsure or teachers had not worked together to identify gaps in the math curriculum.

- In 7 of 14 HC schools—32% or more of the teachers did not believe that most or all of the teachers had a copy of the math curriculum they were to be following.

- In 6 of 14 HC schools—40% or more of the teachers said the staff does not use, or only occasionally uses the math EALRs for planning math lessons and instruction.

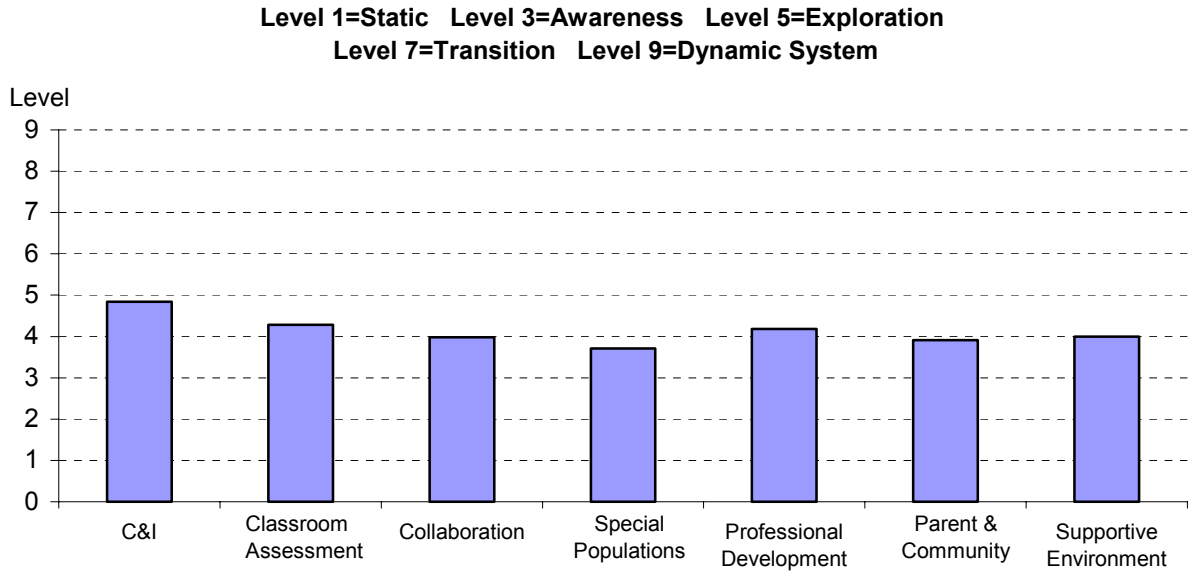
- In 5of 14 HC schools—40% or more of the teachers said their school did not have a leadership team, or if one existed, it did not function in a meaningful way to provide leadership.

- In 5 of 14 HC schools—33% or more of the teachers said the staff does not understand the math EALRs and Benchmark indicators, or are unsure if the staff understands them.

The second survey administered to the teachers, the *School Indicators Rating* is described by it developers "as a gauge for schools to use in reviewing their progress toward school improvement in mathematics. Indicators for Curriculum and Instruction, Classroom Assessment, Collaborative Planning, Special Student Populations, Professional Development, and Family/Community Involvement are considered across five stages that range from a Static System to a Dynamic System. The ideal school culture for teaching and learning mathematics is generally represented in the indicators of a Dynamic System. The results of the 1999 assessment of the 16 HC Schools are shown in Figure 2 and in the appendix (p. 35). The results shown are averages, but it is important to note that there are wide variations in responses within a given school.

End of the year interviews conducted by the external evaluators and analysis of the MHC mentor teacher logs provided additional information that, for the most part, validated the results of these questionnaires, and provided additional insight into why the math scores in many of these schools were below the state average.

FIGURE 2: 1999 School Indicators Ratings for 16 MHC Schools



Challenges Faced by the Helping Corps Mentor Teachers

The MHC mentor teachers faced a number of challenges over the two years of the program. In the first year some of these challenges were overcome and the math curriculum, instruction and professional environment at the schools began to change noticeably. In other schools, less progress was made. By the end of the second year the MHC mentor teachers had experienced some degree of success in a majority of the schools. However, in some of the schools the MHC mentor teachers appear to have had little impact in affecting the types of second order changes associated with increases in student achievement. The challenges faced by the MHC mentor teachers are listed below.

- Varying degrees of teacher support for the program. There was a varying degree of knowledge about the MHC program across the 16 MHC schools at the beginning of the first year. In some schools, teachers had been involved in the application process and therefore were generally supportive of the idea of having a math "expert" in the building and, more specifically, in their classrooms. In other buildings teachers had much less knowledge of the program at the beginning of the year, and therefore were less likely to be accepting of the MHC mentor teacher's efforts. This lack of knowledge was in many cases due to the very short timeline for developing and submitting an application, which resulted in minimal teacher involvement and ownership in the planning stages. The result was that a number of teachers did not seek out assistance, would not accept assistance when offered, and were not willing participants in the professional development opportunities.

- Varying degrees of a sense of urgency among teachers to change current practices. For a variety of reasons, there were often one or more teachers within a building that saw the MHC program as "one more thing" added on to a busy day, or believed that the assistance was not needed by or applicable to them personally. Sometimes this was due to a failure to understand the true nature of the current reform efforts and the degree to which the EALRs impact the entire curriculum at every grade level. MHC mentor teachers noted this situation many times in their logs and in interviews with the evaluators. During the interviews at the end of the first year, numerous teachers made statements that reflected this. For example, a primary teacher who voiced support of the program, but who had not sought out assistance or been involved in the program's activities herself, thought the program had "been really good for our 4th grade teachers." Similarly, when a third grade teacher was asked if she had looked at the 4th Grade WASL test, she replied that she had a few years ago, but concluded that it did not have much to do with her because it did not reflect what she did in 3rd grade math. Another teacher noted, "I don't think the WASL is a good assessment of what the kids are doing in math."

  In fairness to these teachers it must be pointed out that they felt they were following the district math curriculum and materials they had been given, and in many instances they were. Nonetheless, these and many other statements reflect the

current dichotomy between the math curriculum and instruction in these schools and the state math EALRs and WASL. This nonalignment is certainly evident in the results of the *Knowledge and Use Survey* results mentioned above.

In other instances the teachers' reluctance to use the MHC resource may have resulted from having to admit the need for assistance or the "threatening" nature of having a sometimes known and sometimes unknown "expert" coming in to the class to help change teaching approaches that had been in use for many years. Numerous teachers mentioned this during the interviews as a reason why a few specific teachers in a building had not become involved in the MHC process. This problem was accentuated in those schools where the teachers had not been closely involved in the decision to seek MHC assistance and/or the application process. And, for whatever reasons, there were other teachers who felt that while the idea behind the program was fine and that it was good for other teachers in the building, they, personally, did not feel the need to seek out assistance nor to accept it when it was offered.

- Limited teacher mathematical knowledge. Generally, mathematics is one of the content areas that elementary teachers have been least comfortable teaching, and numerous MHC mentor teachers noted this problem. The successful teaching of the EALRs demands a knowledge of mathematical concepts and problem solving abilities beyond the computational emphasis of more traditional math curricula. Consequently, the MHC mentor teachers often found themselves spending time teaching math content concurrently with new instructional and assessment strategies.

- Varying degrees of school starting points. Each of the 16 MHC schools was a unique situation and school culture, and no two schools' math curriculum and instruction were at the same place. This meant that the work developed for one school was not necessarily appropriate for the second school in which the MHC mentor teacher worked. In essence, this doubled the challenge for every MHC mentor teacher trying to meet the needs of a particular school.

