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ABSTRACT

This report presents results from four 1999 Urban Systemic Initiative (USI) school district surveys. The Survey of Enacted Curriculum is the study component of a grant from the National Science Foundation to examine how reform works in USI districts. The study explores the impact of USI programs on student achievement and the learning infrastructure in urban school districts and will develop an inferential causal model linking USI drivers and other key elements. This survey analyzes urban school mathematics and science practices, focusing on enacted curriculum contents and teaching practices. It provides a means of validating reform changes in the four sites by analyzing responses from intervention and control group teachers. In each site, 80 teachers were selected from 20 elementary and middle schools. The initial report on enacted curriculum in USI sites demonstrates that: the survey approach tried at the four USI sites can be used to analyze curriculum and teaching in classrooms; the analysis can be used across different classes, schools, and districts; and a purposeful sample of schools and teachers can be used to compare curriculum and instruction in schools that have high implementation of systemic reform with USI schools that have less implementation. Appendixes include the USI evaluative study abstract and year one progress summary, a brief description of four USI school districts, class descriptions, and content maps. (SM)

SYSTEMIC RESEARCH INC

USI EVALUATIVE STUDY

Urban Systemic Initiatives

Study Monograph No. 2

How Reform Works: An Evaluative Study of NSF's Urban Systemic Initiatives

Survey Results of Urban School Classroom Practices in Mathematics and Science: 1999 Report

Using the Survey of Enacted Curriculum Conducted during Four USI Site Visits

Rolf K. Blank, Council of Chief State School Officers
Jason J. Kim, Systemic Research, Inc.
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Dr. Kim has been involved in educational reform programs for K-12 and college level in various capacities since 1993. Most recently he received a three-year grant from the National Science Foundation (NSF) to conduct an evaluative study to explore the impact of NSF's Urban System Initiatives, entitled "How Reform Works." He designed, developed, and implemented the numerous evaluation and assessment instruments for K-12 and college level programs sponsored by federal or state governments. He has published numerous papers and provided workshops and consultations in the area of educational evaluation and assessment, and information management systems and technologies. Dr. Kim founded Systemic Research, Inc. in 1995 to provide expertise in educational evaluation/information management systems. Prior to founding Systemic Research, Inc., he was a faculty member for ten years in the College of Engineering of Northeastern University, Boston.

John Smithson, Ph.D.

Dr. Smithson is a project director at the Wisconsin Center for Education Research, where he has been involved in the development, use and analysis of indicator measures of classroom practice for the past ten years. In recent years, working with the Council of Chief State School Officers (CCSSO), he has developed the use of "content maps" as a graphical tool for presenting data on instructional content, and has assisted in the development of a procedure for calculating a measure of alignment to describe the level of agreement between instruction and assessments. Current work includes extending these tools to encompass content standards and curriculum frameworks in order to measure alignment of instruction to standards as well as assessments. His work also focuses on promoting the use of indicator and alignment data by districts, schools, and teachers as a resource for informing curricular decision-making.

CONTENTS

CHAPTER IV:
CONCLUSIONS

LIST OF TABLES, FIGURES, AND CHARTS

ACKNOWLEDGEMENTS

The original Survey of Enacted Curriculum (SEC) is an instrument designed and developed by a collaborated effort among the Council of Chief State School Officers (CCSSO), National Institute for Science Education (NISE) at the University of Wisconsin-Madison, National Science Foundation (NSF), and participating states. The SEC instrument was tailored to urban school districts within the context of our three year study funded by a grant from the National Science Foundation- "How Reform Works: An Evaluative Study of NSF's Urban Systemic Initiatives." This monograph presents the results of four USI school district surveys conducted during site visits held between April and May 1999. Systemic Research, Inc. coordinated the survey process with technical assistance from CCSSO and the Wisconsin Center for Education Research. The survey will be continued in the second and third years of the study period in four selected USI sites each year.

Special thanks to the many teachers who participated in the Survey and the Project Directors who assisted the survey process in the following four USI sites:

Baltimore USI	Dr. Jonathan Wilson
Dallas USI	Ms. Sally Dudley
Detroit USI	Ms. Juanita Clay-Chambers
Phoenix USI	Dr. Susan Holt-Maas

ABSTRACT

Survey Results of Urban School Classroom Practices in Mathematics and Science : 1999 Report

Using the Survey of Enacted Curriculum Conducted during Four USI Site Visits

The Survey of Enacted Curriculum (SEC) is being conducted as a study component of a three year grant from the National Science Foundation (NSF), entitled "How Reform Works: An Evaluative Study of NSF's Urban Systemic Initiatives (USI)." The evaluative study explores the impact of USI programs on student achievement and the learning infrastructure in urban school districts, and will develop an inferential causal model linking the Systemic Initiatives drivers and other key elements.

Within the context of the USI evaluative study, the survey provides an initial analysis of urban school classroom practices in mathematics and science, focusing on enacted curriculum contents and teaching practices. The survey has been designed to provide a means of validating reform changes in the four USI sites by analyzing responses from two groups of mathematics and science teachers - implementation group and control group. In each urban site, 80 teachers were selected from 20 schools, with 10 schools each at elementary and middle grade levels.

This initial report on enacted curriculum in USI sites provides two very important kinds of results. First, we demonstrate that the survey approach tried with four USI sites in 1999 can be used to analyze curriculum and teaching in classrooms, and that the analysis can be used across different classes, schools, and districts. Second, the report demonstrates that a purposive sample of schools and teachers can be used to compare curriculum and instruction in schools with high implementation of systemic reform through USI with schools that have less implementation.

CHAPTER I

INTRODUCTION

I.1 The Survey of Enacted Curriculum and the Evaluative Study of NSF's Urban Systemic Initiatives

The Survey of Enacted Curriculum (SEC) is being conducted as a study component of a three year grant from the National Science Foundation (NSF), entitled "How Reform Works: An Evaluative Study of NSF's Urban Systemic Initiatives (USI)." The purpose of the study is to determine the impact of the USI program on student achievement and the learning infrastructure in urban school districts. The study is focusing on development of an inferential causal model that relates the systemic initiative drivers and other key elements to the outcomes observed.

As part of the study activities, the evaluative study team conducts four site visits each year to meet and interview superintendents, principals, teachers, and USI and district staff members. During two day site visits to the Baltimore, Dallas, Detroit, and Phoenix school districts between April and May 1999, the study team also met with a group of teachers to conduct the survey. This monograph presents the survey summary and findings relevant to the first year of our evaluative study. The survey will be continued in the second and third years of our study period for four selected USI sites each year.

Within the context of the USI evaluation study, there are four main objectives for conducting the Survey:

- Collect data from a sample of teachers in selected urban sites and schools in order to analyze classroom practices and curriculum in science and math that will help to confirm and validate change in practice related to USIs.
- Analyze actual classroom teaching practices compared to the Key Indicator Data System (KIDS).
- Analyze current enacted classroom curriculum and instruction in relation to expectations for practice as outlined in state or district content standards, science and math reform initiatives, and assessments.
- Develop survey and data analysis tools that provide reliable, valid data for measuring and reporting curriculum and instructional practices, as well as teacher preparation and background.

The SEC provides a practical research tool for collecting consistent data on mathematics and science instructional practices and curriculum, based on teacher reports on what is taught in the classroom. The SEC offers an objective approach to analyzing current classroom practices in relation to state, national, and local content standards and the goals of systemic initiatives. The survey results provide a means of validating described changes in practice in urban systemic sites by analyzing classroom practice data from a sample of schools in selected sites. The survey instrumentation and method of data reporting will also provide a model for subsequent studies and indicators of reform in Urban Systemic Initiatives.

Urban Systemic Initiative
21 School Districts

Cohort 93
Baltimore
Chicago
Dallas
Detroit
El Paso
Miami-Dade
New York
Phoenix

Cohort 94
Cleveland
Columbus
Fresno
Los Angeles
Memphis
New Orleans
Philadelphia

Cohort 95
Milwaukee
St. Louis
San Antonio
San Diego

Cohort 97
Atlanta
Jacksonville

I.2 Background of Urban Systemic Initiatives and the Evaluative Study

In 1994, NSF launched the USI program, applying lessons learned from its initial State Systemic Initiative (SSI) program to the problems of inner city school systems. The USI program was offered to the 25 cities with the largest number of K-12 students living in poverty. Four cohorts of cities (21 cities in all) signed cooperative agreements with NSF for a five-year concerted system-wide effort to promote standards-based reform in mathematics, science, and technology (MST). The NSF investment was meant to be a catalyst for large-scale educational change affecting standards, curriculum, assessment, professional development, partnerships, and convergence of intellectual and fiscal resources, with constant attention to improving student achievement.

Over the course of its systemic initiative programs, NSF has developed a theoretical structure for systemic reform that is based on six "drivers"; four process drivers and two student outcome drivers, as well as a number of cross-cutting issues such as equity, quality, scaling up, coordination and organization. NSF is committed to measuring impact within its systemic initiatives in the following three areas: the implementation of standards-based curriculum, enhanced professional development for teachers of mathematics and science, and significant student achievement.

With a focus on the six drivers outlined by NSF, our evaluative study will pursue evidence of program effectiveness that profoundly affected and sustained systemic changes in 21 USI cities. We seek to identify interrelationships among the four process drivers (Drivers 1 to 4) and two outcome drivers (Drivers 5 and 6) based on compiled/surveyed Key Indicator Data from the current USI sites.

Our study is focusing on two major hypotheses and one investigative question:

Hypothesis I: A well-implemented USI program has significant and sustainable positive impact on the infrastructure that supports student success (opportunity to learn) including curriculum, teacher skills, and resources in urban school districts.

Hypothesis II: A well-implemented USI program leads to significantly improved student outcomes in MST.

Question I: Which SI drivers/elements/cross-cutting variables are most critical to achieving sustainable reform and improved student outcomes, and how do these variables interact with each other?

Six Drivers for Educational System Reform

1. Implementation of comprehensive, standards-based curricula as represented in instructional practice, including student assessment, in every classroom, laboratory, and other learning experiences provided through the system and its partners.

2. Development of a coherent, consistent set of policies that supports: provision of high quality mathematics and science education for each student; excellent preparation, continuing education, and support for each mathematics and science teacher (including all elementary teachers); and administrative support for all persons who work to dramatically improve achievement among all students served by the system.

3. Convergence of the usage of all resources that are designed for or that reasonably could be used to support science and mathematics education--fiscal, intellectual, material, curricular, and extra-curricular--into a focused and unitary program to constantly upgrade, renew, and improve the educational program in mathematics and science for all students.

4. Broad-based support from parents, policymakers, institutions of higher education, business and industry, foundations, and other segments of the community for the goals and collective value of the program, based on rich presentations of the ideas behind the program, the evidence gathered about its successes and its failures, and critical discussions of its efforts.

5. Accumulation of a broad and deep array of evidence that the program is enhancing student achievement, through a set of indices that might include achievement test scores, higher level courses passed, College admission rates, college majors, Advanced Placement Tests taken, portfolio assessment, and ratings from summer employers, and that demonstrate that students are generally achieving at a significantly higher level in science and mathematics.

6. Improvement in the achievement of all students, including those historically underserved.

CHAPTER II

METHODOLOGY AND INSTRUMENTATION

II.1 Background

Under the grant for the USI Evaluative Study, Systemic Research, Inc. contracted with the Council of Chief State School Officers (CCSSO) to use the Survey of Enacted Curriculum (SEC) as a study component, beginning in Spring 1999. The SEC instruments, analyses, and reporting methods were designed and field-tested by CCSSO in collaboration with researchers at the National Institute for Science Education (NISE) at the University of Wisconsin-Madison. The design and development work began in 1995 as part of a multi-state collaborative project, and the current survey design was completed under support from the National Science Foundation, Education and Human Resources Directorate, Division of Research, Evaluation and Communication. A 1998 grant to CCSSO is also supporting a concurrent study of state reform initiatives using the SEC design.

II.2 Sampling and Data Collection

In each urban site, we purposely selected 20 schools, with 10 schools each at elementary and middle grade levels. Five high reform, or Implementation, schools per level (based on degree or time in urban systemic implementation) were matched with five Comparison schools (schools not in the first phase of the urban systemic initiative, and thus with less implementation of reform). We studied elementary and middle schools in each site because the focus of reform implementation in the majority of USIs is focused at these levels, rather than in high schools.

The plan was to standardize the data collection in schools by selecting four teachers per level. Two completed the teacher survey for science education, and other two completed the survey for mathematics education. In each district, the teachers were selected at grade 4 or 5 and grade 7 or 8. Thus, the goal was a total of 40 teachers (20 mathematics and 20 science teachers) surveyed per grade level, or a total of 80 teachers per district as summarized in Table 1. The survey forms are prepared in four categories: two subjects (mathematics and science) per two grade levels (elementary and middle).

Table 1. Survey Sample Size for a USI School District

School Level	High Reform Schools (Teachers)	Comparison Schools (Teachers)	Total
Elementary grade 4 or 5	5 schools (10 Math & 10 Science Teachers)	5 schools (10 Math & 10 Science Teachers)	10 schools (20 Math & 20 Science Teachers)
Middle grade 7 or 8	5 schools (10 Math & 10 Science Teachers)	5 schools (10 Math & 10 Science Teachers)	10 schools (20 Math & 20 Science Teachers)
Total	10 schools (20 Math & 20 Science Teachers)	10 schools (20 Math & 20 Science Teachers)	20 schools (40 Math & 40 Science Teachers)

II.3 Survey Procedures

As previously mentioned, the survey was conducted during each site visit. Table 2 briefly illustrates a sample site survey procedure.

Table 2. A Site Survey Procedure Sample

Step	Procedure	Target Date
1	Select 4 USI Sites for visits; Brief sites on survey/ school selection	Jan. 30
2	Site submits list of "high reform" and comparison schools	By Feb. 28
3	SR and CCSSO staff review schools and data; contacts sites if needed	Feb.
4	Site contact gains cooperation of schools and provides study information School contact names given to staff	Feb.
5	Superintendent or PD sends a letter to participating schools Draft letter and info. on teacher selection provided by staff	By March 1
6	Briefing for school contacts first day of site visit	April
7	Surveys administered during site visit week or distributed with return date	April
8	CCSSO receives surveys, logs in, and follow-up	April
9	Completed surveys/forms transmitted to NSF/UW-Madison for scanning/input to data file	By May 15
10	Data analysis program and data file for each site provided to SR	By July 1

Before each site visit, CCSSO sent out an initial memorandum explaining the purpose and methodology of the survey. The USI Project Director selected 20 schools based on the criteria described in the memo. During the site visit, the evaluative study team met a representative teacher from each of the 20 schools to deliver the survey package and instructions. After the site visit, each teacher completed a survey and returned the completed forms in a self-addressed, prepaid envelope to the University of Wisconsin for data processing and analysis.

II.4 Survey Instrument Structure

The survey was conducted using four different instruments to accommodate two grade levels and the two subject matters involved. However, each instrument follows the general structure as shown in Table 3.

Table 3. General Structure of SEC Instrument for Middle School Mathematics

Section	Questions (number of questions & type)
I. General School and Class Descriptions	• School Description (2Q- multiple choice) • Class Description (11Q- multiple choice) • Most recent unit of mathematics instruction & instructional time distribution (10Q- percentage of time)
II. Subject Content -- Expectations for Students in Mathematics	• Number sense/ Properties/ Relationships (17Q) • Measurement (13Q) • Data analysis (15Q) • Algebra concepts (22Q) • Geometric concepts (18Q) • Instructional technology (3Q)
III. Instructional Activities in Mathematics	• Homework (10Q) • % of mathematics instruction time (12Q) • % of problem-solving activities (8Q) • % of pairs or small groups work (6Q) • % of use of hands-on materials (6Q) • Use of calculators, computers, etc. (11Q) • Assessments (8Q) • Instructional influence (10Q) • Classroom instructional prep. (18Q) • Teacher opinions (18Q) • Professional Development (14Q) • Formal course preparation (3Q) • Teacher Characteristics (8Q)
Total	• 155 questions

For example, Section I requests the teacher's most recent unit of mathematics instruction and instructional time distribution, as well as school and classroom information.

