

Baltimore's K-5 Mathematics Program: How Synergistic Partnerships Result in Success

Andrea R. Bowden
Supervisor, Science and Health Education
Baltimore City Public School System

Melva Greene
Coordinator, Elementary Mathematics
Baltimore City Public School System

Patricia F. Campbell
Associate Professor
University of Maryland

Baltimore City Public School System

- **49,720 students enrolled in kindergarten through 5th grade across 122 elementary schools**
- **44,905 students in schools implementing the BCPSS elementary mathematics curriculum**
- **87% African American, 11.5% white, and 1.5% other ethnicities**
- **74% of the enrolled elementary students access free or reduced lunch**
- **1% of the enrolled elementary students have limited English proficiency**

BCPSS ELEMENTARY MATHEMATICS PROBLEMS 1995-96

- **low student achievement on CTBS and MSPAP**
- **curriculum overload**
- **lack of instructional materials**
- **inconsistent assessments**
- **unfocused and under-funded professional development**
- **conflicting policies**

BCPSS ELEMENTARY MATHEMATICS PROGRESS

- **1995-96 partnership with University of Maryland**
- **1996 National Science Foundation Local Systemic Initiative MARS (\$6M)**
- **1997 city-state partnership**
- **1996-2001 focused, systemic professional development funded by Eisenhower and NSF**
- **1997, 1999, 2001 curriculum revisions and final rewrite by Dr. Patricia Campbell**

- **1999 systemic adoption of instructional materials**
(McGraw Hill, *Math in My World* and Scott Foresman
Addison-Wesley, *Investigations in Number, Data, and
Space*)
- **1999-2001 system-wide implementation of
curriculum using adopted materials**
- **1999-2001 systemic unit assessments grades 1-5
and high accountability**
- **2000-2001 performance, promotion policy and
summer school linked**
- **1998-2001 increase in student achievement on
CTBS and MSPAP**

FUNDING STREAMS TO SUPPORT REFORM OF K-5 MATHEMATICS

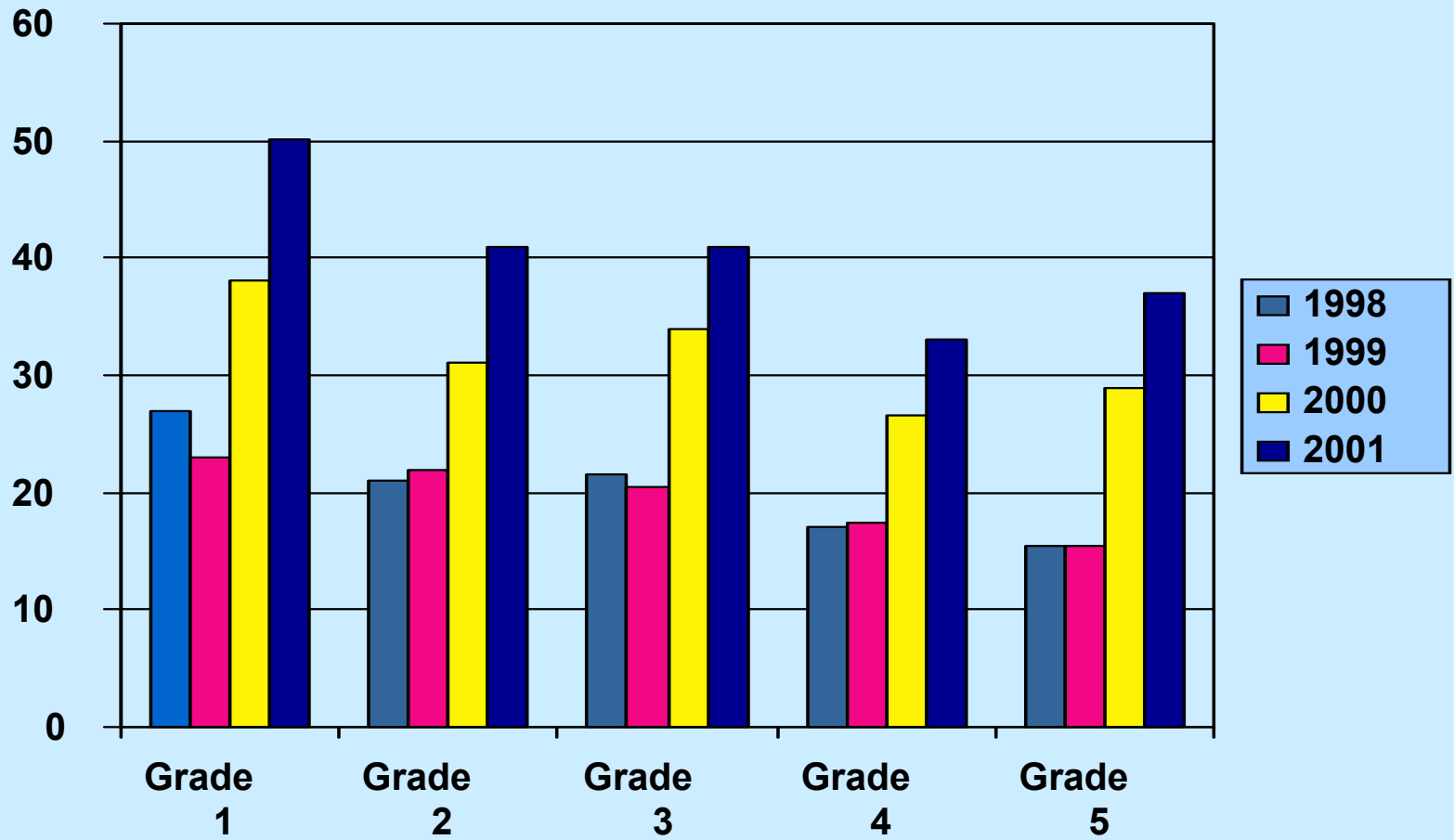
- **NSF-funded Local Systemic Change Initiative**
- **NSF-funded Urban Systemic Initiative**
- **Eisenhower (Title II) Grant for Professional Development**
- **City-State Partnership Funds** (Baltimore City Public School System-Maryland State Department of Education)
- **School System Funds**
- **Title I**
- **University of Maryland Funds**