- Varying degrees of principal leadership. As noted earlier in this report, a key element to student learning and changing school culture is strong principal leadership. In the 16 MHC schools all principals voiced strong support of the program, but the degree to which the principal appeared to make it a priority and worked to facilitate the efforts of the MHC mentor teacher varied. Generally, the greater the priority given to the program by the principal, the greater the success in changing the math curriculum and instruction as reported by the MHC mentor teacher.

Summary

Results of the School Indicators Ratings, Knowledge and Use Survey, and first year interviews at the schools strongly suggest the schools chosen for the MHC program

had professional teacher cultures and approaches to math curricula and instruction that closely resembled the non-standards based model described in the left column of Table 2. In essence, the schools, at least in regard to the teaching of mathematics, had not adapted to a standards-based environment and professional culture. Teachers in many schools were relatively unfamiliar with the EALRs, the existing math curriculum was unfocused, assessment practices were not aligned with the expectations of the new state requirements, accountability for teaching the EALRs was limited, and teachers operated independently of each other. Mathematics instruction at the schools had not been a strong focus of professional development activities, and some teachers were not comfortable with the new math content and expectations. In addition, in some schools teachers were not supportive of the program initially, did not understand the nature of the changes necessary to improve student achievement or the role of the MHC mentor teacher in facilitating this change.

Consequently, the schools selected for the MHC program needed assistance making the change from a traditional curriculum and professional environment to one in which the math curriculum is aligned with the EALRs, the sequence of instruction is established and adhered to by teachers, instruction is focused on problem-solving in addition to basic skills, assessment is consistent and on-going, and teachers share effective practices and information on student achievement. In essence, the schools needed assistance in making meaningful "second order" changes in the teaching of mathematics, the most difficult and challenging type of change to make.

EVALUATION QUESTION 2: WAS THE ASSISTANCE EFFECTIVE?

Changes in the Schools' Math Curriculum, Instruction, and Professional Environment

Survey Results. At the end of the second year of the program, teachers in all of the MHC schools completed the School Indicator Ratings and teachers in 13 of the 16 schools completed the Knowledge and Use Survey. Those results are shown in Figures 3 and 4 and in the appendix (pp. 35-36). Overall, at the conclusion of the second year of the MHC program, teachers reported a more positive picture of the mathematics teaching and learning climate and professional development culture than they did in 1999 when the program began. A higher percentage of the teachers reported that the EALRs were directing their curriculum decisions, that there was more curriculum continuity both vertically and horizontally throughout the grades, and that they were more collaborative in their approach in the teaching of mathematics. These results were generally supported by the evaluation interviews at the end of the second year. However, the results were not shared evenly by all of the schools, and there is evidence from the two surveys, interviews, and reports from the MHC mentor teachers that some schools made considerable changes in these areas, others made moderate changes, and some schools made few, if any meaningful changes during the two years.

Figure 3: 1999 & 2001 School Indicators Ratings for 16 MHC Schools

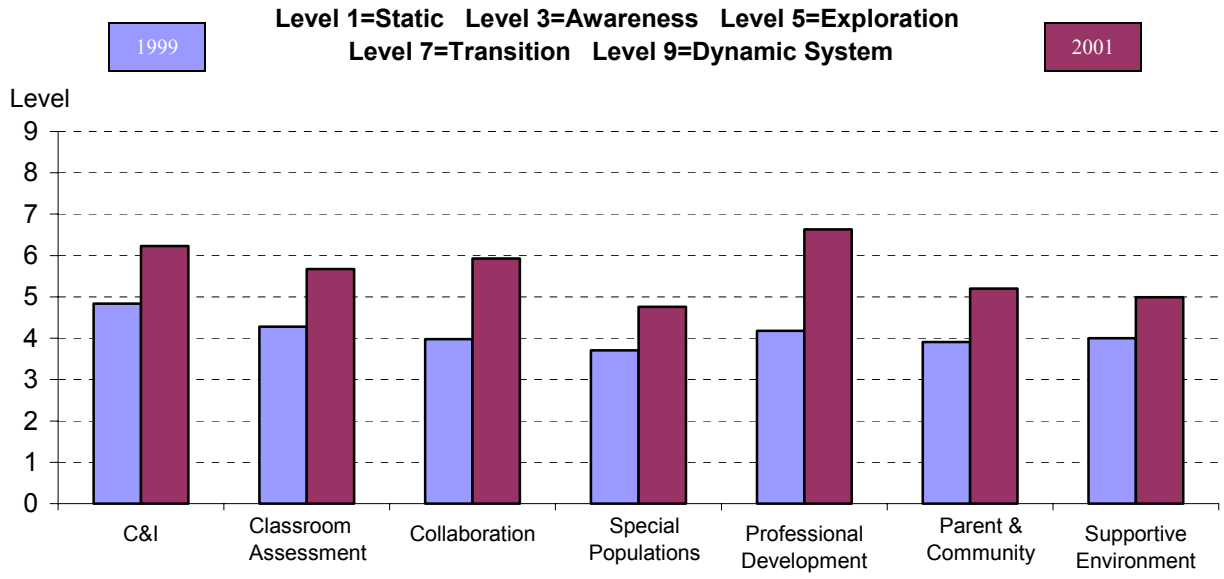
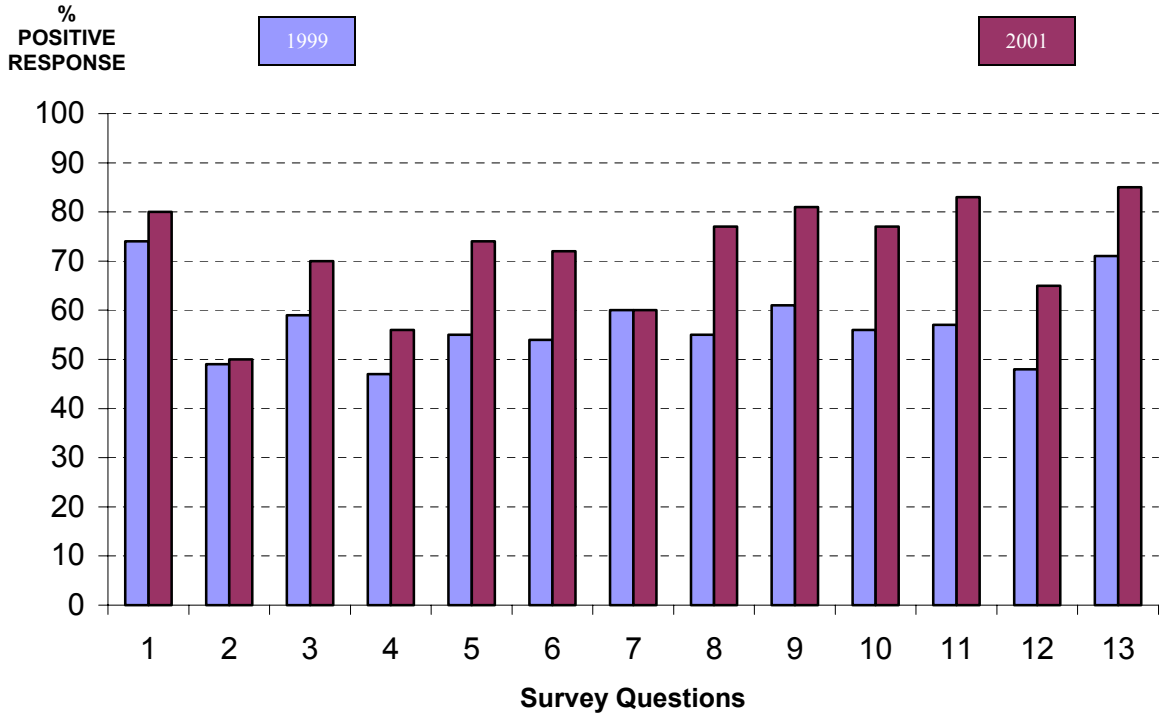


Figure 4: 1999 & 2001 Knowledge and Use Survey Results for 13 of the 16 MHC Schools



Findings from the Interviews and Teacher Logs. Throughout the two years of the project MHC mentor teachers filed monthly logs describing their activities, challenges, successes, and progress for each of their schools. At the conclusion of the first and second year of the program evaluators visited each school to interview the MHC mentor teacher, the building principal, and a sample of the teachers. Evidence from these sources suggests that creating second order change was a challenging undertaking, but progress was made in a number of the buildings. In the aggregate, the program did produce desirable changes, and this is reflected in the survey results. However, the changes must be viewed as a matter of degree, and most, if not all, of the schools must make continuing efforts to move further toward the Standards-Based Model described in Table 2.