Figure 1. Sample Questionnaire in Section I

What percent of mathematics instructional time was spent on the following activities?

Enter the percentage of time for each item in the box provided, so that items 9-16 total 100%. Then use the scale to code your response (rounded to the nearest 10%) for each item on the answer sheet.

	%	None	10	20	30	40	50	60	70	80	90+
9 Management or administrative routines, interruptions, and other non-instructional activities		⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
10 Whole class lecture or class discussion		⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
11 Individual student work (e.g. completing exercises, reading textbook)		⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
12 Small group work		⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
13 Field study or out-of-class investigation.		⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
14 Student demonstrations or presentations.		⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
15 Review or work on homework during class.		⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
16 Test or quiz		⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	100%	(Note: Total should sum to 100)									

Section II requests information regarding topic coverage and teacher's expectations for students in the target mathematics class for the current year. It is not intended to reflect any recommended or prescribed content for the grade level. For middle school mathematics, six topic areas are detailed by multiple sub-topic areas as shown in Figure 2.

To complete this section, the teacher identifies topic/sub-topic areas covered in his/her mathematics class, using "time on topic" column (0= none- not covered, 1= slight coverage- less than one class/lesson, 2= moderate coverage- one to five classes/lessons, 3= sustained coverage- more than five classes/lessons). Then the teacher indicates the relative emphases of each student expectation for every sub-topic taught using scale bubbles for six categories: memorize, understand concepts, perform procedures, analyze/reason, solve novel problem, and integrate). Four scale bubbles indicates: 0= no emphasis, 1=slight emphasis- accounts for less than 25% of the time, 2=moderate emphasis- accounts for 25% to 33% of the time, 3= sustained emphasis- accounts for more than 33% of the time.

Figure 2. Sample Questions for Mathematics Topic Coverage and Teacher's Expectations for Students

SECTION II								
Time on Topic		*Middle School Math Topics*	*Expectations for Students in Mathematics*					
<none>	1	**Number sense / Properties / Relationships**	**Memorize**	**Understand Concepts**	**Perform Procedures**	**Analyze / Reason**	**Solve Novel Problems**	**Integrate**
⓪ ① ② ③	101	Place value	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	102	Whole numbers	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	103	Operations	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	104	Fractions	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	105	Decimals	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	106	Percents	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	107	Ratio, proportion	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	108	Patterns	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	109	Real numbers	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	110	Exponents, scientific notation	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	111	Factors, multiples, divisibility	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	112	Odds, evens, primes, composites	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	113	Estimation	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	114	Order of operations	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	115	Relationships between operations	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	116	Mathematical properties (e.g. distributive property)	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③

Section III asks 13 types of questions regarding instrucational practice. Figure 3 illustrates a sample question regarding "Instructional Activities in Mathematics."

Figure 3. Sample Questions about Instructional Activities

INSTRUCTIONAL ACTIVITIES IN MATHEMATICS

Listed below are some questions about what students in target class do in mathematics. For each activity, pick one of the choices (0,1,2,3) to indicate the percentage of instructional time that students are engaged in the activity identified. Please think of an average student in this class, in responding.

What percentage of mathematics instructional time in this target class do students:

NOTE: No more than two '3's , or four '2's should be circled for any given set of items.

		None	Less than 25%	25% to 33%	More than 33%
27	Observe the teacher demonstrate how to do a procedure or solve a problem.	⓪	①	②	③
28	Read about math-related topics in books, magazines, articles				
29	Collect and/or analyze data.	⓪	①	②	③
30	Maintain a portfolio of their own work.	⓪	①	②	③
31	Use hands-on materials/manipulatives (e.g. counting blocks, geometric shapes, algebraic tiles, etc.).	⓪	①	②	③
32	Engage in mathematical problem solving (e.g. computation, story-problems, and mathematical investigations).	⓪	①	②	③
33	Students take notes.	⓪	①	②	③
34	Work in small groups	⓪	①	②	③
35	Work on an assigned mathematics project at home or away from school.	⓪	①	②	③
36	Use computers, calculators, and/or other technology to leaming mathematics.	⓪	①	②	③
37	Work individually on assignments.	⓪	①	②	③
38	Take a quiz or test	⓪	①	②	③

CHAPTER III

SURVEY RESULT
SUMMARY AND ANALYSIS

III.1 Overview

State and national standards in math and science provided the constructs for the survey design, item writing, and for reporting results. The standards used in design and reporting were selected by the CCSSO/NISE study team with a panel of mathematics and science education leaders from states. Not all topics and standards that provided the structure for the survey questions are reported here. This report is an initial analysis to provide a picture of some of the practices and curriculum content. Further reporting and analyses will be provided in subsequent reports.

The profiles that follow are based on completed teacher surveys from 71 teachers of mathematics and 73 teachers of science in four USI sites: Baltimore, Dallas, Detroit, and Phoenix. A total of 58 schools were included in the 1999 survey, and a total of 232 teachers were given surveys from their school contact persons. The total response rate from the four sites was just over 50 percent.

The data presented in this report are not from a random selection of schools and classrooms in districts, and thus are not district-representative. The schools are a purposive sample of schools in the four selected districts, based on the school's degree of involvement in the USI project. The collected data offer sufficient numbers of responses to give meaningful statistics and analysis of differences between Implementation and Comparison schools. (Note: Baltimore surveys were not identified according to school designation, and the data are reported only for the summary graphs.)

In all four districts, the elementary science surveys were completed by teachers of grade 5, and middle level classes were teachers of grade 8. The elementary mathematics surveys were completed by teachers of grade 4 in all four districts; while the middle level mathematics surveys were from teachers of grade 7 in Phoenix and teachers of grade 8 in Baltimore, Detroit and Dallas.

The survey results are compiled and analyzed in two parts: The first part presents

"Item Profiles," which display data on instructional practices used in math and science curriculum as well as teacher preparation. The second part presents "Content Maps" and "Content Graphs." Each chart has a text page with data interpretation.

III.2 Selected Item Profiles for Mathematics and Science

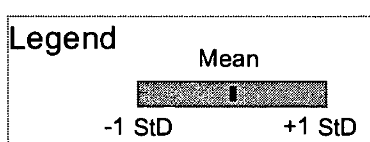
The theme or concept that is being reported and analyzed in each data chart from the 1999 Survey of Enacted Curriculum is based on a standard for learning in mathematics or science or a common goal of the USIs. Table 4 outlines the data charts presented in the report for mathematics and science. These 20 charts report on results for classroom instructional practices, teacher preparation, and subject content taught in classrooms. The charts and data presentations are intended to illustrate some of the findings that can be analyzed with surveys of enacted curriculum.

Table 4. Selected Item Profiles for Mathematics and Science

Chart No.	Mathematics	Chart No.	Science
1	Use of Class Time in Mathematics	2	Use of Class Time in Science
3	Problem Solving Activities in Mathematics	4	Active Learning in Science
5	Small Group Work in Mathematics	6	Small Group Work in Science
7	Assessment Strategies in Mathematics	8	Assessment Strategies in Science
9	Use of Educational Technology in Mathematics	10	Use of Educational Technology & Lab Equipment in Science
11	Professional Development in Mathematics	12	Professional Development in Science
13	Teacher Course Taking in Mathematics	14	Teacher Course Taking in Science
15	Middle and Elementary School Mathematics Content Maps	18	Middle and Elementary School Science Content Maps
16	Middle School Mathematics Content Graphs	19	Middle School Science Content Graphs
17	Elementary School Mathematics Content Graphs	20	Elementary School Science Content Graphs

Item Profile Format

Item Profiles are used to report survey results in Charts 1-14. Each chart reports the total results by grade level for the four districts, and elementary and middle grades results by Implementation vs. Comparison school surveys for three districts. The vertical line indicates the item mean and shaded area shows the range of responses from -1 to +1 standard deviation from the mean, which generally includes two-thirds of the survey responses.



Charts 1 & 2: Use of Class Time

Teachers were asked to allocate 100% of class time during the most recent instructional unit into 9 categories of how time was used, both instructional and non-instructional activities. The purpose of this section of the survey is to obtain a broad picture of differences across the sample of classes and schools in approaches to instruction. In Chart 1 we present the data from all 9 possible responses for mathematics classes, and Chart 2 shows data for science classes. Below we highlight some of the findings from data in the charts:

Mathematics:

- Three kinds of classroom practices were reported most often: *small group work*, *individual student work*, and *whole class lecture/discussion* each averaged 20% of class time for both elementary and middle grade classes. There is wide variation in teacher responses, with a significant group of classes below 10% of time on each type of instruction, and a significant group over 35% of time.

- *Non-instructional time* averages 10% at both grade levels. *Review and homework activities* also take about 10% of time on average.

- Classes in high Implementation schools in the USI were similar to those in Comparison schools. In middle schools we can note more *whole class lecture or discussion* in Implementation classes, along with less time in *small group work*, more use of *student demonstrations/presentations*, and more time on *tests or quizzes*.

Science:

- Work with *hands-on or laboratory materials*, was the largest activity, with an average of 25% of time in middle and elementary classes. This activity is clearly advocated by standards and systemic reforms.

- *Non-lab small group work*, *individual student work*, and *whole class lecture/ discussion* each covered from 10 to 20% of time each. *Class management and interruptions* took 10 to 20% of class time. Slightly more *individual work in class* and *lecture/whole class discussion* were used in elementary classes than in middle grade classes.

- In elementary schools, teachers in high Implementation schools reported an average of 5% more time spent on active science activities (indicated by *student work with hands-on, lab materials*). Teachers in Implementation middle schools reported less time on *review or homework in class* slightly less time on *management/interruptions*.

Chart 1

Use of Class Time
During Most Recent Unit of Instruction in Mathematics

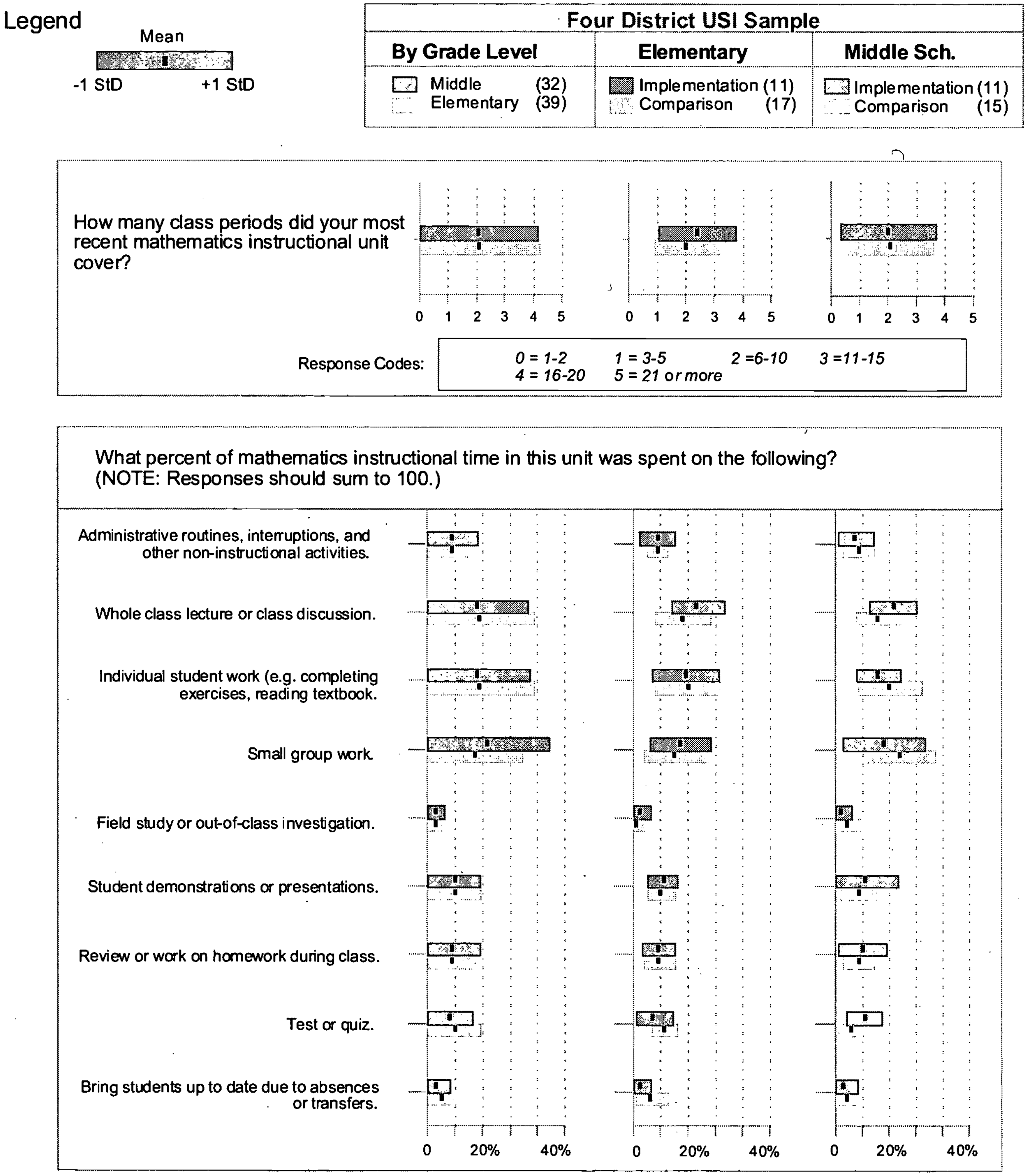
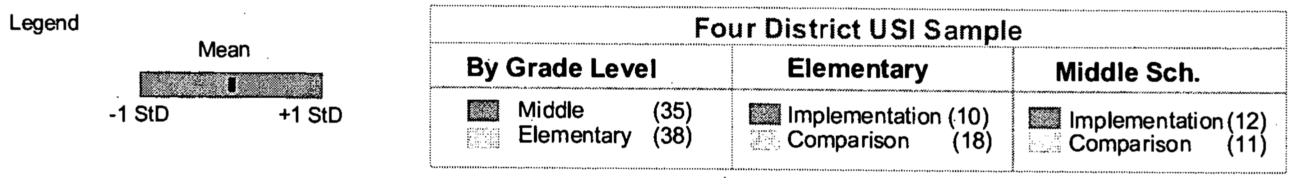
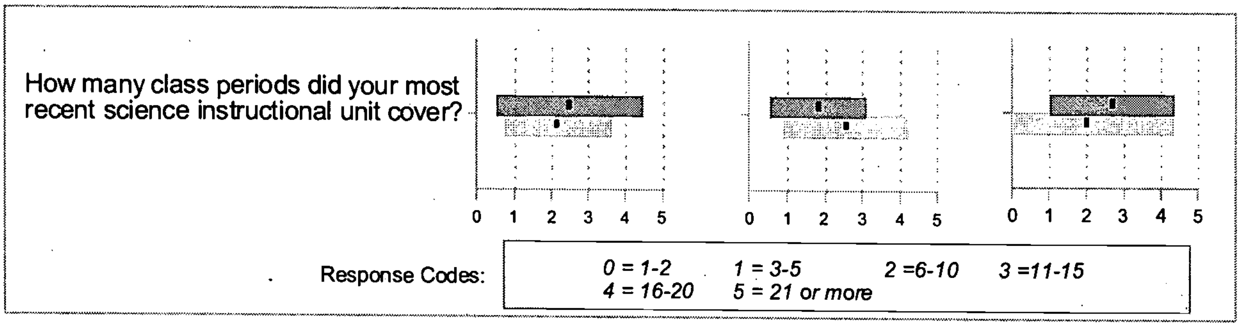
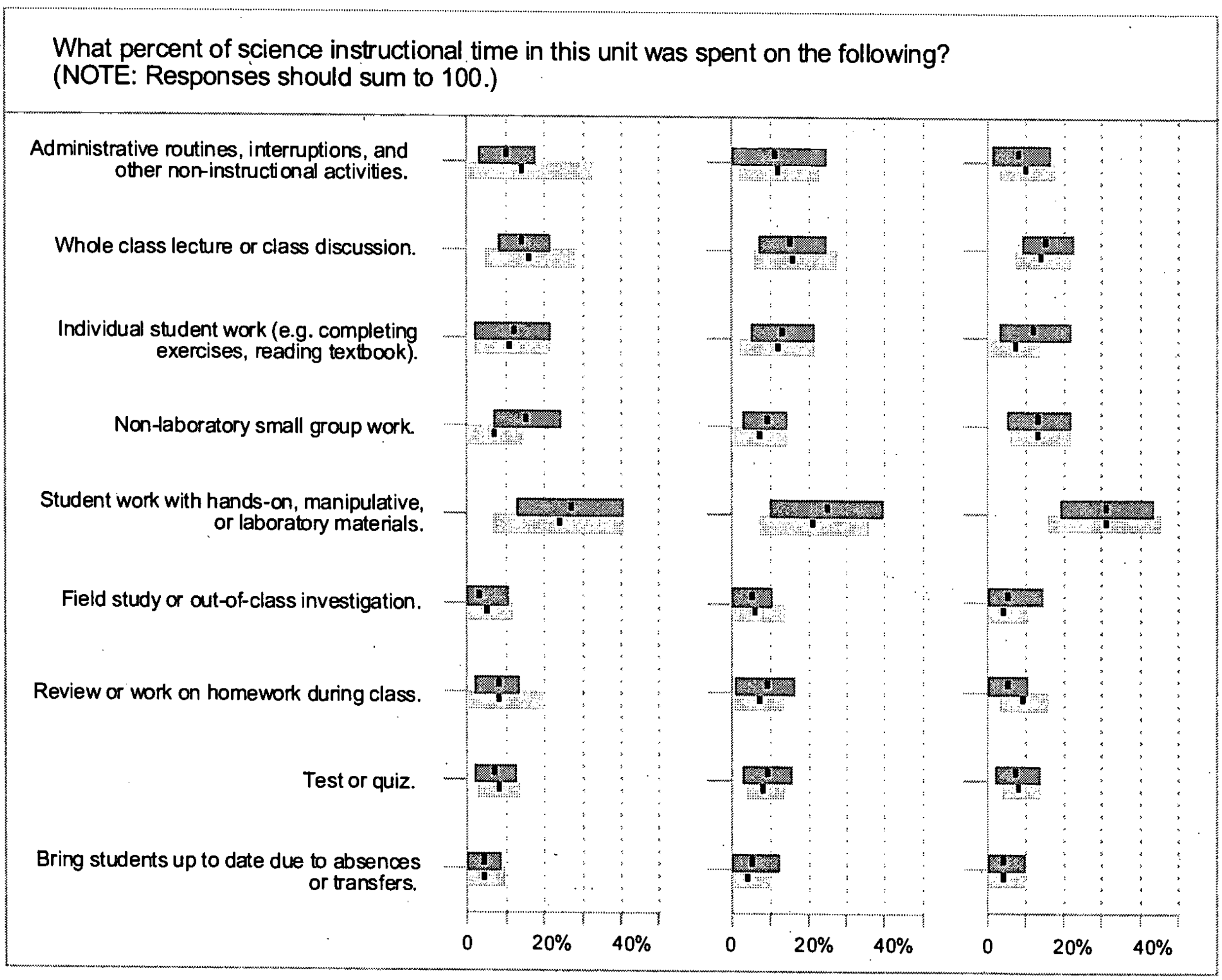