Mathematics: Application and Reasoning Skills (MARS Project)*

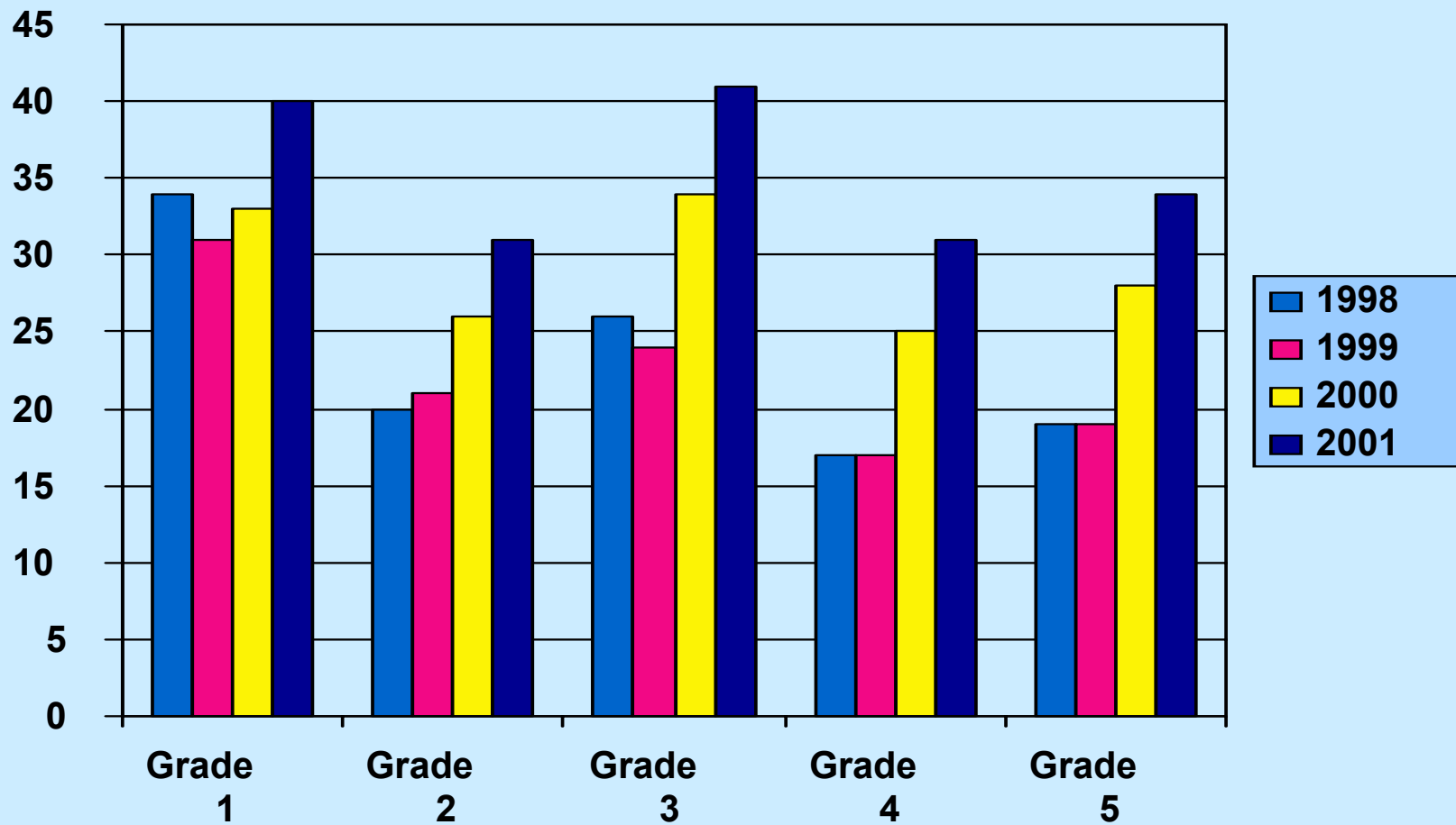
Develop, implement, and evaluate a model for systemic reform in elementary mathematics across the Baltimore City Public School System in order to yield increased student achievement through teacher enhancement

**A Local Systemic Change Project funded by the National Science Foundation. Any opinions, findings and conclusions or recommendations expressed are those of the authors and do not necessarily reflect the views of the National Science Foundation.*

Baltimore City Public School System CTBS Mathematics Composite Scores Median National Percentiles