In the schools where the program was *most effective*, the interviews and MHC mentor teacher logs revealed changes in the school's math curriculum, instruction, and professional environment in the following areas.

- **An increased focus on mathematics instruction.** Admittedly, many of the schools selected for the MHC programs had relegated mathematics to a secondary position of importance. A number of the teachers were uncomfortable teaching math and consequently it was not a high priority area. This has changed in a number of the MHC schools. On the positive end of this spectrum is a school that was described prior to the MHC program as one where after the ITBS and WASL tests the teachers "slammed the book shut" and did "something else (reading?) for the rest of the year. Now, however, they look forward to having 'extra time' to do math enrichment activities. Attendance at math classes is nearly 100%, and teachers are hungry for any and all outside math in-service opportunities."

- **An increased understanding of state reform and the EALRs.** In schools where the program was most successful, teachers showed a deeper understanding of the state's reform efforts, the role of the EALRs and the WASL assessments overall. Where the program had little effect a typical teacher comment at the end of the second year was something like, "MHC is a great program for the test grades," indicating a lack of understanding of the goal of a unified focused curriculum. In contrast, where one school availed themselves of the professional development opportunities to the greatest extent, the principal and teachers proudly proclaimed that the impact of MHC has been school-wide and had affected other areas besides math. In the words of the principal, "MHC has been an outstanding program [for the school], and the benefits have gone far beyond math teaching and learning."

- **A growing urgency to change.** In some schools where the program had little affect, teachers admitted to not using the MHC resource or thinking that they, personally, did not need it. Others said that they were "too busy" to seek out the MHC mentor teacher. In contrast, in other schools teachers were excited about helping their students be successful and believed that the program offered invaluable resources to help them. One school proclaimed: "Attendance at math

classes is nearly 100% and teachers are hungry for any and all outside math in-service opportunities."

- **Focused professional development.** In the schools where the program was most successful the principal provided direction and resources (usually in the form of release time and curriculum days), and strongly encouraged teacher participation in the MHC program activities. In one school a teacher has been identified as the "math lead" for next year to keep the momentum and focus going. In contrast, where the program had little affect virtually no release time was given for MHC activities and the principals were uninvolved with the efforts.

- **Vertical and horizontal curriculum alignment**. This task requires two steps: changing teacher thinking about curriculum, and then the actual job of changing and aligning the curriculum. Where the program was less successful, teachers were more likely to make the statement, "MHC is a great program for the test grades," suggesting that they, themselves, would go on about business as normal. Obviously, in those schools little alignment had taken place, other than maybe on paper. In the schools where the program was more successful, teachers were able to discuss the importance of alignment, and some teachers actually brought materials to the evaluation interviews to show the work that had been done.

- **An instructional move toward problem-solving.** Several of the MHC mentor teachers in the schools where the program had less affect talked about the teachers' discomfort with the subject of math and problem-solving, and hence the reluctance of the teachers to use it in their instructional practices. In contrast, teachers in the schools where the program was more successful, showed excitement about the new approaches and techniques they had learned, and that their students *were* able to do the work. As one teacher explained it: "I'll never teach math the old way again."

- **Increased collaboration among teachers.** In the schools where the program penetrated the teacher culture interviewees talked in 'we' terms rather than 'I' terms. They were able to give concrete and specific examples of collaborative activities with their colleagues, while in other schools specific examples were scarce. These changes constitute a change in the professional culture of the school. One school described their own changes: "Another important component of the success at [the school] is the fact that all classified staff have become involved in MHC, attending and participating in math classes and in-services. The school is a team, where everyone is focused on math."

In short, where the program had the most effect, the schools were beginning to make the transition from the traditional school model to the standards-based model shown in Table 2. However, effects of the program were not uniform across schools. Some schools made significant movement, while a few made little noticeable change. A more detailed description of two schools—one where the program had dramatic affect and one where the program appears to have been only minimally successful—illustrates the range of experiences throughout the MHC program.

School A: Second order change and increased test scores. Two years ago the school was described as a "backwards, sleepy little school" where achievement was not given much attention and teachers had little confidence in their abilities to teach math. Little attention was given to the EALRs, and math was taught sporadically, in some cases only a couple times a week. In the words of the principal and teachers, "the Mathematics Helping Corp changed the entire school." Now, teachers talk math, are aware of the EALRs, and see themselves as competent math teachers. They report that kids have changed because teachers have changed. Teachers think math is fun. Their students think math is fun. WASL scores have improved dramatically.

According to the MHC mentor teacher, much of the success of the program must be attributed to the principal, whose direction, support, and demand for accountability kept teachers focused and motivated. This was not easy in the beginning, but as teachers came on board, they appreciated the direction from the principal more and more. Teachers trusted both the MHC mentor teacher and the principal and were willing to follow their direction, even if they did not completely understand the reason immediately.

According to the building principal, the success of the program must be attributed to the ability of the MHC mentor teacher. She was skilled at all aspects of the program, and particularly skilled at winning the confidence and trust of the teachers. In fact, during the interviews the teachers raved about her and actually referred to her as a "math goddess."

Plans are being made to continue the focus of the program. The principal is clear about her role in continuing the success of MHC. She needs to "keep the flame lit, so to speak," making sure that math stays center front in the eyes of teachers. She plans to continue looking at alignment, dropping in on teachers, and "talking math."

There is evidence that the benefits of the program have gone far beyond math teaching and learning. The school now has an academic focus, and there is an enthusiasm for math on the part of both teachers and students that could not have been imagined two years ago. Teachers are confident in their abilities to teach (not just math), have been recognized by the district for their expertise, and are even beginning to see themselves as competent mathematicians. They are asking specific, content-oriented math questions now, and are highly motivated to track their progress and talk frequently about alignment of the entire curriculum with the EALRs. In short, all involved report that the Mathematics Helping Corps has changed the whole culture of the school. The staff functions as a team. This school is a model of what is possible with MHC.

School B: Contextual factors and school change.

The Mathematics Helping Corps teacher at School B had a very difficult assignment. Part of the difficulty was due to the nature of the existing school and teacher culture in general, the somewhat departmentalized curriculum, and the size of the school. In addition, this particular school had other school and professional issues unique to that school. During the second year of the program these problems were compounded by a

change in school leadership, considerable teacher turnover, and a reported "crisis mentality at the school."

During the first year of the program, the MHC mentor teacher faced challenges similar to those faced at the other schools: an unfocused curriculum, teachers working in isolation, limited math knowledge among some teachers, and a lack of understanding of the EALRs, among other things. In addition, however, throughout the two years of the program a number of the teachers at the school were not accepting of the program and others had personal and professional issues that limited their participation.