Chart 2

Use of Class Time
During Most Recent Unit of Instruction in Science







Charts 3 & 4: Problem-Solving Activities during Mathematics Instruction; Active Learning in Science

Mathematics:

Reasoning and Problem Solving is a cross-cutting standard for mathematics learning set out by NCTM in the Curriculum and Evaluation Standards (1989). The survey included a set of items on practices related to teaching reasoning and problem solving that taken together provide a reliable index of the degree to which teachers are focusing math instruction to student learning towards this standard. The broad term "problem solving" can be misinterpreted or used by teachers to mean very different kinds of instruction. The seven individual items graphed in Chart 3 provide specific information on the kinds of activities students are doing in class. Several specific results can be highlighted.

- The seven activities in problem solving/reasoning gained a similar level of response from teachers, indicating that all of these activities are being used in most classes. Five class activities have slightly higher responses (about 15% of time), at both elementary and middle level classes: *complete computation exercises*, *solve word problems*, *apply math to real world problems*, *make estimates/predictions,* and *analyze data.*

- There are several differences in problem solving activities. Elementary students in Implementation schools spend less time *completing computational problems* or *solving word problems from a text or worksheet*, and both elementary and middle school students in Implementation schools spend more time *analyzing data to make inferences or draw conclusions*.

Active Learning in Science:

The survey included a set of questions asking more details about the kinds of active, hands-on learning present in science class. Active Learning is one of the central concepts in state and national standards for student learning in science which were used to construct the survey. The data in Chart 4 show results for a range of specific actions when students are doing an experiment or laboratory activity.

- In an experiment or investigation, students would be expected to be doing a number of the activities in combination or sequence. Three activities are reported more often: *use science equipment, follow step-by-step directions* and *make tables, graphs or charts*. Teachers report that students are less often *changing something in an experiment to see what happens* or *designing an experiment.*

- We can note in column two that elementary students in Implementation schools are less likely to *follow step-by-step directions* and more likely *to change something in an experiment to see what will happen*, which suggests more student directed activity in science class.

- We can also note in column three that middle grade classes in Implementation schools spent more time *using science equipment and tools in experiments or investigations*. They also spent more time *collecting data* and *designing ways to solve a problem*, than students in Comparison schools, but they were less likely to *make predictions, guesses or hypotheses*, or to *draw conclusions from science data*.

Chart 3

Problem Solving Activities During Mathematics Instruction

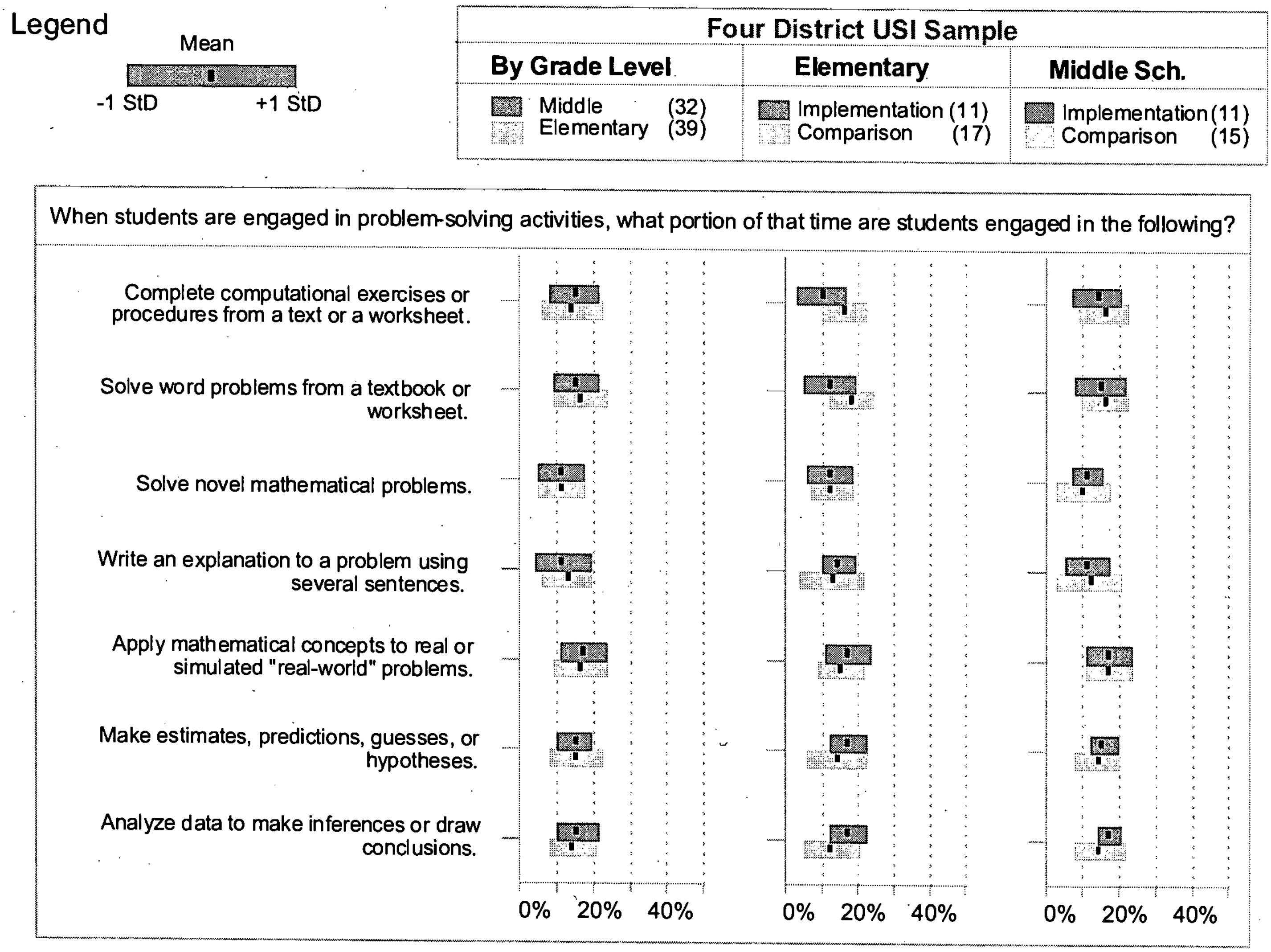
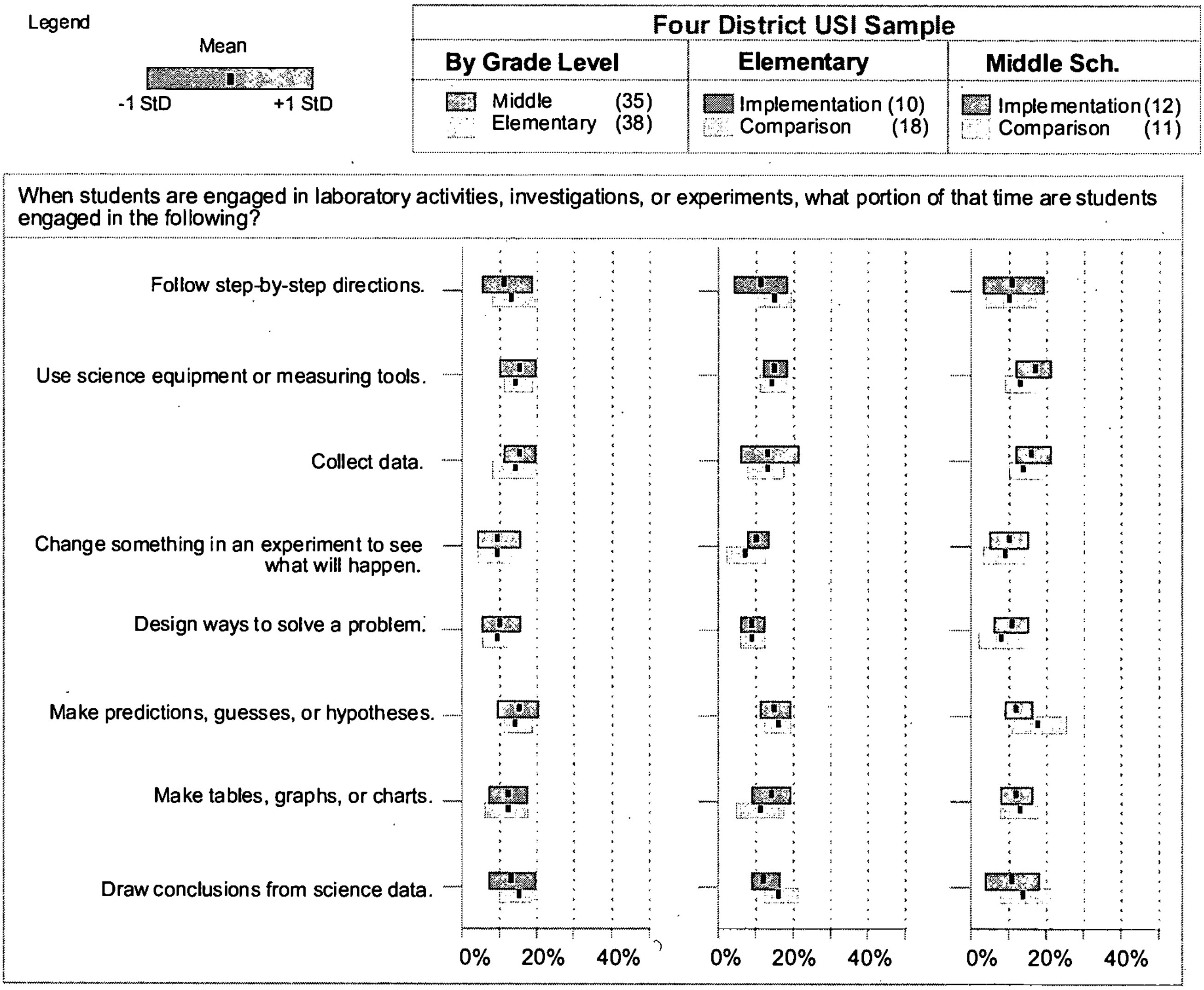


Chart 4

Active Learning in Science



Charts 5 & 6: Small Group Work

Teachers reported in Use of Class Time that small group work was a major instructional activity in both mathematics and science. Instruction directed toward scientific inquiry and student skills in reasoning and problem solving has often been organized so that students work together in pairs or small groups. At the same time, student work in small groups might have other learning objectives or simply be an organizational scheme for the classroom.

The Survey included a set of five items that provide more detailed information about student roles and activities in small group work in class. The results from these items in Charts 5 and 6 provide a better picture of how small groups operate in math and science instruction, and they show differences across the study sample.

Mathematics

- The three items with the highest response in class time were: *students talk about ways to solve math problems* (30% of time), *complete written assignments*, and *review assignments or problems*. The first activity is often described as a reform-strategy for students to work together in discovering approaches to solving problems, and we see that classes in High Implementation schools spend more time with students talking about ways to solve problems. The other two small group activities indicate fairly traditional reasons for having students work in groups.

- Student small group work on *longer-term projects* and on *writing projects* comprise 10 to 15% of time in class, at both elementary and middle grades levels. These uses might be viewed as instructional reforms in class activities, but the rates of use are similar in Implementation and Comparison schools.

Science

- *Write results or conclusions of a laboratory activity* had the highest response in class time in both elementary and middle schools (about 22% percent of time). This may reflect the importance of students being able to explain their work, a common assessment measure. In elementary schools, this activity, along with *talk about ways to solve novel problems* had the most variations in responses (from 5% to over 40% of class time), especially in high Implementation schools.

- High implementation elementary schools spent less time (about 12%) on *review assignments and problems* than comparison schools (close to 20%). In middle grades of Implementation schools students spent less in small groups working on *written assignments* or *working on longer assignments or projects* than students in Comparison schools.

- At the middle school level the two items with the greatest variation in responses between high Implementation and comparison schools are *complete written assignments* and *work on long term projects*. The High implementation schools reported more time spent on *work on long term project* (almost 20% vs. less than 15%) and less on *complete written assignments* (15% vs. 20%).