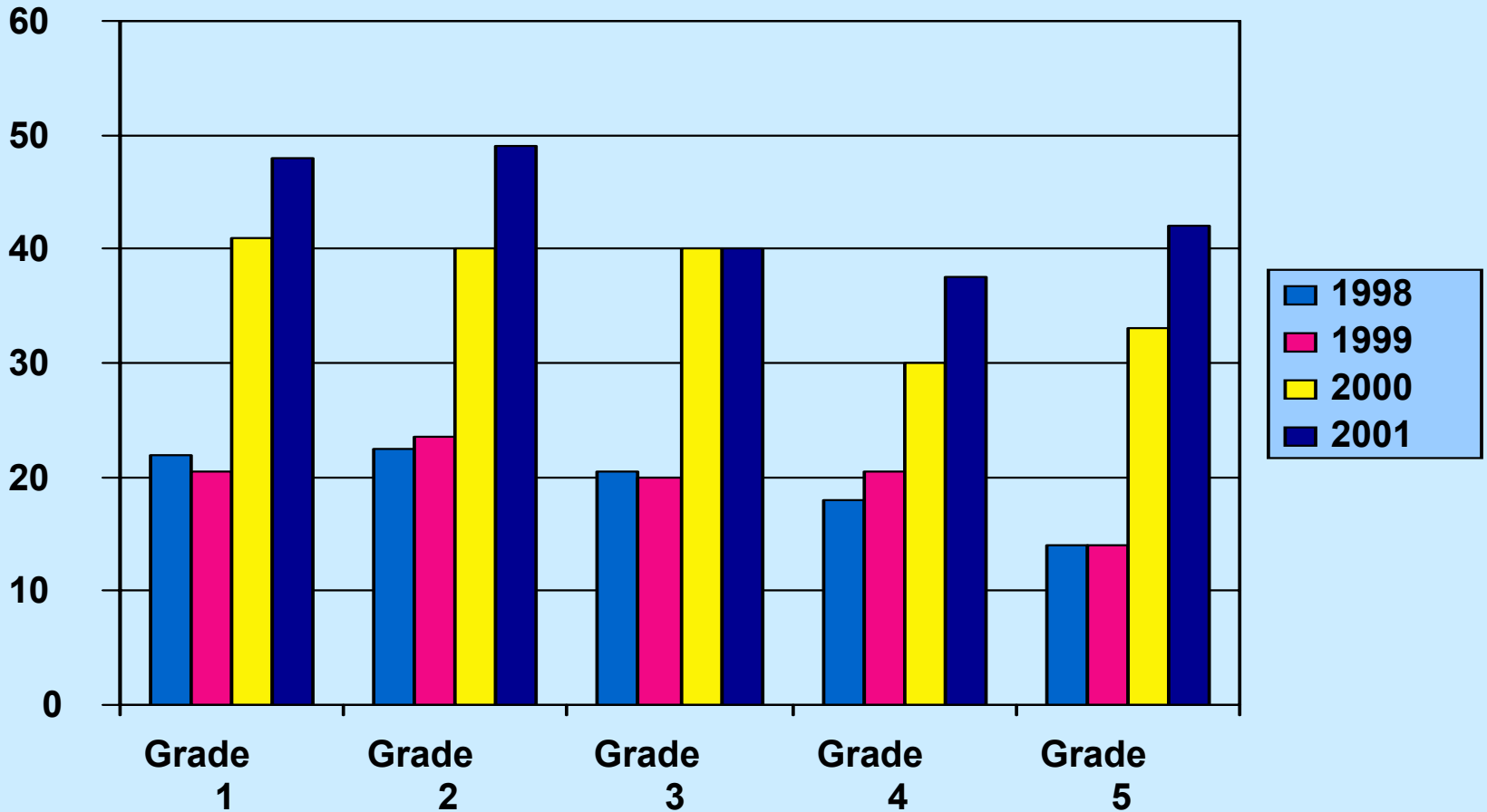
Baltimore City Public School System CTBS Mathematics Concept & Application Scores Median National Percentiles