In spite of these challenges and with the support of the principal, the first year ended on a somewhat optimistic note. The MHC mentor teacher reported that one of the major objectives was to get a sequential view of the curriculum. "They did not have it on paper. We got it done, just two weeks before the year ended. So, next year we have a clear target. Everyone indicated that they were willing to accept what was on paper." However, by all reports, other developments at the school prevented change from happening. A large number of teachers left the school and, therefore, an element of continuity was lost. Second, the larger cultural issues at the school continued, and it was reported by several people that it was a difficult place in which to work. Third, there was a change in the building principalship adding to the loss of continuity. Possibly because of other distractions, the principal gave little attention to the MHC program.

Consequently, in the mind of the MHC mentor teacher, during the second year very little was accomplished. He spent his timing working with the handful of teachers who were receptive to the assistance and in helping prepare the students for the WASL tests. Certainly those teachers benefited personally from their association with and assistance from the MHC mentor, but at the end of the second year there was little evidence that the program had facilitated second order change or that its impact will be long-lasting.

These two contrasting schools are on the opposite ends of a continuum of school change. They represent the extremes of the experiences of the 16 schools, and the other 14 schools are somewhere between these extremes. Overall, many more schools are on the positive side of the continuum than the negative, as reflected in the surveys, logs and interview results and tests scores (see below). However, it is important to determine, if possible, why there were such varying degrees of success? *Why were some schools able to make the transition and needed changes, while others were not?* The degree of success of the program at a given school was determined by a number of factors.

- **Existing school culture.** Every school is a unique collection of individual adults with its own history and climate. In some schools the teachers were receptive and ready for change. In other schools the teachers were more skeptical but willing to give the program a chance. In still other schools there were more deep-seated problems that the MHC mentor teacher could not overcome. MHC mentor teachers

found some teachers who were excited about the program, some passive, and some openly hostile for reasons that had little to do with the program itself.

- **Strength of principal instructional leadership.** The leadership styles of the principals in the schools varied greatly. Those schools in which the principal had a more "hands-off" or management approach rather than assertive leadership generally made less progress. For example, one principal was described as having a "laid-back" approach to the job. A teacher explained the participation in the program this way: "While there was no open resistance, teachers did not come to her [MHC mentor teacher] for assistance" and the principal basically left it up to the mentor teacher do what she could to break in to the professional culture of the school. The mentor teacher met with some success and the school made some strides forward, but not to the degree other schools did where the principal took a more directive and formal role in the work of the program.

- **Existing teacher acceptance of state reform and the EALRs.** Clearly, the teachers in some schools began the program with a higher level of understanding and *acceptance* of the EALRs and the associated knowledge and skill areas than did teachers in other schools. For example, in one school the teachers had worked hard at aligning the reading program with the EALRs, but acknowledged that they had not done so with math. So, they began the program with at least some receptivity to the idea of aligning the math curriculum. In other schools, however, the understanding was minimal to start with. In one such school one teacher stated: "The problem with the state EALRs is that they do not reflect what we do in our classrooms in math." In these schools, two years is probably not an adequate amount of time to make the desired changes.

- **The particular strengths and weakness of the MHC mentor teacher.** Each MHC mentor teacher had unique strengths and weaknesses, and their ability to deal effectively with any given school situation varied. For example, some mentor teachers were able to make inroads into the teacher culture where the leadership by the principal was minimal, while other mentor teachers were less successful in schools with similar principal leadership. It is predictable that some mentor teachers who were relatively successful in one situation might be much less so in another situation.

- **Other factors.** In addition, there were a number of other local factors that determined, in part, the degree to which schools were able to make meaningful second order changes, such as contract issues, changes in leadership, and teacher turnover.

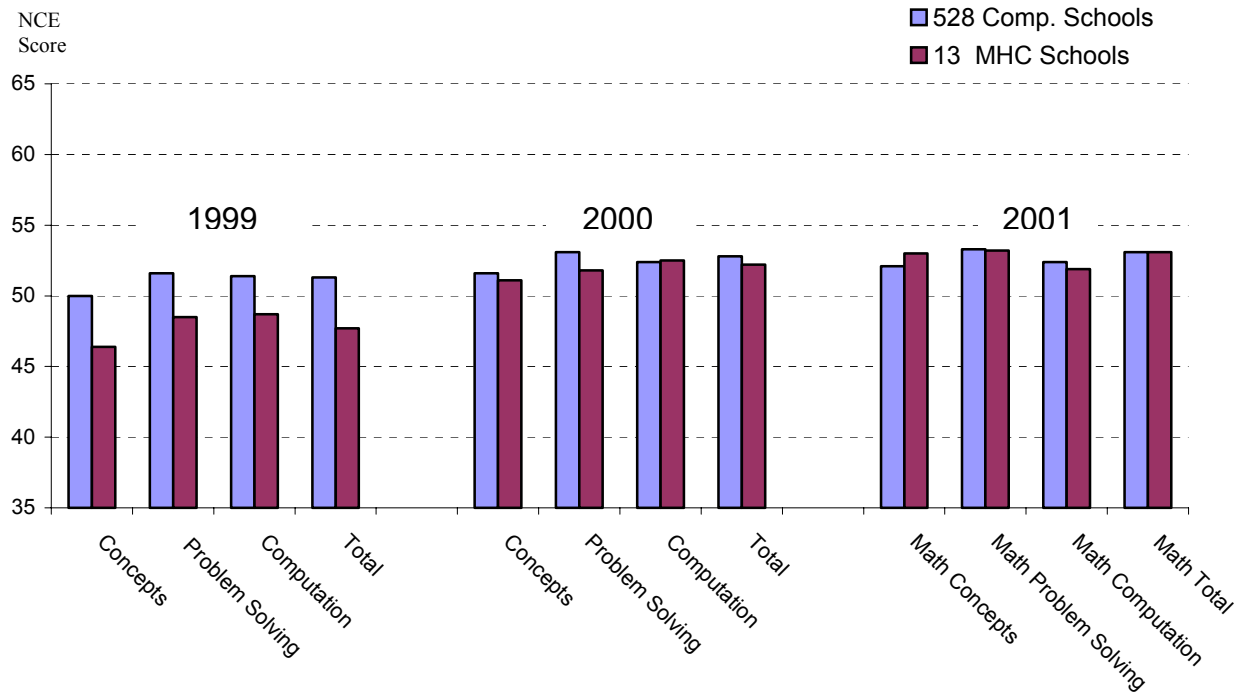
In short, there was a great deal of variability in the situations faced by the MHC mentor teachers, and these local situations, along with the particular strengths and weaknesses of the mentor teachers interacted to determine the effectiveness of the program at any given school. What emerges from these findings is the importance of school selection for the Mathematics Helping Corp program. *The program will be most*

effective in schools where the teachers are open to change, where the teachers are accepting of the direction of state reform and the EALRs, where the principal is capable and understands the importance of his/her role in the change process, and where there is some degree of stability in the teacher and principal positions. The program is least likely to be successful in schools where these factors are limited or missing, and where other deep-seated professional climate problems exist well beyond weakness in the math curriculum and instruction.

Changes in Academic Achievement Levels

3rd Grade 1999, 2000 and 2001 ITBS Math Scores. The 1999 ITBS Total Math mean NCE scores for the 13 MHC elementary schools was 47.7 (45 national %ile rank) compared to a mean of 54.9 mean NCE (59 national %ile rank) for all elementary schools in the state. A comparison group of schools was selected based on similar school size, percent of non-white students, and percent on free/reduced lunch. The MHC schools had an average enrollment size of 452 students, 35 percent non-white student body, and 57 percent free/reduced lunch. The comparison group of 526 schools had an average enrollment of 459 students, 34 percent non-white student body, and 54 percent free/reduced lunch. The 1999, 2000, and 2001 ITBS 3rd grade math NCE scores are shown in Figure 5 and in the appendix (p. 36).