Chart 5

Small Group Work in Mathematics

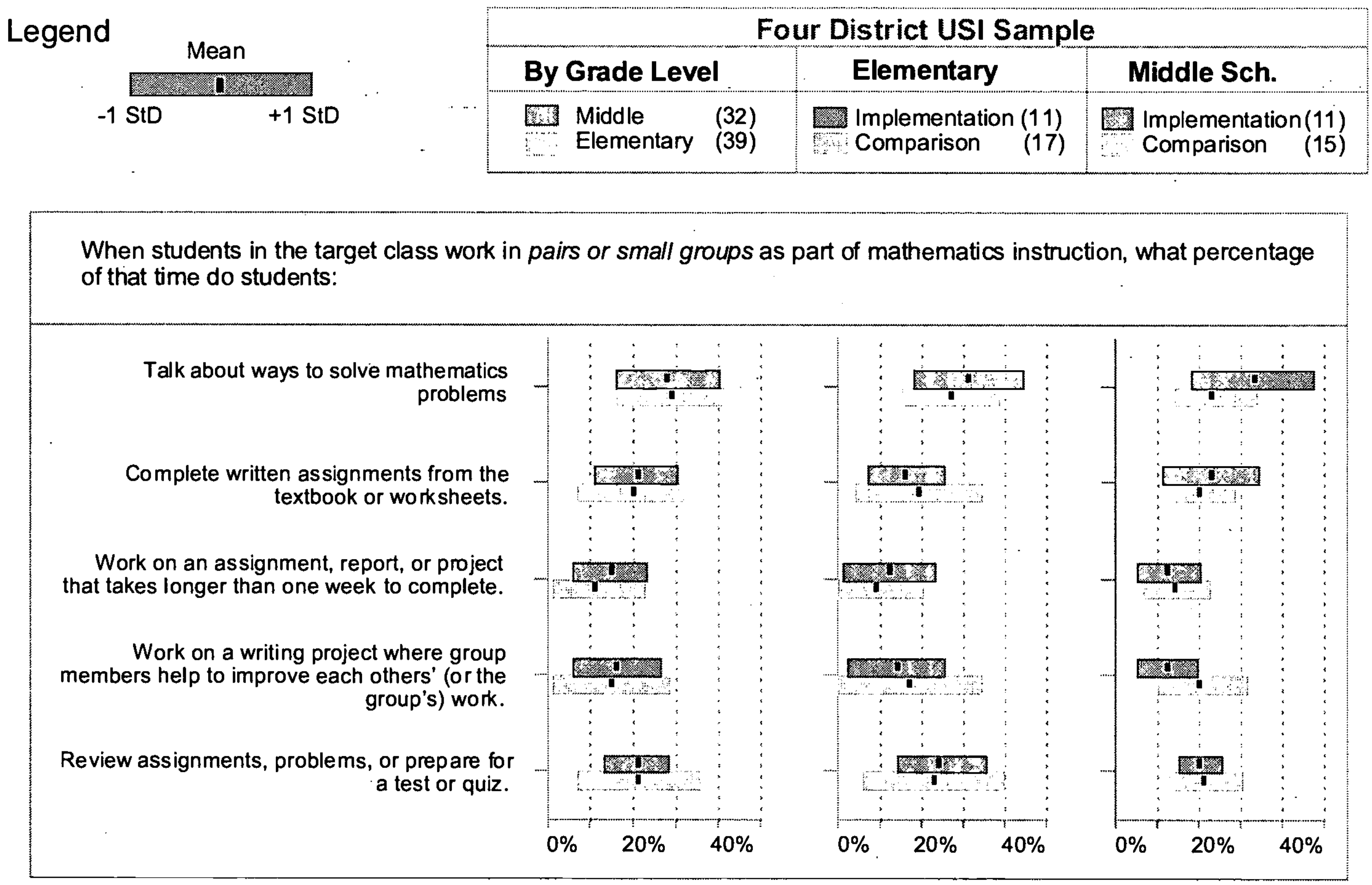
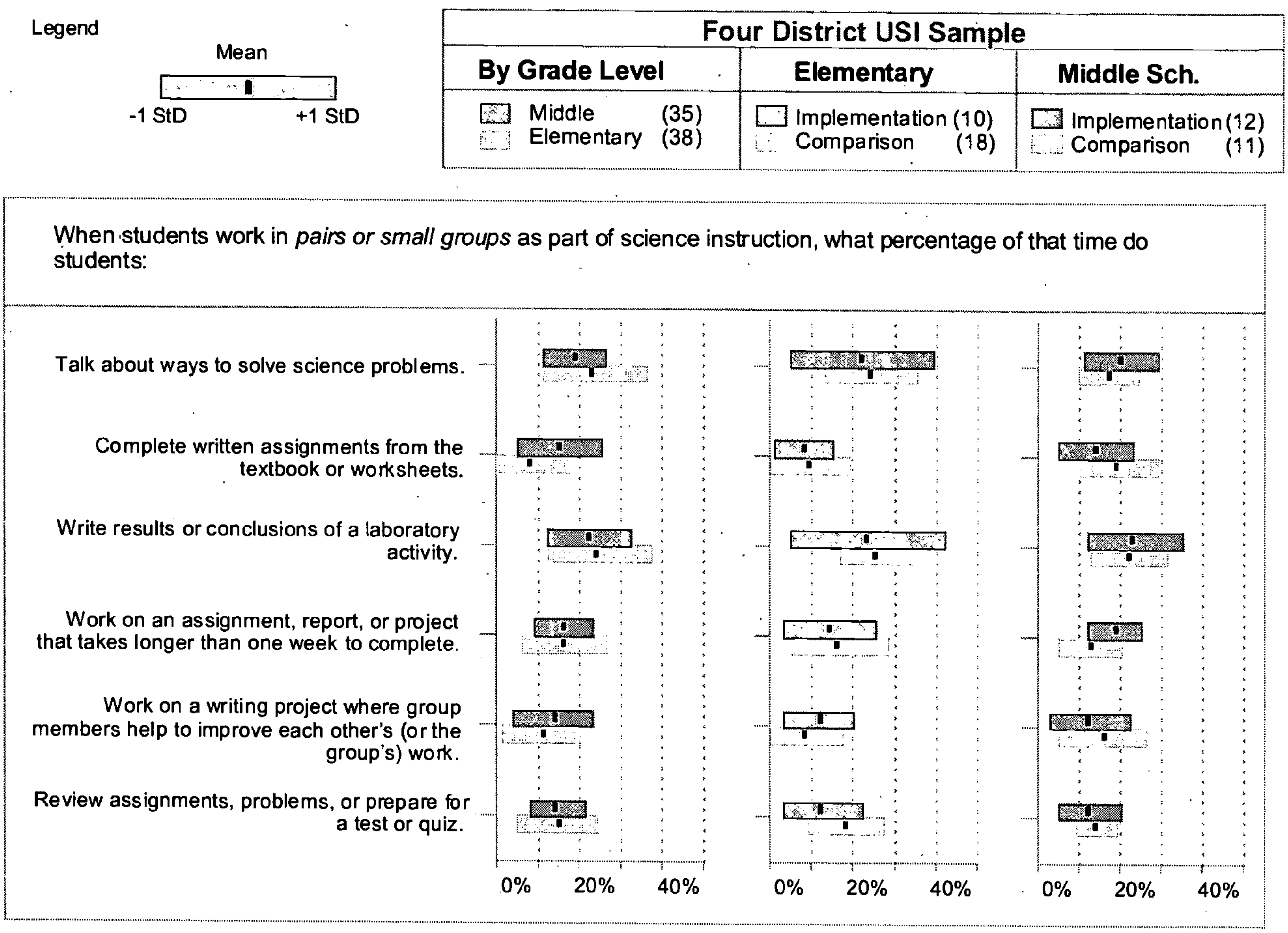


Chart 6

Small Group Work in Science



Charts 7 & 8. Assessment Strategies in Mathematics and Science

Rather than relying on a single type of assessment, such as paper-and-pencil tests comprised of objective items or routine procedural problems, mathematics and science teachers are being encouraged to make use of a variety of assessment strategies. In part, this is to increase the validity of the inferences that teachers can then make about student learning. Using multiple sources of evidence allows the strengths in one type of assessment to compensate for weaknesses in another. But to what extent are mathematics and science teachers moving beyond a reliance on a single type of assessment, and what other strategies are they using? The results in Charts 7 and 8 illustrate how Survey data can be used to find out.

Mathematics Item Profiles:
The responses from teachers of mathematics on the assessment questions are displayed in Chart 7. The highest frequency of responses on strategies were *short answer*, *extended response, performance tasks,* and *observation*:

- *Short answer:* A common form of assessing student knowledge in class is short answer questions, such as asking students to perform a mathematical procedure. Students are given this type of assessment, on average, about once a week. This is true across grade levels and with both Implementation and Comparison schools.

- *Extended response*: Elementary Teachers in High Implementation schools are significantly more likely than Comparison school teachers to ask students to explain or justify their answers (1-3 times/week).

- *Performance tasks* are used to a significantly greater degree by Implementation teachers than Comparison teachers, both at the elementary and the middle grade levels.

We should note that objective questions are used only monthly on average, although a significant portion uses them weekly.

Science Item Profiles:
- *Portfolios*: There are large differences in the use of several assessment strategies in science, and especially wide variation in the use of portfolios. Some teachers are not using portfolios at all, while some elementary school science teachers are using portfolios in assessment 1 to 3 times per month. The average for the middle school science teachers in Implementation schools is 1 to 4 times per year. Implementation elementary school teachers have greater use of portfolios.

- *Performance tasks* use in science assessment averages about the same among Implementation and Comparison classes, both at the elementary and the middle grade levels. There is more variation in use in Implementation schools.

- *Extended response*: Teachers report that students are asked to write explanations for answers, on average, about 1 to 3 times per month, about as often as *objective* or *short answer items*. All three items are used less often in elementary schools.

Chart 7

Assessment Strategies in Mathematics

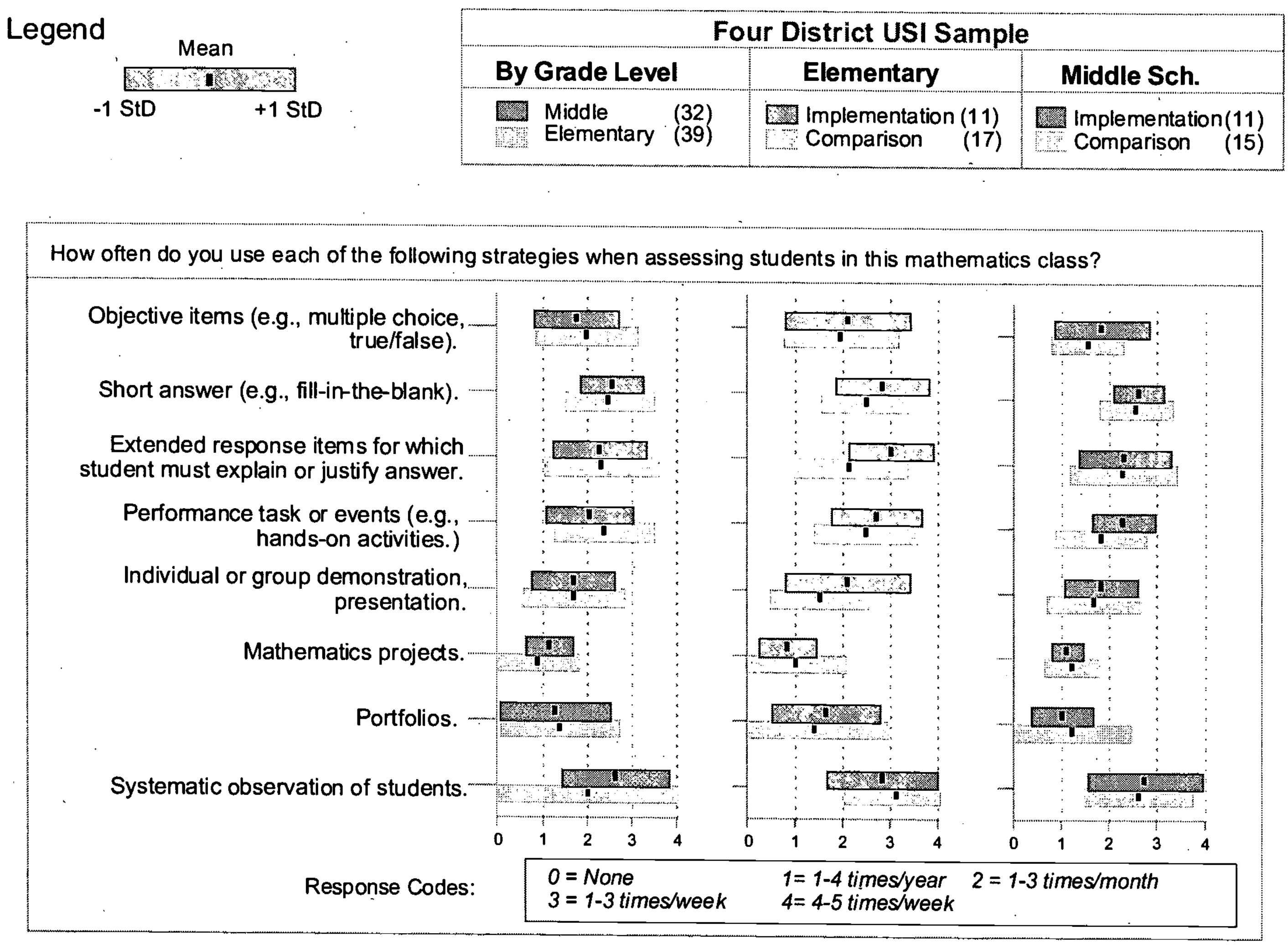
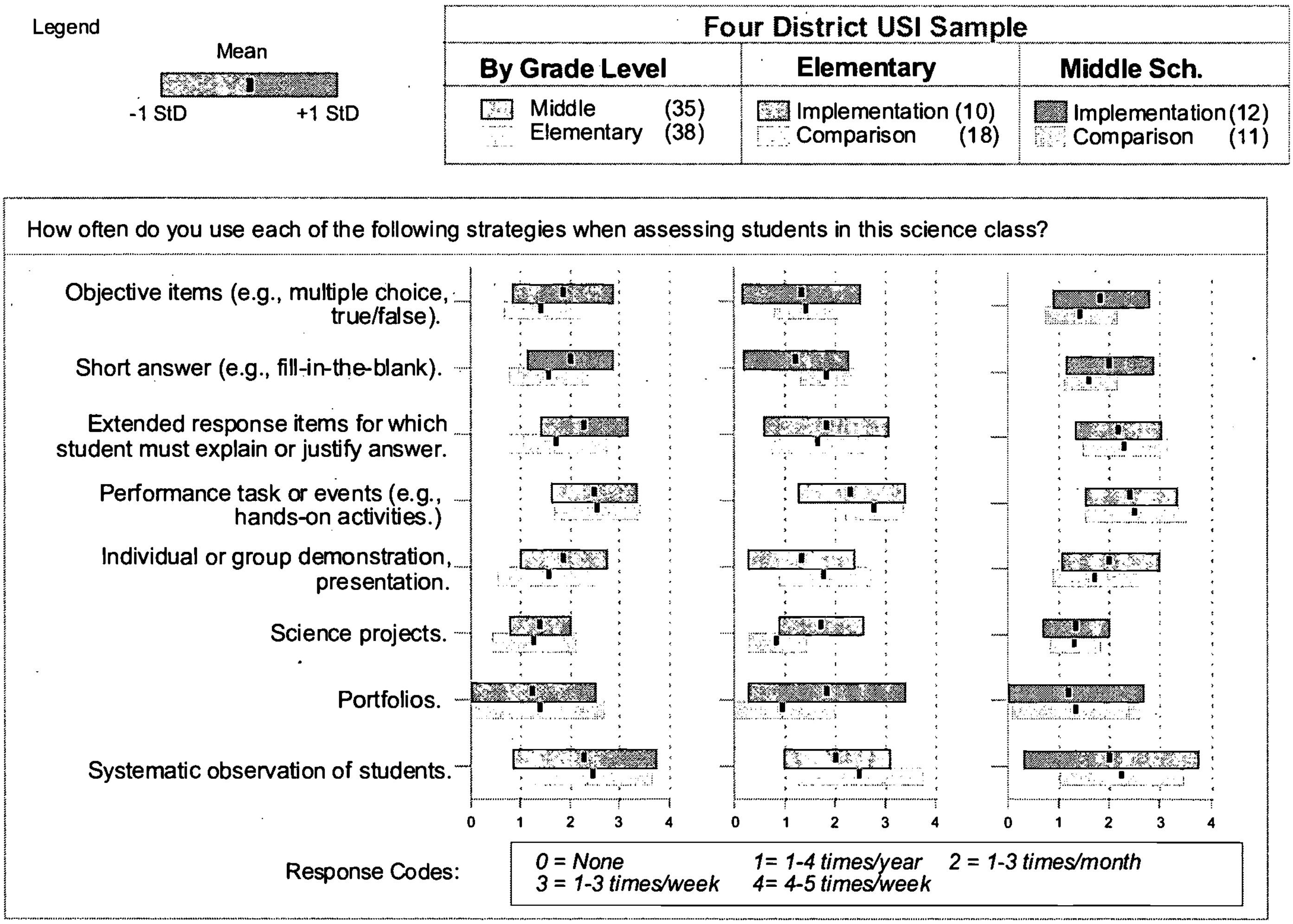


Chart 8

Assessment Strategies in Science



Charts 9 & 10: Use of Educational Technology and Lab Equipment.