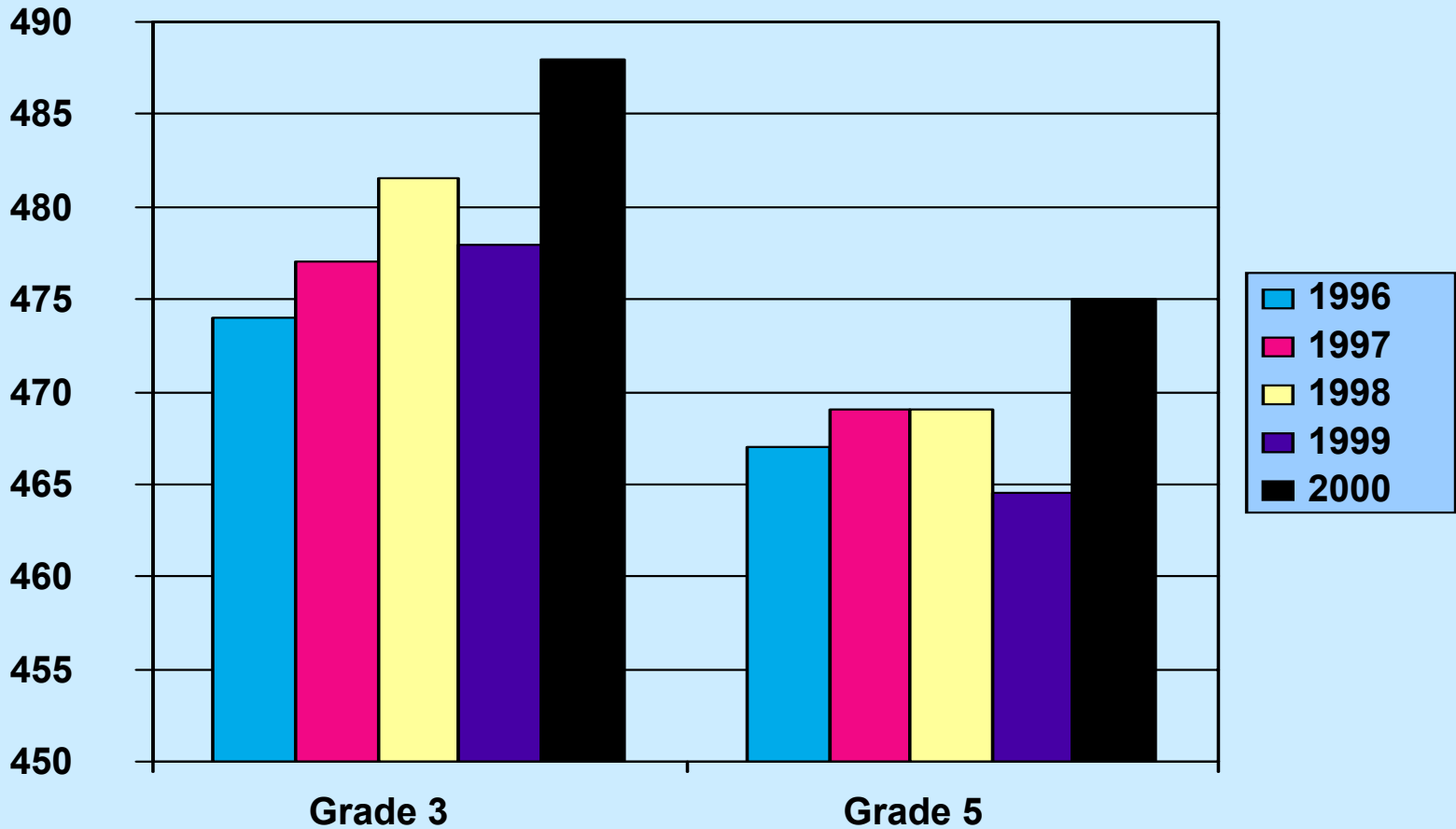
Baltimore City Public School System

CTBS Computation Scores

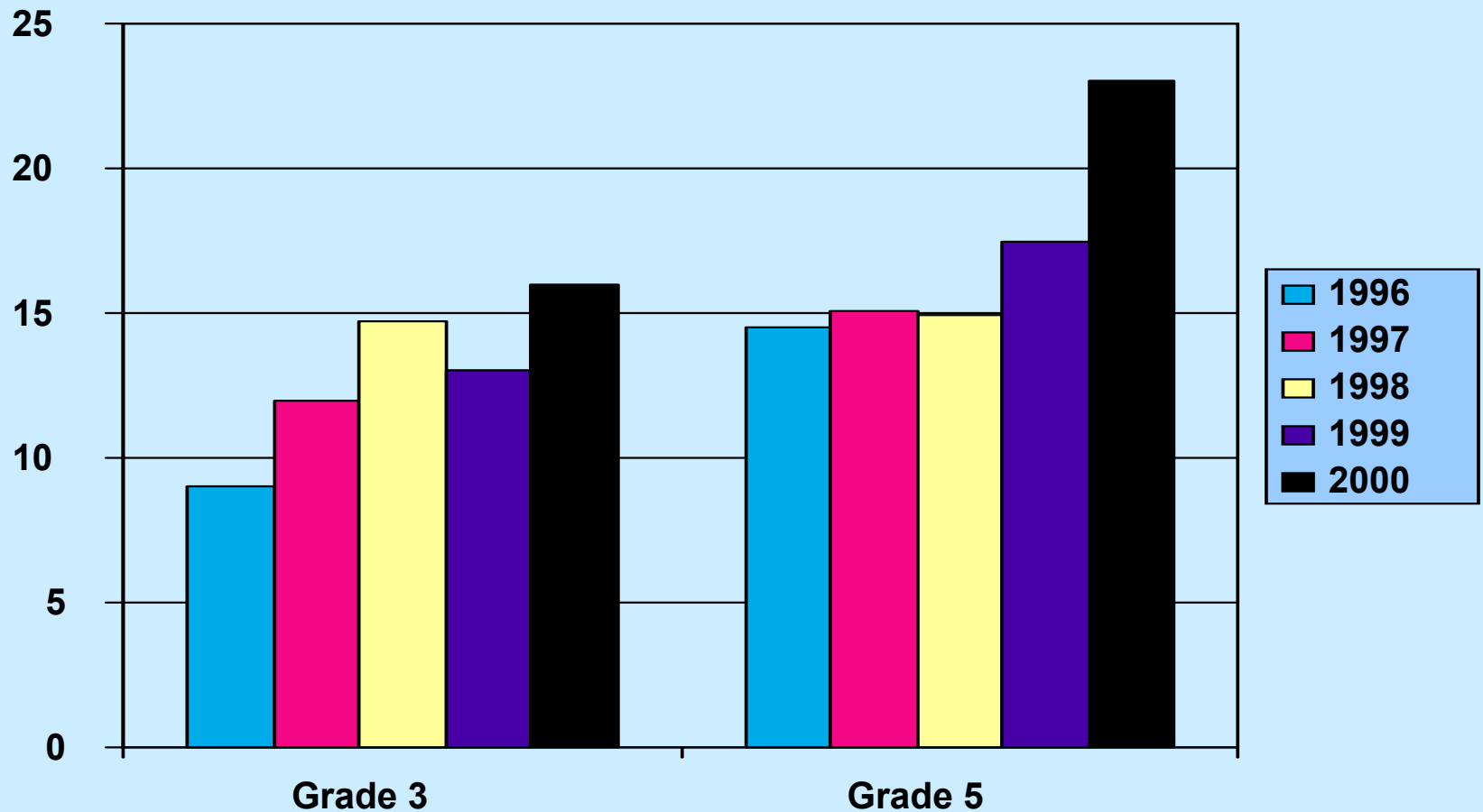
Median National Percentiles



Baltimore City Public School System MSPAP Mathematics Median Scale Scores



Baltimore City Public School System MSPAP Mathematics Percent at Proficient or Higher (Levels 1, 2, or 3)



Original Goal

Increase student achievement in K-5 mathematics through professional development in mathematics for cohorts of teachers from participating schools

Shift to District-wide Program

- **Develop new mathematics curriculum guide**
- **Establish new instructional model**
- **Adopt new commercial instructional materials aligned with the curriculum guide and adaptable to the instructional model**
- **Support a cadre of instructional support teachers who deliver district-wide and on-site professional development**
- **Develop aligned unit assessments**
- **Advise regarding mathematics policy**

Mathematics Content