Figure 5: 1999-2001 ITBS Math Scores

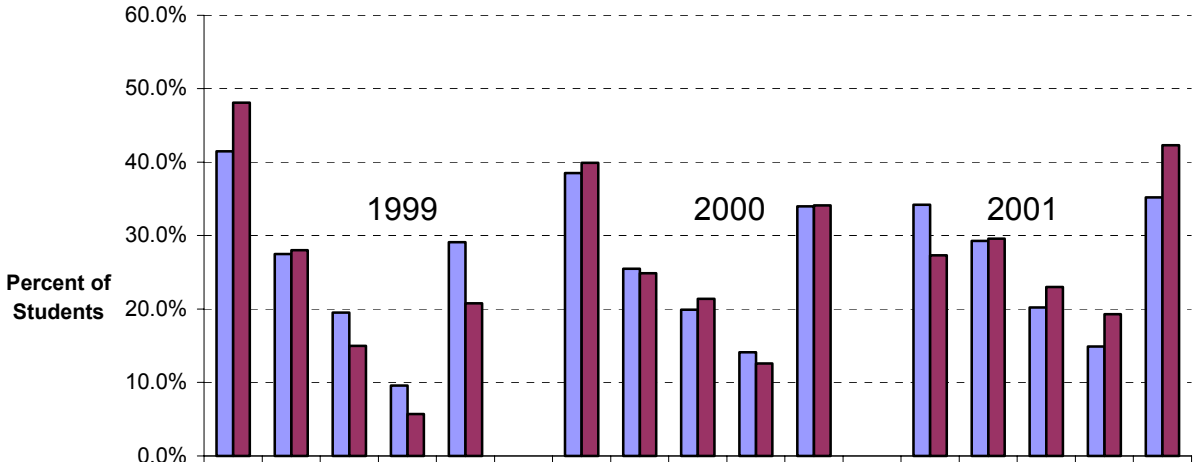


The one-year gains for the MHC schools were somewhat higher than the comparison schools, however, there was a diversity of outcomes among the MHC elementary schools. Although the overall mean gains were positive, the gains in NCE Total Math scores ranged from –1 to 17, with a very positively skewed distribution due to one exceptionally large gain of 17 NCE points. This one score accounts for approximately 25% of the total gain for the MHC schools. With this one school removed from the analysis, the overall mean gain for the remaining 12 schools is reduced from 4.5 NCE points to 3.4 NCE points, dropping the MHC schools percentile gain from about 8%iles to 6%iles. This gain may be explained by regression to the mean on the part of the MHC schools.

The two-year mean gain for the MHC schools was 5.4 NCE points, compared to a two-year mean gain of 1.8 NCE points for the comparison schools. However, once again the gains were not equal across the MHC schools, ranging from a –7.3 to +16.5. Still, overall, the positive upward trend is an encouraging finding.

4th Grade 1999 - 2001 Math WASL Results. The 1999 mean percent passing rate for the 4th Grade WASL Math was 20.8% for the 13 MHC schools compared to 36.4 % for all elementary schools in the state. The 1999 mean percent passing rate for the comparison group of schools was 29.1%. The 1999, 2000, and 2001 4th grade WASL results by level for the MHC schools and the 526 comparison group schools are shown in Figure 6.

Figure 6: 1999-2001 4th Grade WASL Results by Level

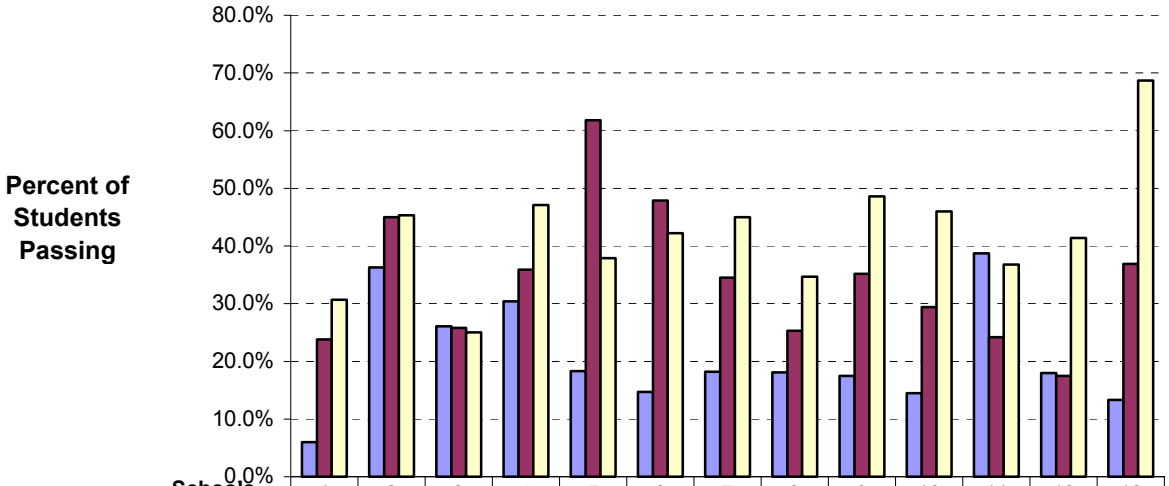


	1999 Level 1	1999 Level 2	1999 Level 3	1999 Level 4	1999 Total % Pass	2000 Level 1	2000 Level 2	2000 Level 3	2000 Level 4	2000 Total % Pass	2001 Level 1	2001 Level 2	2001 Level 3	2001 Level 4	2001 Total % Pass
526 Comp. Schools	41.5%	27.5%	19.5%	9.6%	29.1%	38.5%	25.5%	19.9%	14.1%	34.0%	34.2%	29.3%	20.2%	14.9%	35.2%
13 MHC Schools	48.1%	28.0%	15.0%	5.7%	20.8%	39.9%	24.9%	21.4%	12.6%	34.1%	27.3%	29.6%	23.0%	19.3%	42.3%

The 1999 math WASL 20.8% passing rate for the13 elementary MHC schools was considerably below the state average of 37.2% and below the 526 comparison school average of 29.1%, but somewhat higher than the 16.7% passing rate of the 19 MHC

school applicants not selected for the program. Over the life of the MHC program, the passing rates increased for the comparison group by 6.1 percentage points, while the MHC schools passing rate improved by 21.5%. The improved passing rate was not shared by all MHC schools equally as show in Figure 7. The percent passing change from 1999 to 2001 ranged from –1.9% (school 11) to +55.4% (school 13). However, the results for most schools were positive and the overall trend for the MHC schools is encouraging. The differences in the improvement rates are statistically significant ($F = 22.9$, $p < .001$), and the effect size (*gamma,* 1.34) indicates that the MHC treatment effect was very substantial.

Figure 7: 1999-2001 4th Grade WASL Results for 13 Mathematics Helping Corps Schools



Schools	1	2	3	4	5	6	7	8	9	10	11	12	13
1999 % Passing	6.0%	36.3%	26.1%	30.4%	18.3%	14.7%	18.2%	18.1%	17.5%	14.5%	38.7%	18.0%	13.3%
2000 % Passing	23.8%	45.0%	25.8%	35.9%	61.8%	47.9%	34.5%	25.3%	35.2%	29.4%	24.2%	17.5%	36.9%
2001 % Passing	30.7%	45.3%	25.0%	47.1%	37.9%	42.2%	45.0%	34.7%	48.6%	46.0%	36.8%	41.4%	68.7%

The 1999-2001 WASL math passing rates for the 13 elementary Mathematics Helping Corps Schools, all elementary schools in the state, the 528 comparison group schools, and the 19 schools not selected for the Mathematics Helping Corps are show in Figure 8 and in the appendix (p. 37).