An important indicator of active, inquiry-based methods of teaching science and math, as well as school system capacity for supporting this approach, is the availability and use of educational technology and laboratory equipment. Science and mathematics standards advocate learning to apply knowledge to real problems and gain skills that will be used outside of school. Science and mathematics uses in careers now involve computers, calculators, and a variety of simple and complex lab equipment. Thus, a key component of the survey of enacted curriculum is questions concerning the use of equipment and technology in teaching science and math.

Mathematics:

Chart 9 illustrates how the data can be reported to examine several kinds of questions concerning availability and instructional uses.

- *Calculators*: Teacher reports on students' use of calculators show that middle grades classes average use is less than weekly, although many classes use them weekly. Use in elementary classes differs widely, from *rarely used* to *weekly use*, and classes in Comparison schools had slightly greater use. Graphing calculator use varies widely. Middle grades classes differ from *rarely used* to almost *weekly use*.

- *Frequent Uses*: The survey data show that the most frequent uses of educational technology in math instruction are: (a) *learning facts or practicing procedures* (20% of time average), (b) *displaying/analyzing data* (18% middle grades), *testing* (18% middle grades), and (d) *individualized instruction* (20% elementary).

Science:

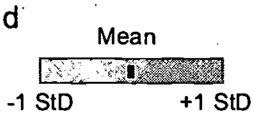
- *Calculators or computers:* Education technology is used most often in science class for *learning facts* (30% in Implementation schools) and for *retrieving information* or *displaying/analyzing data* (28%). We can also note that these uses vary widely in both groups of schools, from 0 to 40% of time, indicating that teachers make very different uses of technology in instruction.

- *Lab Equipment:* We highlight two different types of equipment in classrooms. First, *running water* (a traditional indicator of lab capacity) is not available in about one-third of elementary classes, and it is only rarely used in the average elementary class. The average middle grade science class uses running water less than monthly, although classes in Implementation schools average monthly to weekly use. Second, "high-tech" approaches to experimentation use *computer lab interfacing devices*. Our survey with urban schools showed that about a third of classes did not have these devices and the average class had access, but rarely used them.

Chart 9

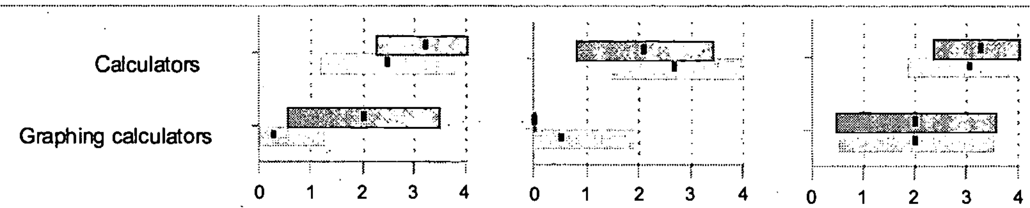
Use of Calculators, Computers & Educational Technology in Mathematics

Legend



Four District USI Sample		
By Grade Level	**Elementary**	**Middle Sch.**
Middle (32) Elementary (39)	Implementation (11) Comparison (17)	Implementation (11) Comparison (15)

Indicate how often the average student uses each of the following types of equipment in this mathematics class:



Response Codes: *0 = Not Available* *1 = Available, but rarely used* *2 = Used < 7 times/yr.* *3 = 7- 36 times per/yr.* *4 = Used weekly*

When students are engaged in activities that involve the use of calculators, computers, or other educational technology as part of mathematics instruction, what percentage of that time do students:

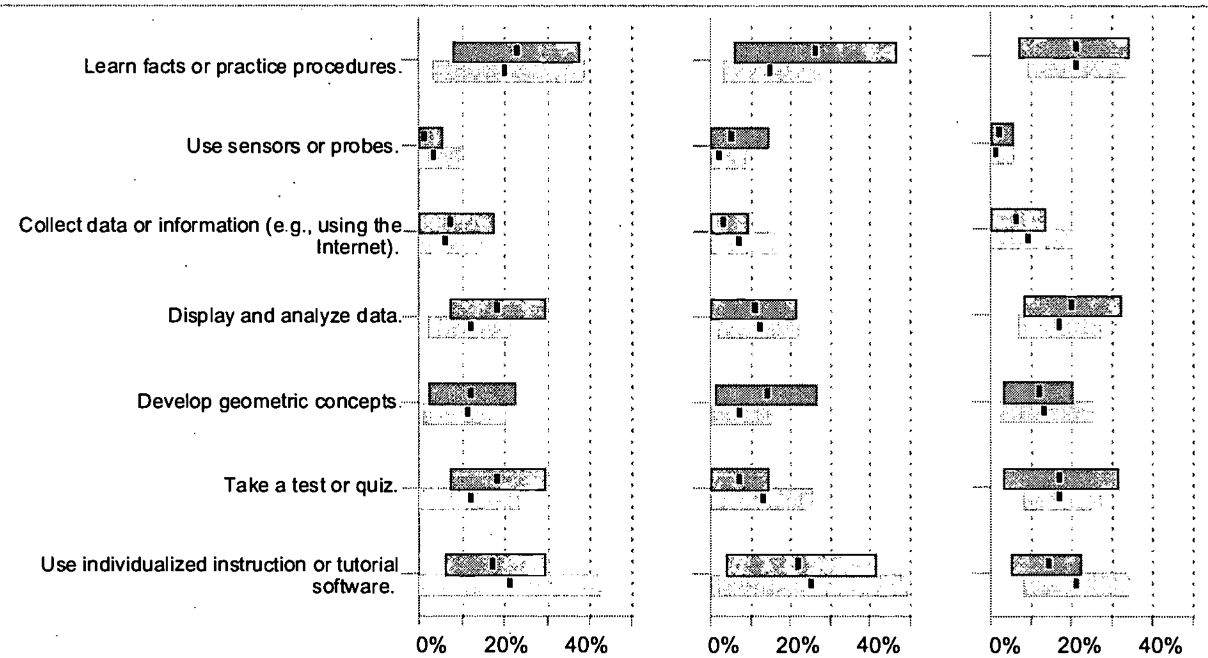


Chart 10

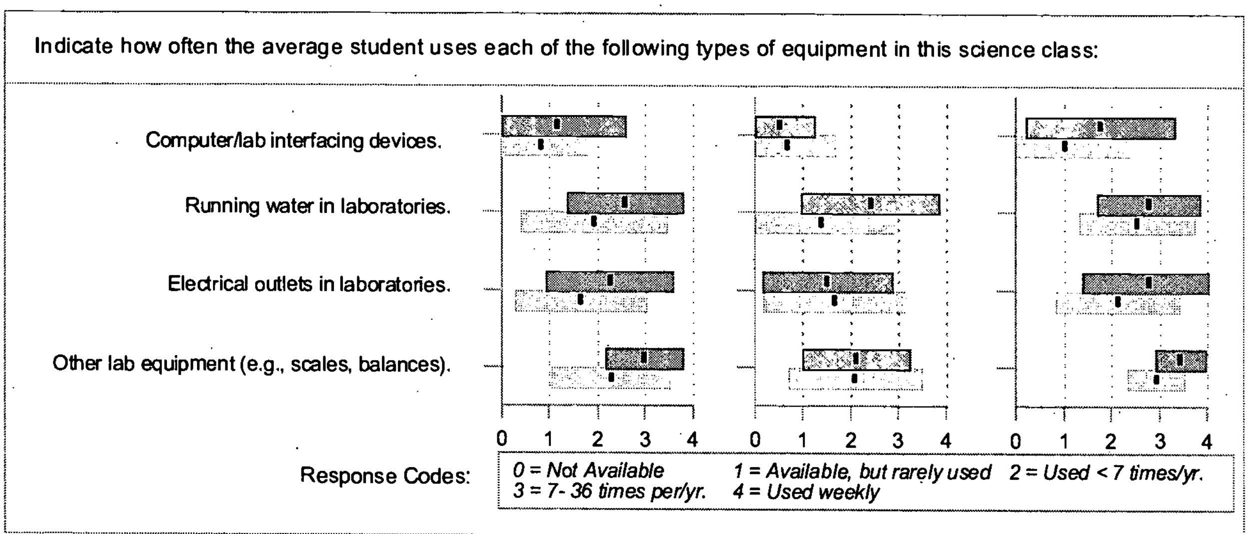
Use of Educational Technology and Lab Equipment in Science

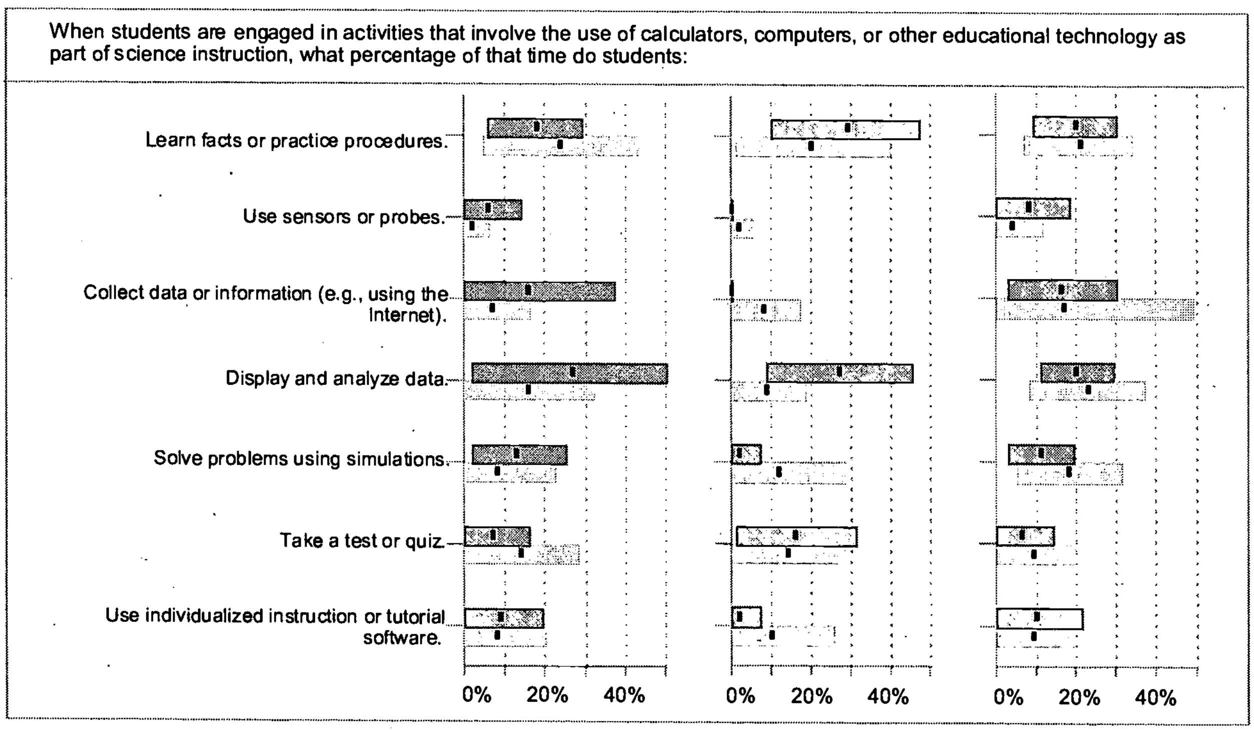
Legend

Mean

-1 StD +1 StD

Four District USI Sample		
By Grade Level	**Elementary**	**Middle Sch.**
Middle (35) Elementary (38)	Implementation (10) Comparison (18)	Implementation (12) Comparison (11)





Charts 11 & 12. Professional Development

Teachers were asked to report the total number of hours spent on professional development or in-service in mathematics education during the past year, and to report their response to the kinds of activities in which they participated. The Survey results for the four districts are in Charts 11 and 12.

Mathematics:

- Middle grade teachers received an average of almost 20 hours of professional development in both *teaching mathematics* and *study of math content.* Elementary teachers averaged 10 hours in each area. Teachers in Implementation schools received significantly more professional development at both elementary and middle grade levels.

- The highest positive responses from teachers concerning their professional development activities were for: *implementing new curriculum* (elementary and middle), *new methods of teaching* (e, m), *meeting needs of all students* (e, m), *implementing standards* (e), *in-depth study* (m), and *education technology* (m).

Science:

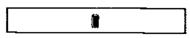
- Middle grades science teachers received an average of almost 20 hours of professional development in both *methods of teaching science* and *study of science content*. Elementary teachers received about 10 hours less professional development in each area. Teachers in Implementation middle grade schools received more *science education professional development* than those in Comparison schools.

- The professional development activities of most teachers in the past year included *student assessment*, *in-depth study*, *new teaching methods*, *implementing new curriculum*, and *implementing standards*. Responses were most positive to *new teaching methods* (middle grades), *implementing new curriculum* (e, m), *in-depth study* (e, m), *implementing standards* (m), and *meeting needs of all students* (e, m).

Chart 11

Professional Development in Mathematics

Legend

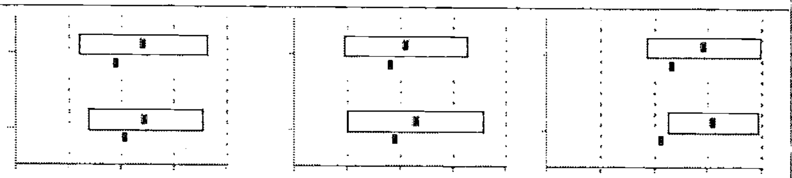


Four District USI Sample		
By Grade Level	Elementary	Middle Sch.
Middle (32) Elementary (39)	Implementation (11) Comparison (17)	Implementation (11) Comparison (15)

What is the total amount of time in the last twelve months that you spent on professional development or in-service activities in the following categories?

In-depth study of mathematics content.

Methods of teaching mathematics.



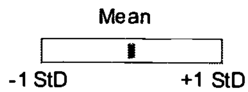
For each of the following professional development activities that you participated in *during the last 12 months*, what best describes the *impact of the activity*?