Too often the “conventional wisdom” is that the curriculum in high poverty classrooms should follow a fixed sequence of lessons, emphasizing practice and moving from basic to more advanced skills without ever addressing problem solving or reasoning.

BCPSS Elementary Mathematics Curriculum Guide

- **Content and process objectives aligned with the Maryland Mathematics Content Standards (*PSSM*)**
- **Part One serves as a developmental sequencing of big ideas and instructional objectives for each math topic and process from K-5**
- **Part Two presents the instructional model and suggests how to use the Guide for planning**

- **Units of instruction noting placement and duration as well as clustering and ordering of instructional objectives**
- **Up-front listing of Maryland Mathematics Learning Outcomes, Standards, and BCPSS objectives for each unit. BCPSS objectives are grouped as “introducing and developing” or “maintaining” or “refining”**
- **Chart matching MSPAP indicators and BCPSS big ideas/objectives with a sample task to clarify the instructional goal; also lists textbook references and instructional focus for the objective**

Textbook Selection

- **Nationwide call for submissions to all publishers**
- **Publishing representatives presented to textbook review committee composed of teachers, college faculty, administrators, and community members**
- **Piloting of 4 commercial materials in selected schools**
- **Criteria addressed alignment with curriculum guide's objectives, as well as pilot teachers' review**
- **Public viewing and information session**
- **Adoption by New Board of School Commissioners**

A Shift in Mathematics Teaching

Asking Questions
and
Questioning Answers



Show and Tell
Demonstrate and Practice

Instructional Model in MARS

Students will:

Analyze mathematical tasks, problems or abstractions as a class, guided by a teacher's questions;

Work individually or in groups to figure out how to solve the task, problem, or abstraction;

Reflect on their own solution strategy and rationale, sharing their approach and solution either verbally or in writing; and

Justify the mathematical validity of their work in response to a teacher's questions.