7th Grade 1999-2001 Math WASL Results. The three middle/junior high schools varied considerably on the 1999 passing rates on the 7th Grade Math WASL. Two of the schools had approximately 10% fewer students passing than the state average, while the third school was above the state average by approximately 9%. Improvement rates on the 2000 WASL for two of the schools reflected the state average improvement of approximately 4%, while the third school improved dramatically, with an additional 15% of students meeting the 2000 math standards. Passing rates in two of the middle/junior high schools declined in 2001and the third school showed a slight increase. The 1999-2001 passing rates of the 3 Mathematics Helping Corps and the state average are shown in Figure 9 and in the appendix (p. 37).

Figure 8: 1999-2001 4th Grade WASL Math Passing Rates for Four Groups of Schools.

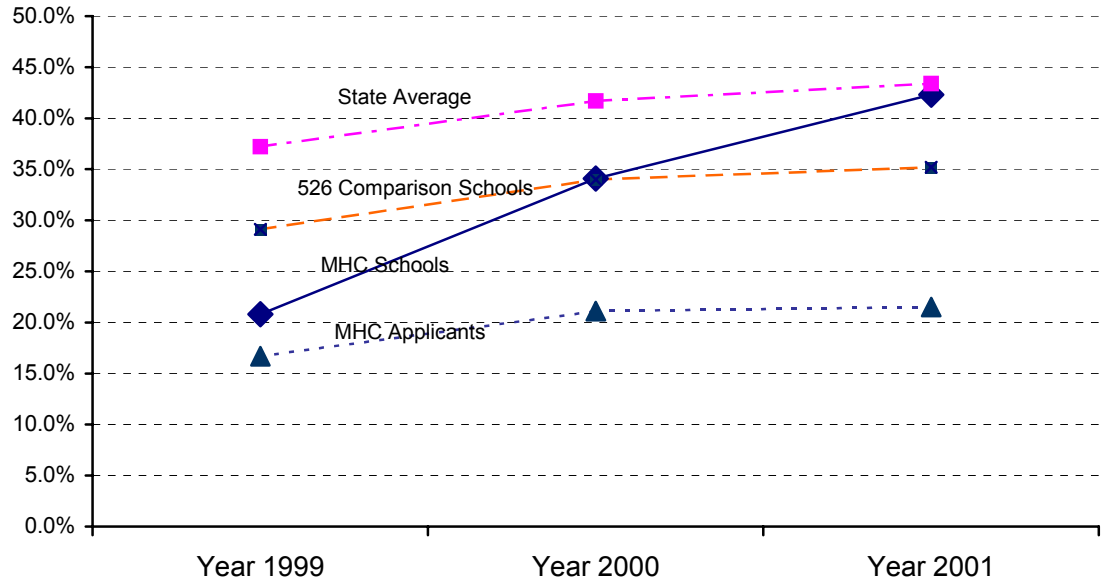
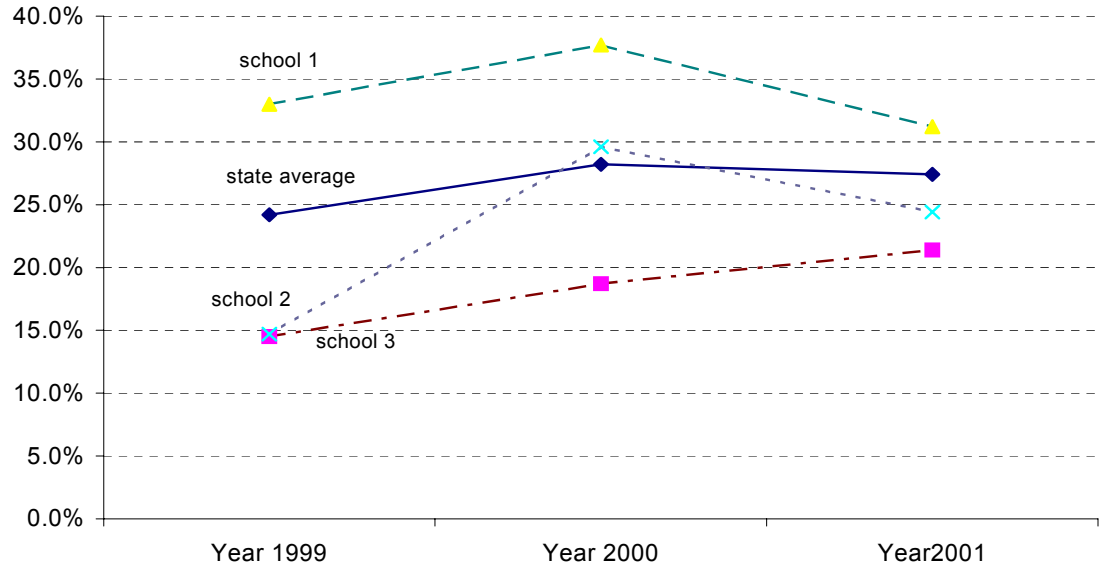


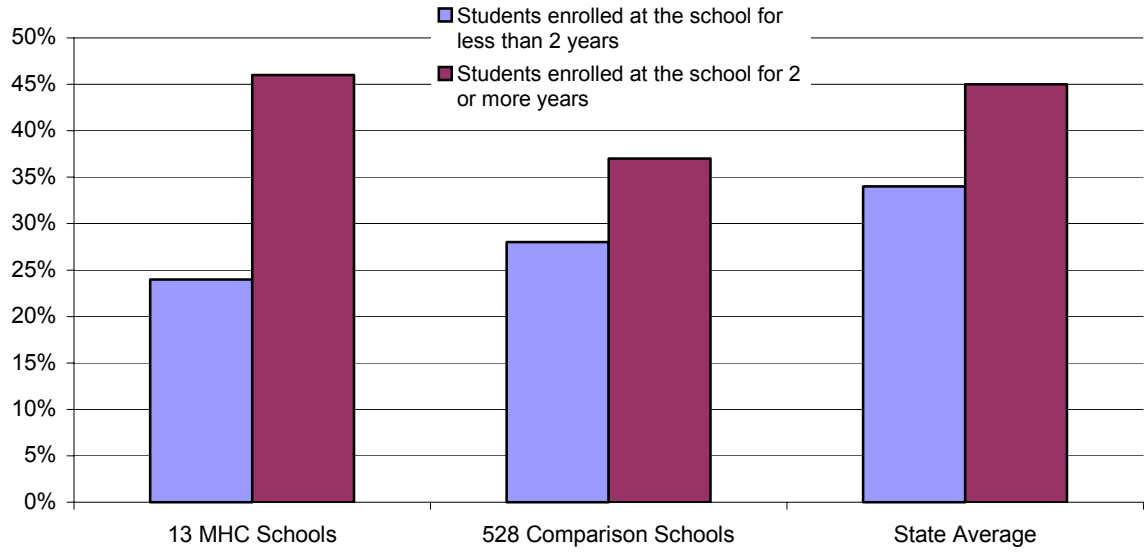
Figure 9: 1999 – 2001 7th Grade WASL Math Passing Rates



Continuous Enrollment and Ethnicity Factors. To examine the effect of student mobility on school student achievement scores, students who were at the school less than two years were removed from the analysis. For the 3rd grade math ITBS, the results of the analysis changed only slightly, with the continuously enrolled students at the 13 MHC

schools increasing their score by 1 to 2 NCE points more than the state average of such students. The most noticeable differences were on the 4th grade math WASL results. Between 1999 and 2001 the passing rate of the continuously enrolled students at the 13 MHC schools during those two years was approximately 22% greater than the students who had been at the school less than two years. This difference was more than double the differences in the 528 comparable schools and the state average (see Figure 10). Third grade ITBS scores and passing rates on the 4th grade WASL based on student ethnicity in the 13 MHC schools showed inconclusive results because of sample and testing limitations. However, given the starting point of the schools two years earlier (see Figure 8) the data do suggest that the program may have benefited all or most of the groups to some degree. The data for these factors are provided in the appendix (pp. 38-39).