		Did not participate	*Little or no impact*	*Trying to use*	*Changed my practice*
How to implement state or national content standards.	Elementary	25.00 %	7.14 %	46.43 %	21.43 %
	Middle	26.09 %	13.04 %	43.48 %	17.39 %
How to implement new curriculum or instructional material.	Elementary	10.34 %	10.34 %	62.07 %	17.24 %
	Middle	8.70 %	17.39 %	60.87 %	13.04 %
New methods of teaching.	Elementary	14.81 %	7.41 %	44.44 %	33.33 %
	Middle	17.39 %	21.74 %	39.13 %	21.74 %
In-depth study of mathematics content.	Elementary	27.59 %	17.24 %	34.48 %	20.69 %
	Middle	21.74 %	17.39 %	43.48 %	17.39 %
Meeting the needs of all students.	Elementary	25.00 %	7.14 %	42.86 %	25.00 %
	Middle	30.43 %	4.35 %	34.78 %	30.43 %
Multiple strategies for student assessment.	Elementary	32.14 %	7.14 %	35.71 %	25.00 %
	Middle	30.43 %	21.74 %	26.09 %	21.74 %
Educational technology.	Elementary	41.38 %	17.24 %	34.48 %	6.90 %
	Middle	13.04 %	26.09 %	39.13 %	21.74 %
Participated in a teacher network or study group (electronic or otherwise) on improving teaching.	Elementary	71.43 %	14.29 %	3.57 %	10.71 %
	Middle	65.22 %	13.04 %	17.39 %	4.35 %
Attended an extended institute or professional development program for teachers (40 contact hours or more).	Elementary	67.86 %	%	10.71 %	21.43 %
	Middle	39.13 %	4.35 %	30.43 %	26.09 %

Chart 12

Professional Development in Science

Legend

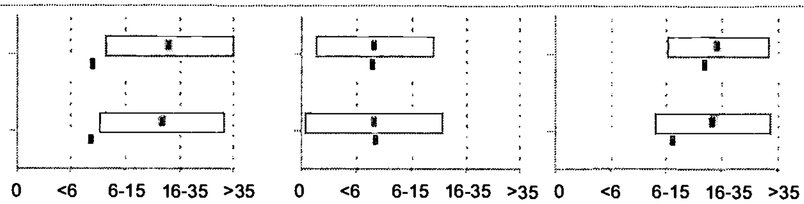


Four District USI Sample		
By Grade Level	Elementary	Middle Sch.
Middle (35) Elementary (38)	Implementation (10) Comparison (18)	Implementation (12) Comparison (11)

What is the total amount of time in the last twelve months that you spent on professional development or in-service activities in the following categories?

In-depth study of science content.

Methods of teaching science.



For each of the following professional development activities that you participated in *during the last 12 months*, what best describes the *impact of the activity*?

		Did not participate	*Little or no impact*	*Trying to use*	*Changed my practice*
How to implement state or national content standards.	Elementary	25.7 %	17.1 %	51.4 %	5.7 %
	Middle	14.7 %	5.9 %	55.9 %	23.5 %
How to implement new curriculum or instructional material.	Elementary	14.7 %	14.7 %	50.0 %	20.6 %
	Middle	8.8 %	14.7 %	44.1 %	32.4 %
New methods of teaching.	Elementary	34.3 %	11.4 %	40.0 %	14.3 %
	Middle	14.7 %	5.9 %	50.0 %	29.4 %
In-depth study of science content.	Elementary	34.3 %	5.7 %	54.3 %	5.7 %
	Middle	26.5 %	2.9 %	50.0 %	20.6 %
Meeting the needs of all students.	Elementary	28.6 %	8.6 %	51.4 %	11.4 %
	Middle	20.6 %	11.8 %	47.1 %	20.6 %
Multiple strategies for student assessment.	Elementary	25.7 %	17.1 %	48.6 %	8.6 %
	Middle	17.6 %	14.7 %	50.0 %	17.6 %
Educational technology.	Elementary	54.3 %	11.4 %	25.7 %	8.6 %
	Middle	38.2 %	8.8 %	35.3 %	17.6 %
Participated in a teacher network or study group (electronic or otherwise) on improving teaching.	Elementary	73.5 %	5.9 %	17.6 %	2.9 %
	Middle	50.0 %	8.8 %	29.4 %	11.8 %
Attended an extended institute or professional development program for teachers (40 contact hours or more).	Elementary	70.6 %	0.0 %	14.7 %	14.7 %
	Middle	44.1 %	2.9 %	26.5 %	26.5 %

Charts 13 & 14. Teacher Course-Taking Preparation

Charts 13 and 14 provide important data on the extent of preparation of teachers in the subjects of mathematics and science they are teaching. The Survey asked teachers to report the total number of courses they had completed in undergraduate or graduate education. In the four USI districts we find the following summary results.

Mathematics:

- The average middle grades math teacher in these districts has taken 4 *advanced math courses* (calculus or higher), and 3 or 4 *refresher courses* (algebra, geometry, i.e., high school math courses). A significant portion of have no advanced or refresher courses. The average middle grade teacher has taken 5 or 6 *math education courses.*

- The average elementary teacher in these districts has taken 2 *advanced math courses* (calculus or higher), and 3 to 4 *refresher courses.* A significant portion of the teachers have no advanced or refresher courses. The average elementary teacher has taken 7 to 9 *math education courses.*

- Elementary teachers in the Comparison schools have more preparation in *mathematics and math education*, but middle grades teachers in the Implementation schools have slightly more preparation in *mathematics and math education.*

Science:

- The average middle grades science teacher in these districts has taken 3 courses in life science or biology, 1 to 2 courses in physical science, and 3 in earth science, and 9 or 10 courses in science education.

- The average elementary teacher in these districts has taken 1 or 2 life science courses, less than 1 physical science course, and 1 to 2 courses in earth science, and 3 to 4 courses in science education.

- Elementary teachers in Implementation schools are more likely to have taken at least one physical science course, and have taken more science education courses than teachers in Comparison schools.

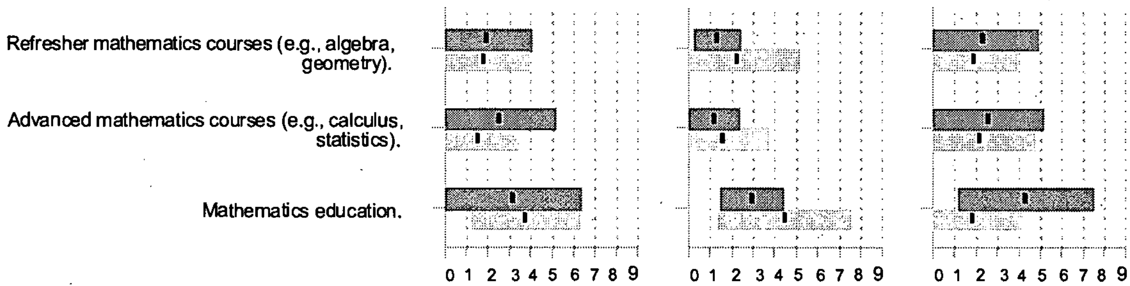
Chart 13

Teacher Course-Taking in Mathematics and Mathematics Education

Legend: Mean; -1 StD; +1 StD

Four District USI Sample		
By Grade Level	**Elementary**	**Middle Sch.**
Middle (32) Elementary (39)	Implementation (11) Comparison (17)	Implementation (11) Comparison (15)

Indicate the number of quarter or semester courses that you have taken at the undergraduate or graduate level in each of the following areas:



Response Codes: *0 = 0 courses 1 = 1-2 2 = 3-4 3 = 5-6 4 = 7-8 5 = 9-10 6 = 11-12 7 = 13-14 8 = 15-16 9 = 17+*

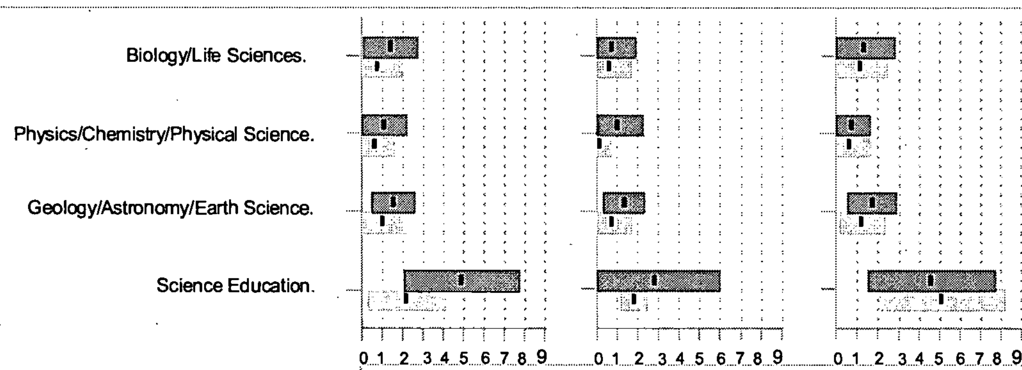
Chart 14

Teacher Course-Taking in Science and Science Education

Legend: Mean; -1 StD; +1 StD

Four District USI Sample		
By Grade Level	**Elementary**	**Middle Sch.**
Middle (35) Elementary (38)	Implementation (10) Comparison (18)	Implementation (12) Comparison (11)

Indicate the number of quarter or semester courses that you have taken at the undergraduate or graduate level in each of the following areas:

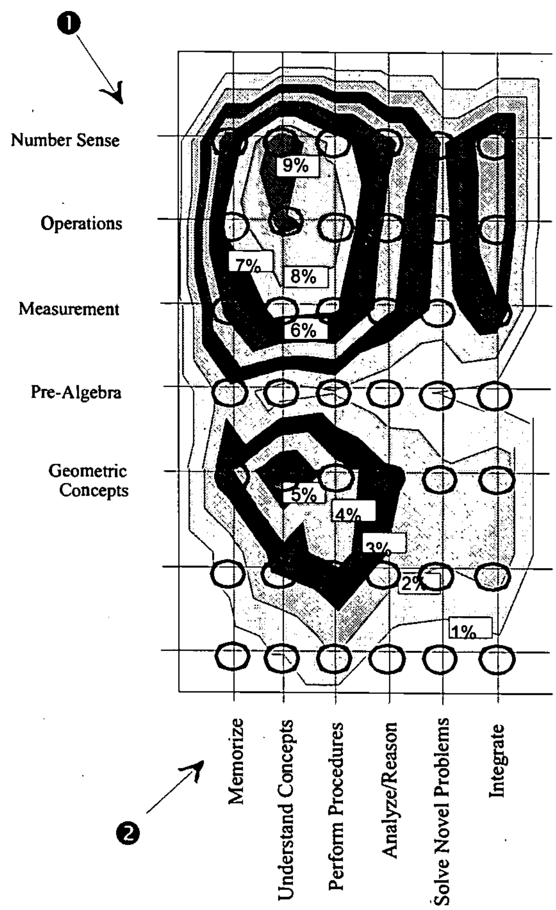


Response Codes: *0 = 0 1 = 1-2 2 = 3-4 3 = 5-6 4 = 7-8 5 = 9-10 6 = 11-12 7 = 13-14 8 = 15-16 9 = 17+*

III.3 Content Maps and Content Graphs for Mathematics and Science

Data on the mathematics and science content taught in class have been compiled and visualized using "content maps," and "content graphs." A content map, as shown in Figure 4, provides a two-dimensional representation of instructional content using a surface area chart, which results in a graphic very similar to topographical maps. The grid overlaying each map identifies a list of topics areas (indicated by horizontal grid lines- ❶ below) and six categories of cognitive expectations for students (indicated by vertical grid lines- ❷ below). The intersection of each topic area and category of cognitive expectation represents a measurement node. A Content Map is an excellent instrument for general overview using a topographic perspective.

Figure 4. A Sample Mathematics Content Map



For more detailed node-by-node comparison, a Content Graph is presented in a matrix format combining multiple bar graphs on each node with scales. Each bar graph compares Implementation and Comparison schools. Each Row Total shows a mean value and a range of one standard deviation for each topic area. Likewise, each Column Total shows a mean and standard deviation for six categories of cognitive expectations for students.

Content maps and content graphics are both generated from the teacher responses across all four USI school districts. The teacher responses are aggregated and reported by grade level (elementary, middle) and Implementation vs. Comparison schools.

The following section provides six Content Maps and Content Graphs for Mathematics and Science as follows:

Chart 15. Middle and Elementary School Mathematics Content Maps
Chart 16. Middle School Mathematics Content Graphs
Chart 17. Elementary School Mathematics Content Graphs
Chart 18. Middle and Elementary School Science Content Maps
Chart 19. Middle School Science Content Graphs
Chart 20. Elementary School Science Content Graphs

Appendix D presents 20 charts for Item Profiles and Content Maps for further analysis.

- Class Description
- Use of Homework
- Instructional Activities
- Use of Hands-on Material in Mathematics
- Student Reflection on Scientific Ideas
- Influences on Instructional Practice
- Teacher Readiness
- Teacher Opinions
- Grade 4 Mathematics Content Maps
- Grade 8 Mathematics Content Maps
- Grade 4 Science Content Maps
- Grade 8 Science Content Maps

Mathematics Content

Chart 15 provides a Cross-District Map for middle and elementary school mathematics by Comparison and Implementation schools. The map allows the reader to see the basic patterns of content topics by teacher expectations for student learning. Chart 16 and 17 provide Content Graphs for mathematics which allow more detailed analysis of each intersecting cell and the percentages for each row and column category.

- Middle level math teachers reported over 20% of time each on *number sense, algebraic concepts* and *geometric concepts*. *Measurement* and *data analysis* were taught an average of 12-15% of time. Expectations focused on *understand concepts* and *perform procedures* (over 20%) and about 15% on *analyze/reasoning* and *memorize*.

- Middle teachers in Implementation schools reported significantly more time on *geometric concepts* and *data analysis*, and less time on *number sense*. The implementation school teachers focused less on expectations for *memorization*, and place more emphasis on *integrating concepts* than the Comparison school teachers.

- In elementary math, the topics in *number sense*, *operations*, and *geometric concepts* were taught an average of 20% of instructional time. The greatest intersection with expectations was with *understand concepts* and *perform procedures*. *Solving novel problems* and *integrating math concepts* were expected primarily with the topics in *number sense* and *operations* and *geometric concepts*.

- The Implementation elementary school teachers reported more time on spent on *operations* than Comparison teachers. The other content categories have similar average time and variation between groups of schools.

Chart 15

Middle and Elementary School Mathematics Content Maps
Four USI District Sample: Comparison vs. Implementation

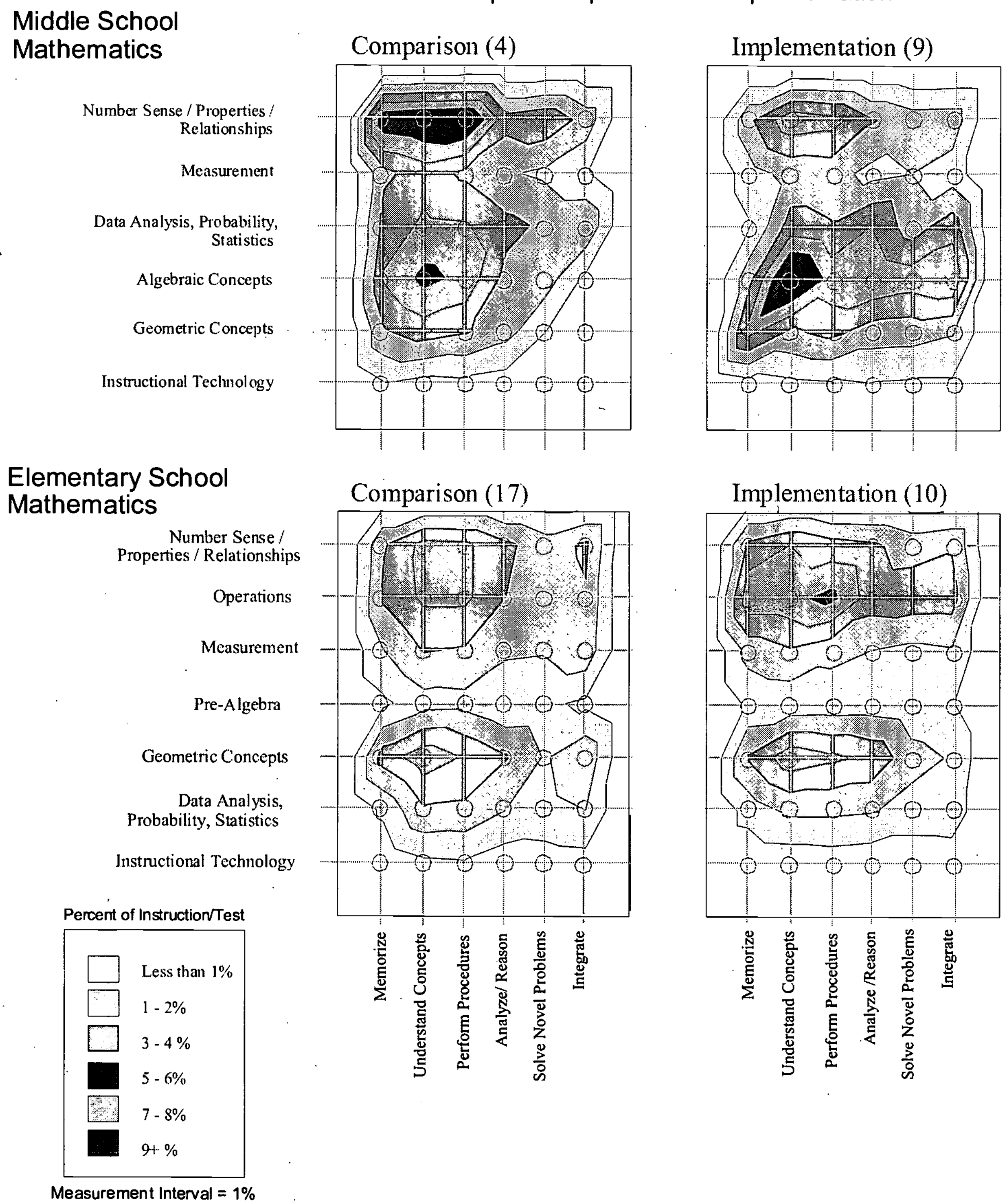


Chart 16

Middle School Mathematics Content Graphs
Four USI District Sample: Comparison (15), Implementation (11)