Teachers will:

Consider both the students' current mathematical understandings and the curriculum's objectives when making instructional decisions;

Develop questions to promote analysis of the mathematical task, problem, or abstraction under discussion;

Develop questions to foster or challenge the understandings and misconceptions as revealed by the students' responses;

Develop questions to highlight the mathematics and to probe mathematical reasoning; and utilize "judicious telling".

Professional Development Offerings

Summer institute with grade-specific sessions (10 days)

On-site professional development via grade-level planning and Instructional Support Teachers

Saturday workshops, typically addressing content and pedagogy for the next grading quarter

Graduate course (3 credits)

Mathematics mini-courses (16 contact hours each)

Cross-site Professional Development

- **Relevant to practice, while building a knowledge base for future decision making**
- **Address content and pedagogy, teaching teachers mathematics using the methods being encouraged in the professional development**
- **Address research on children's learning of key topics in grade-specific mathematics**
- **Discuss developmental aspects of pupils' strategies, interpreting student work, or differentiating instruction**

On-site Professional Development

- **Support grade-level planning with school-based Instructional Support Teacher**
- **Provide opportunities for feedback and reconstruction of practice through observation, critique, and reflection**
- **Use co-teaching, coaching, co-planning, and de-briefing, as well as teacher discussion of student work**

Instructional Support Teachers

- **Assist classroom teachers in assigned schools**
- **Address long-and short-range planning to promote implementation of the curriculum**
- **Lead weekly/bi-weekly grade-level planning meetings**
- **Provide staff development for teachers on mathematics content that is a part of the curriculum and/or specific strategies that enhance instruction**
- **Nurture the development of teachers with leadership potential**
- **Use experiences in schools to recommend revisions in curriculum and/or suggest instructional materials**
- **Promote professional development activities (workshops, courses, seminars, intra/ inter-school observations)**

Teachers Also Construct Knowledge

Instructional “change is a process, not an event.” (Fullan, 1991)

Teachers construct their own understanding as they:

- **Interpret the meaning of the intended mathematics, as opposed to focusing only on the procedural approach;**
- **Develop facility in interpreting students’ responses;**
- **Learn how to modify future instruction based on those responses; and**
- **Gain expertise in questioning in order to challenge misconceptions or to foster understandings.**

District-wide Unit Assessments

- **Developed by central office staff and ISTs, then reviewed and edited by University of Maryland faculty**
- **Three different revisions, each with slightly more sophisticated expectations but always aligned with the curriculum**
- **Address critical content in a unit, as well as retention objectives**
- **Component of district policy for promotion and grading**

You Can't Control the Wind, But You Can Adjust Your Sail.

**Realize systemic reform is very difficult,
especially in urban centers, but not impossible**

**Understand that systemic reform requires far
more money, time, and effort than anticipated**

**Be prepared to withstand political and
administrative upheavals**

**Know what the system will bear in terms of reform
and funding**

Tell the story of reform repeatedly to multiple district audiences to assure that your plank will be in every new administrative platform

Embed the reform in schools with teachers, support or lead teachers, and principals as disciples

Work with a compatible partner who shares a sense of mutual obligation and responsibility

University Researcher's Perspective

Establish and maintain a connection with district's Research, Evaluation and Assessment Division, although this leadership will be transient

Constantly examine the alignment and connections between curriculum, instructional materials, assessment, and professional development

Set up a system to collect teacher/school data to measure the fidelity of the implementation

Carve time to reflect on the effort

Earn the acceptance, trust and respect of the school system personnel through immersion in the day-to-day reality of the schools

Be prepared to positively react to the crisis of the moment and to fill many voids as the resident expert

Realize that the demands of reform will interfere with university expectations