Figure 10: 2001 Passing Rates for Continuously and Non-continuously Enrolled Students



Summary

Evidence from the School Indicator Ratings, the Knowledge and Use Survey, teacher and principal interviews and school visits suggests that, generally, the MHC program was successful in making changes in teacher culture, professional development, and math curriculum and instruction that are associated with higher levels of student achievement in a standards-based environment. A higher percentage of the teachers reported that the EALRs were directing their curriculum decisions, that there was more curriculum continuity both vertically and horizontally throughout the grades, and that they were more collaborative in their approach in the teaching of mathematics. These findings were supported by qualitative information from a number of the schools However, the results were not shared evenly by all of the schools, and some schools

made considerable changes in these areas, others made moderate changes, and some schools made few, if any, meaningful changes during the two years.

The 13 Mathematics Helping Corps elementary schools showed a larger increase on the 3rd Grade ITBS math scores than did a comparison group of 526 schools. The two-year mean gain for the MHC schools was 5.4 NCE points, compared to a two-year mean gain of 1.8 NCE points for the comparison schools. However, the gains were not equal across the MHC schools, ranging from a –7.3 to +16.5. Still, overall, the positive upward trend is an encouraging finding. This trend will need to be followed over several years before it can be attributed to the effects of the MHC program.

The positive growth in the passing rate on the 4th grade WASL for the MHC elementary schools outpaced the growth of the state average, the comparison group, and the other MHC applicant schools and is both statistically significant and substantial when compared to the comparison schools. The magnitude of the growth of the applicant schools not selected for the MHC suggests that the growth of the MHC schools is not due solely to the regression to the mean phenomenon. The trend of the passing rates on the 7th grade WASL for the 3 middle/junior high schools were mixed, at best, suggesting that the program had little impact on student achievement.

EVALUATION QUESTION 3: WHAT UNIQUE ELEMENTS, IF ANY, WERE FOUND IN THE ASSISTANCE PROCESS/DELIVERY IN THE SCHOOLS, AND WERE THOSE ELEMENTS RELATED TO INCREASES IN STUDENT ACHIEVEMENT?

The "assistance process/delivery in the schools" was actually quite consistent across the various locations in which the MHC mentor teachers were placed. The scope and expectations for professional development across the sites were also comparable. Each MHC mentor teacher received the same training, was provided with the same mathematics professional education materials, and had the same amount of additional resources. Each school had approximately the same number or hours per week of the mentor teacher's time. Every school and its staff were given the same opportunity to participate in statewide mathematics professional development activities. Yet, the MHC mentor teachers were clearly more successful in some schools than in others in bringing about fundamental changes in the mathematics curriculum and instruction.

The degree to which the MHC mentor teacher was successful in helping bring about fundamental change in the mathematics instruction of the school was dependent on several factors, including the individual expertise and personality of the MHC mentor teacher, the leadership ability of the building principal, and the nature of the school professional climate in which the MHC mentor teacher was placed. Any one or all of these factors interacting played a determining role in the degree to which MHC program was successful at a given school.

Examples of one or more of these factors were found in a number of schools. One school was described as "a totally dysfunctional place," and the MHC mentor teacher stated, "the Math Helping Corps cannot solve a dysfunctional staff." In another school the MHC mentor teacher was described by the principal as not having "really clicked with the staff," and not a "real good fit in this building." In yet a third school the MHC mentor teacher described the principal as so totally removed from the instructional leadership role that this was "a wasted year" and a "year of turmoil."

As the data in Figure 7 indicate, the upward movement of scores over the two year period of the MHC program is generally positive for all but two (schools 3 and 11) of the 13 elementary schools. It is difficult to interpret the 7th grade WASL score trends shown in Figure 9 and to relate them at all to the effects of the MHC program. However, in the aggregate, g*enerally*, the increases in test scores are more closely associated with those schools in which the MHC program appeared to have the most influence on teachers and classroom instruction. However, there is not a perfect correlation between apparent success in the changes in math instruction and teacher professional culture and improved student achievement. In one or two schools where the program apparently had little effect, test scores improved over the two years, and in one or two schools where the program appeared to thrive, student achievement increases were somewhat limited. This suggests that, while the elements of the MHC program can be important contributors to school reform in mathematics instruction, other factors at work must be considered.

CONCLUSIONS

The 16 schools selected for the Mathematics Helping Corps Program were relatively low achieving schools in mathematics based on the 1999 WASL results. Research findings in Washington and other states, questionnaire and interview results, MHC mentor teacher logs and reports, and analyses of the 1999, 2000, and 2001 WASL and ITBS results have been used as the data sources for this evaluation and are the basis of the following conclusions.

- The basic tenets of the Mathematics Helping Corps Program differ considerably from traditional professional development practices that have proven ineffective in changing teacher practice and in increasing student achievement. The tenets of the program are in close agreement with research proven professional development practices that provide a sustained opportunity for teachers to learn, experiment with and receive advice, and that provide opportunities for feedback and follow-up activities in a collegial setting.

- Schools selected for the MHC assistance in 1999 had not adapted to a standards-based environment and professional culture, at least in regard to the teaching of mathematics. *In addition,* some of these schools suffered from weak instructional leadership and/or some degree of a dysfunctional professional climate. In some schools teachers were not supportive of the program initially, did not understand the

nature of the changes necessary to improve student achievement or the role of the MHC mentor teacher in facilitating this change. These factors at least partially determined the degree of success reported by the MHC mentor teachers and observed by the evaluators.

- Evidence from a variety of sources indicates that the *majority* of these schools have made considerable strides forward in changing the teaching professional culture, in aligning the mathematics curriculum with the EALRs, and in how mathematics is taught in the classrooms. In a few of the schools, however, little if any improvement was observed.

- Overall, student achievement in the elementary schools participating in the Mathematics Helping Corps Program increased substantially, particularly as measured by the 4th grade WASL. Whether compared to increases in the state average or to two separate comparison groups, the improvements are considerable. However, achievement gains were not evident in two elementary schools and the program effects at the three middle/junior high schools appear to be minimal.

- Evidence from a variety of sources suggests that the Mathematics Helping Corps is a sound program for school improvement. However, it is most effective when it is combined with other factors, such as strong principal leadership at the school, teacher acceptance of the program, and an understanding on the part of the teachers as to the types of changes necessary to improvement student learning. In addition, evaluation results also suggest that it is not realistic to expect that the Mathematics Helping Corps program can overcome a number of existing factors in some schools that are handicapping the reform efforts.

RECOMMENDATIONS

- As the Mathematics Helping Corps Program expands to new schools in the future, it is important that considerable effort be made *prior* to selection of the schools and implementation of the program to help the teachers and principals understand the nature and depth of the changes that the MHC teachers will be asking for. Without this understanding and acceptance on the part of the teachers, the MHC will be greatly limited in what it can accomplish.

- To maximize the likelihood of the success of the program, the selection process of schools for future involvement in the Mathematics Helping Corps program should take into account a school's current leadership and professional culture to ensure that certain prerequisite factors necessary for success are present.

- An additional goal of the program should be to develop the mathematic leadership role of one or more teachers in the school to replace the MHC mentor teacher at the conclusion of the program to help insure sustainability.