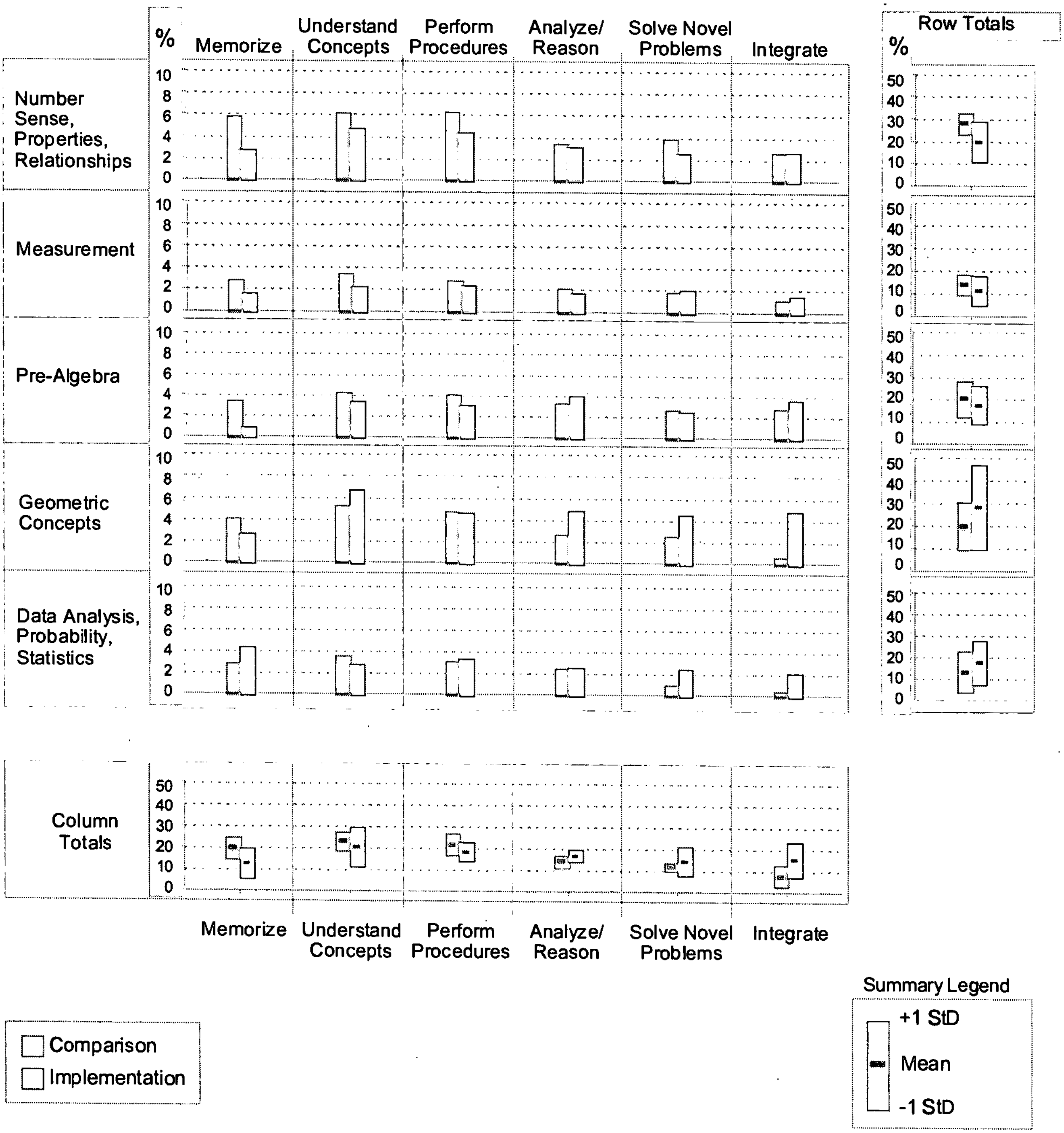
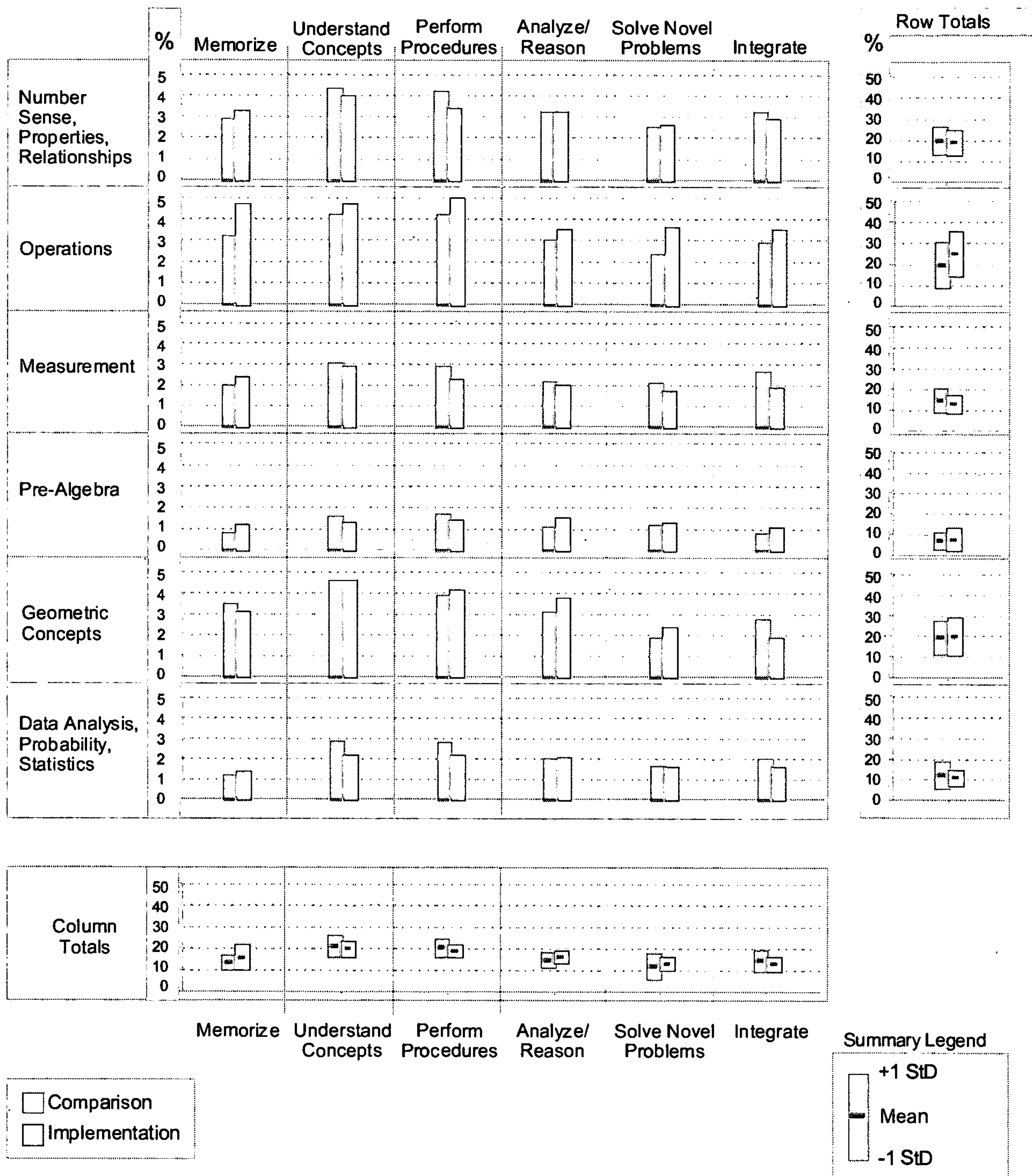


Chart 17

Elementary School Mathematics Content Graphs

Four USI District Sample: Comparison (17) vs. Implementation (11)



Science Content

Chart 18 illustrates a Cross-District Map for middle and elementary school science by Comparison and Implementation schools. The map allows the reader to see the basic patterns of content topics by teacher expectations for student learning. Charts 19 and 20 are Content Graphs for science which show detailed analysis of the intersecting cells in Chart 18, and the percentages for each row and column category.

- The middle school science content taught varied most between Comparison and Implementation schools with *physical science.* Average time spent by Comparison school teachers was about 38% and by Implementation school teachers about 22%. Teachers in Implementation schools, on average, spent more time on *life science* and *chemistry*, with wide variation in time spent on these subjects as well as in *physical science*.

- Classes in Comparison middle schools had more emphasis on expectations of *memorize* and *analyze information* than those in Implementation schools, and wider variation in expectations for *understand concepts* and *conduct experiments*.

- In elementary schools the greatest intersection of content and expectations was *life science* and *understand concepts.* There was not a correspondingly clear intersection in middle schools.

- There was a marked difference between Comparison schools and Implementation schools in elementary science content taught. Implementation school teachers taught *nature of science* an average of 25% of time and *life science* an average of 32% of time vs. Comparison school teachers' average times of 10% and just over 20% of time respectively. On the other hand, Implementation school teachers spent an average of over 20% of time on *physical science* vs. 10% for Comparison school teachers.

Chart 18

Middle and Elementary School Science Content Maps
Four USI District Sample: Comparison vs. Implementation

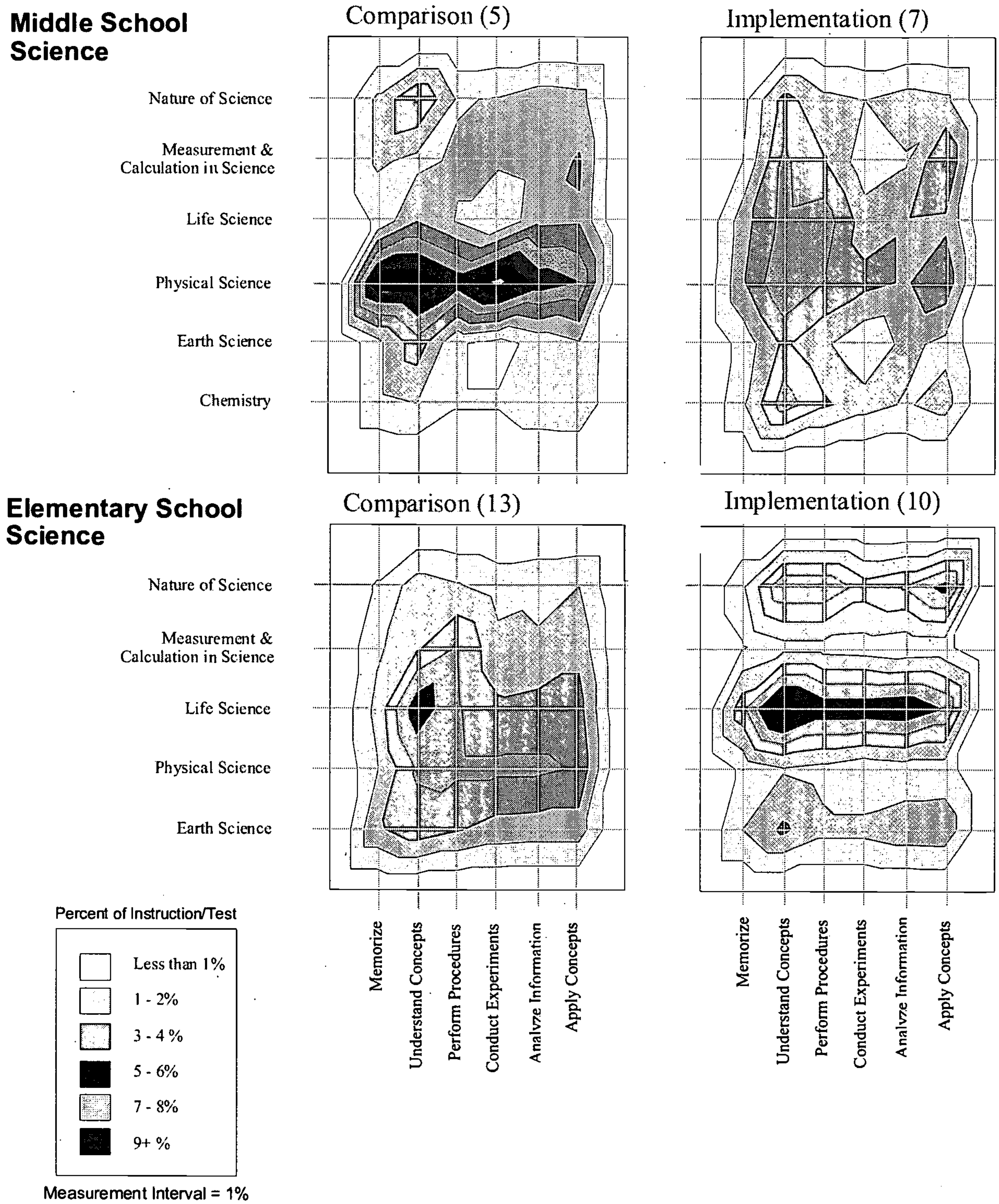


Chart 19

Middle School Science Content Graphs

Four USI District Sample: Comparison (13) vs. Implementation (13)