- Evaluation efforts in the future should focus on the degree to which the schools in the first MHC cohort were able to sustain the changes made in curriculum and instruction over the next several years.

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APPENDIX

PP. 16 & 20. Means and Standard Deviations for 1999 and 2001 School Indicators Ratings Shown in Figures 2 & 3.

	C & I	Classroom Assesment	Collabor-ation	Special Populations	Prof. Development	Parent & Commun.	Supportive Environ.
1999	4.84	4.27	3.98	3.70	4.17	3.95	3.89
	.69	.79	.88	.9	.96	.61	1.03
2001	6.23	5.67	5.93	4.76	6.63	5.2	4.99
	.72	1.03	1.21	.93	1.14	1.0	.96

P. 20. Percentages of Teachers Responding Positively to Items on the Knowledge and Use Survey, 1999-2001, Shown in Figure 4.

Knowledge and Use Survey Items	1999 % Responding Positive	2001 % Responding Positive
Does the school have a vision/mission statement, developed or revised by current staff?	74%	80%
Does the mission or vision statement serve as the foundation for decision-making, staff development, and other school improvement efforts?	49%	50%
Does the school have an effective leadership committee/team that works with the principal to analyze student achievement data; study current learning research; gather information on effective curriculum, instruction, and assessment practices; maintain knowledge of state educational reform efforts; offer leadership advisement to staff?	59%	70%
Has the staff reviewed or studied research on the characteristics of improving schools and applied that research to your own school?	47%	56%
How familiar is the staff with the Mathematics Essential Academic Learning Requirements and the Benchmark Indicators for either grade 4 or grade 7?	55%	74%
How often does the staff use the Math Essential Learnings as a guide for planning math lessons and instruction?	54%	72%
How well does the staff understand the Math Essential Learnings and the Benchmark Indicators?	60%	60%
Were the state Essential Learnings utilized in the development		

of the Math Curriculum used by teachers in the school?		
Do teachers have a copy of the Mathematics Curriculum (more than just textbook materials; a written document defining what is to be taught by grade level/course)?	55%	77%
Does the Math Curriculum define the developmental learning expectations for each grade level or course?	61%	81%
Have teachers worked together to identify gaps (content or processes not taught across grade levels or courses) and overlaps (content or processes taught at multiple grade levels or courses) and revised the Math Curriculum to correct gaps and unnecessary overlaps across grade levels (or courses)?	56%	77%
Is the Math Curriculum sequenced across grade levels (or courses), defining the learning which is expected at each grade level (or in sequential courses) leading up to the knowledge and skills necessary for students to meet the Essential Learning Benchmark expectations at grade 4 (or grade 7)?	57%	83%
Have mathematics teachers developed a syllabus or course outline defining the learning expectations for specific math courses that are linked to the Essential Academic Learning Benchmarks at Grade 7?	48%	65%

P. 26. Means and Standard Deviations for 1999-2001 ITBS 3rd Grade Math Scores Shown in Figure 5.

	Concepts	Problem Solving	Computation	Total
1999				
528 Comparison Schools	50 7.1	51.6 7.1	51.4 7.1	51.3 7.5
13 MHC Schools	46.4 6.5	48.5 6.2	48.7 4.4	47.7 6.2
2000				
528 Comparison Schools	51.6 7.2	53.1 7.1	52.4 7.4	52.8 7.8
13 MHC Schools	51.1 6.9	51.8 70.	52.5 6.3	52.2 7.6
2001				
528 Comparison Schools	52.1 7.2	53.3 7.0	52.4 7.3	53.1 7.6
13 MHC Schools	53 7.6	53.2 6.7	51.9 7.5	53.1 8.0

P. 29. 4th Grade WASL Math Passing Rates for Four Groups of Schools Shown in Figure 8.

	Year 1999	Year 2000	Year 2001
13 MHC Schools	20.8%	34.1%	42.30%
All State Elementary Schools	37.2%	41.7%	43.40%
MHC Applicant Schools	16.7%	21.1%	21.50%
528 Comparison Schools	29.1%	34.0%	35.20%

P. 29. 7th Grade WASL Math Passing Rates Shown in Figure 9.

	Year 1999	Year 2000	Year2001
State Average	24.2%	28.2%	27.40%
School 1	14.5%	18.7%	21.40%
School 2	33.0%	37.7%	31.20%
School 3	14.7%	29.6%	24.40%

P. 30. Continuous Enrollment, Ethnicity and 4th Grade 2001 WASL Math Success.

	Average school level passing rates for students enrolled at the school for less than 2 years	Average school level passing rates for students enrolled at the school for 2 or more years
13 MHC Schools	24%	46%
528 Comparison Schools	28%	37%
State Average	34%	45%

	Passing rates and mean scale scores for ethnic groups at 13 MHC elementary schools (n=851)	Passing rates and scale scores for ethnic groups for all state elementary schools (n=76346)
American Indian/Alaskan Native	21%	26%
	376	378
Asian/Pacific Islander	45%	48%
	395	397
Black/African American	23%	20%
	378	372
Hispanic	30%	20%
	380	371
White	48%	49%
	397	398
Multiracial	48%	37%
	395	390

A two-way ANOVA with the scales scores as the dependent variable and ethnic status and treatment as the independent variables does produce a significant interaction effect between ethnic status and treatment ($F = 2.5$, $p < .03$). The scale scores in the above table indicate that some MHC students scored higher than the state average and that some scored lower. However, interpreting these differences must be done with caution for several reasons. First, these scores represent a "post-test only" design. No WASL pretest for these groups of students is available to determine the degree to which the groups differed to begin with. Second, some of the cell sizes for the MHC schools are small. For example, the Black/African American cell and the Asian/Pacific Islander cell for the MHC schools both only represent 52 students, the American Indian/Alaskan Native cell represents only 38 students, and the Multiracial cell represents only 21 students. Analysis of the data by examining the effects of both ethnicity and continuous enrollment is not possible because the cell sizes are further reduced substantially. Given the starting point of the schools two years earlier (see Figure 8) the data do suggest that the program may have benefited all or most of the groups to some degree.

P. 30. Continuous Enrollment, Ethnicity and 3rd Grade 2001 ITBS Total Math Scores.

	Mean NCE scores for students enrolled at the school for less than 2 years	Mean NCE scores for students enrolled at the school for 2 or more years
13 MHC Schools	54.3	50.1
State Average	58.5	55.1

	Mean NCE scores for ethnic groups at 13 MHC elementary schools (n=831)	Mean NCE scores for ethnic groups for all state elementary schools (n=71302)
American Indian/Alaskan Native	47.5	48.8
Asian/Pacific Islander	53.2	61.2
Black/African American	42.6	46.0
Hispanic	45.5	43.9
White	57.1	60.0
Multiracial	57.6	55.1

A two-way ANOVA with the scales scores as the dependent variable and ethnic status and treatment as the independent variables does not produce a significant interaction effect between ethnic status and treatment ($F = 2.07$, $p > .074$), nor is there a treatment (MHC or not) main effects ($F = 1.07$, $p > .302$). The NCE scores in the above table indicate that most groups of MHC students scored below the state average at about the same rate as all MHC students in the composite. However, as in the case of the 4th grade WASL results, interpreting these differences must be done with caution. First, these scores represent a "post-test only" design. No ITBS pretest for these groups of students is available to determine the degree to which the groups differed to begin with. Second, some of the cell sizes for the MHC schools are small. Given the starting point of the schools two years earlier (see Figure 5) the data do suggest that the program may have benefited all or most of the groups to some degree. On the ITBS the MHC students did catch up with the 528 comparison schools, but unlike on the 4th grade WASL, the students still lag the state average by several by several NCE points.