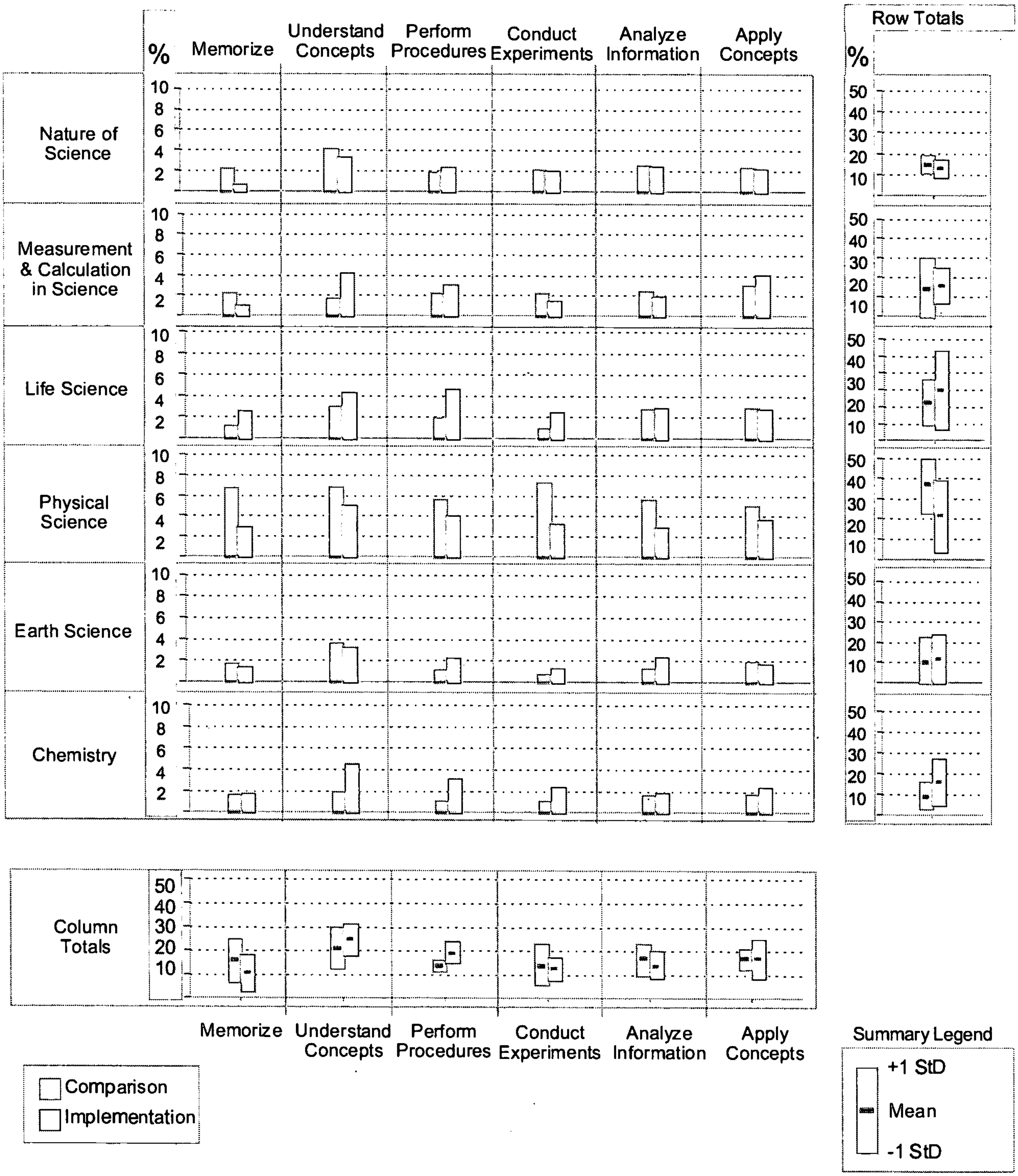
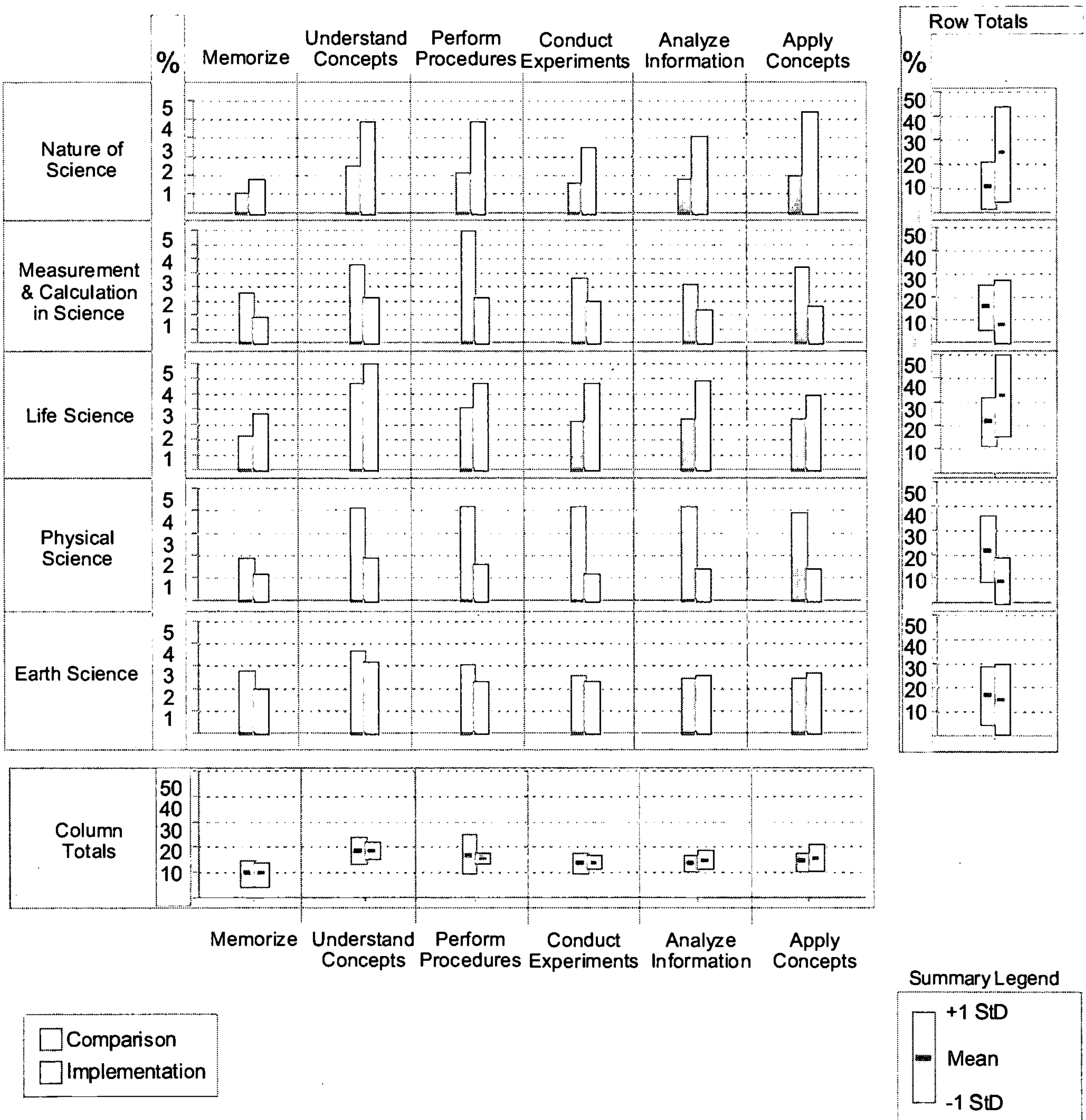


Chart 20

Elementary School Science Content Graphs

Four USI District Sample: Comparison (16) vs. Implementation (10)



CHAPTER IV

CONCLUSIONS

IV.1 Summary of Findings

The initial report on enacted curriculum in USI sites provides two very important kinds of results. First, we demonstrate that the survey approach tried with four USI sites in 1999 can be used to analyze curriculum and teaching in classrooms, and that the analysis can be used across different classes, schools, and districts. The data reported from 1999 demonstrates that surveys with teachers will produce quantitative data that can be aggregated and reported in multiple sites. Second, the report demonstrates that a purposive sample of schools and teachers can be used to compare curriculum and instruction in schools with high implementation of systemic reform through USI with schools that have less implementation.

Improvements can be made in the surveys, data collection, and analysis. Methods of obtaining lists of schools and teachers in advance will improve capacity for verifying sample selection, and improve follow-up efforts with teachers. Additional information was collected about schools in the sample that was not presented in this analysis. Based on initial response to this report, modifications can be made in the analysis plan, data profiles, and content maps, and other strategies for analysis and reporting can be developed. Subsequent interactions of the reports in this project will incorporate feedback and review suggestions.

IV.2 Uses and Misuses of Data

Data on enacted curriculum cannot itself provide a vision of quality education, but it can inform that vision by providing indicator measures to serve as guideposts and measuring sticks to determine where things are and where they need to go in order to move closer to the goals selected.

By providing a broad selection of measures pertaining to content, pedagogy, climate, and background, survey data allows for concerned individuals and groups to construct their own individualized set of indicators for determining how local practice compares to their and others' visions of quality practice.

The survey data also allows schools to determine estimates of time spent engaged in these various types of activities, as well as more descriptive information about how these activities are provided, which together form both an operational definition of desired practice as well as a description of current practice.

While data from these surveys provide a wealth of valuable information about what goes on in classrooms, care must be taken not to over-interpret or even misinterpret the information provided from the surveys.

Curriculum Content Data

The content matrix portion of the Survey of Enacted Curriculum represents the most thorough and detailed approach to measuring classroom subject content that has been developed and tested using a teacher self-report methodology. The method is the first to effectively incorporate both content topics and expectations for learning in teacher reporting on what is taught in classes. This matrix approach is critical to analyzing mathematics and science curriculum and teaching in order to relate classroom content to state and national standards developed in the 1990s. Leading educators have long known that curriculum is not simply a listing of topics but rather includes what students are expected to learn about the topics and what skills and knowledge they gain about them.

There are issues in obtaining valid, reliable data using the content matrix method. Teachers have to report their curriculum in terms of a common set of categories and time scales. It requires concentration and time to complete. As the surveys have been field tested, the design has been changed and simplified. The analysis of data from the USI surveys in 1999, and other teacher surveys recently conducted, indicate that the content matrix methodology does work. We are finding that a comprehensive picture of classroom curriculum across schools and districts can be obtained using this approach.

Specific Classes

Since the survey data represents teacher perceptions of classroom practice targeted to a particular class and group of students, it should be kept in mind when interpreting such data that teacher reports for a particular class may not represent that teacher's practice across all classes and students.

Socially Desired Responses

In considering the limitations of the survey data, it should be noted that the accuracy of the data depends upon the accuracy of teachers' perceptions and estimates. Accuracy can also be affected by perceptions of socially desirable responses, particularly if sanctions or rewards are commensurate with certain practices.

Misuse of Data

The primary misuse of data on the enacted curriculum or teaching practices is the use of such data for accountability purposes. To be a useful tool for school improvement, this type of indicator data should stand aside from the accountability mechanisms developed by schools, districts, or states. In large part, this is due to the possibility that the diagnostic potential of such data would be compromised if used for accountability purposes because of the increased likelihood of teachers providing socially desirable responses to the survey questions. Further, the indicators that such measures provide should not be rigidly imposed as a definition of quality practice. Survey data on curriculum must be combined with local contextual information in order to provide a sufficient basis for making decisions about changing, rewarding, or sanctioning individual practice. For these reasons this indicator data is best conceived of as a diagnostic and not an accountability tool.

REFERENCES

CCSSO/SCASS Science Project. (1993, revised 1997). *Consensus Guidelines for Science Assessment*. Washington DC: CCSSO.

CCSSO/SCASS Science Project. (1995). *Collaborative Development of Science Assessments SCASS Experience*. Washington, DC: CCSSO.

CCSSO/SCASS Science MEC Team. (1998). *How is Science Taught in Kentucky Schools? An initial Report to Schools, Districts, and State Participating in the 1997 Survey of Enacted Curriculum in Kentucky*. Washington, DC: CCSSO.

CCSSO/WCER/State Collaborative on SEC. (2000). *Using Data on Enacted Curriculum in Mathematics and Science: Sample Results from a Study of Classroom Practices and Content*. Washington, DC: CCSSO.

Martin, M,. Blank, R. & Smithson, J. (1996). *Guide for Educators on Use of Surveys and Data on Enacted Curriculum*. Washington, DC: CCSSO.

Porter, A., Kirst, M., Oshshoff, E., Smithson, J. & Schneider, S. (1994). *Reform Up Close: A Classroom Analysis*. Madison, WI: Wisconsin Center for Educational Research.

Smithson, J., Porter, A. & Blank, R. (1995). *Describing the Enacted Curriculum: Development and Dissemination of Opportunity to Learn Indicators in Science Education*. Washington, DC: CCSSO.

Ware, M., Richardson, L., & Kim, J. (1999). *What Matters in Urban School Reform*. Study Monograph No. 1- "How Reform Works: An Evaluative Study of NSF's Urban Systemic Initiatives." Norwood, MA: Systemic Research, Inc.

Weiss, I. (1994). *A Profile of Science and Mathematics Education in the United States: 1993*. Chapel Hill, NC: Horizon Research, Inc.

APPENDIX A:

USI EVALUATIVE STUDY ABSTRACT AND YEAR 1 PROGRESS SUMMARY

ABSTRACT

The purpose of the study is to determine the impact of the National Science Foundation's Urban Systemic Initiative (USI) program on student achievement and the learning infrastructure in urban school districts, and to develop an inferential causal model that relates the SI drivers and other key elements to the outcomes observed. Our study team will analyze the effectiveness of the USI program from five different perspectives: across all 21 USI sites; by USI cohort; longitudinally within sites; by comparison with 7 non-USI cities; and within a national context that includes other major reform efforts.

The study team will develop a Key Indicator Data System (KIDS) to collect/ compile annual core data from the baseline year using both quantitative (K-1) and qualitative templates (K-2). Our study team will conduct an annual KIDS workshop designed for USI core data managers and evaluators to enhance data integrity and share expertise. Based on collaborative research agreements, we will receive SAT, AP, and ACT test results (as part of K-1 data) directly from the Educational Testing Service, the College Board, and ACT, Inc., respectively, for the next three years.

Each year, the team will conduct four site visits including interviews with USI leaders, focus groups, and school visits, to further explore detailed implementation issues. In addition, a modified version of the Council of Chief State School Officers' Survey of the Enacted Curriculum will be administered to 80 selected math and science teachers within these four sites. Finally, we will gather and review information from national databases such as the Third International Mathematics and Science Survey (TIMSS), National Assessment of Educational Progress (NAEP), Goals 2000, Equity 2000, as well as the USI sites' annual reports and relevant documents.

The team has identified key research questions in eight areas mapped to the NSF drivers: (1) student outcomes, (2) curriculum and instruction, (3) assessment instruments, (4) professional development, (5) policy, (6) leadership, governance, and management, (7) convergence of resources, and (8) broad-based support for reform. We will use a variety of statistical analysis methods to validate the hypothesis that a well-implemented USI program has a positive impact on student outcomes. Further systemic analysis will explore the determinants of successful implementation of urban reform in mathematics, science, and technology education.

During the three-year study period of October 1998 to September 2001, we will produce a USI Annual Fact Book and USI Evaluative Study Report, both in print and in CD-ROM format, and a master data base to be available on the world-wide web. Beginning in Year 2 we will publish a series of newsletters and monographs detailing our research findings.

YEAR 1 PROGRESS SUMMARY

As the study has wrapped up its Year 1 effort, a few brief notes on our study progress are:

- Study Monograph No.1 *What Matters in Urban School Reform*: The first monograph has been published as an initial literature review relevant to our evaluative study. The review of selected literature examines the National Science Foundation's standards-based systemic reform theory in the context of research reported by science, mathematics, and urban education policy experts. The review is specifically concerned with viewing evidence of relationships among identified change variables that are associated with fostering high achievement in mathematics and science of urban and underrepresented minority students. The authors indicate that four categories of variables are useful in studying student achievement: demographic information, test data, teacher development, and mathematics and science curriculum. The review revealed little researcher agreement regarding variable relationships that might predict a chain of influence from policy to classroom practice and finally to student performance.

- Site visits: The four site visits conducted in Year 1 of the study served to validate the study's approach to analyzing change in policy and practices across all sites. The evaluative study relies on written reports, data, and documents submitted by the sites to NSF or requested through the study. The site visits provided valuable depth of understanding supplementing the material described in written reports. We are building on the qualitative understanding gained from interviews, observations, and on-site analysis to develop a fair, reliable methodology for analyzing and coding the written material available from all the USI sites. In no case has any site visit led to findings that are opposite to or significantly different from what we learned through reading annual reports.

- KIDS: The study team developed and implemented a Key Indicator Data System (KIDS) to collect and compile annual progress data including both quantitative (K-1) and qualitative data (K-2) from all 21 USI sites. KIDS focuses on student achievement data including mathematics and science enrollment and completion, mathematics and science assessment test results, SAT-I, AP, and ACT test results, as well as disaggregated demographics. KIDS data will provide a basis for causal inferential models focusing on the National Science Foundation's six systemic initiative drivers. KIDS data will also be cross-examined with this enacted curriculum survey results.

- USI Fact Book I & II: Two USI Fact Books are in progress compiling both K-1 and K-2 data for further analysis and visualization of impact data. Fact Book-I presents each USI site's progress based on both quantitative and qualitative key indicators, and Fact Book-II presents overall program impact.

- Cross-Site Qualitative Summary and Rubrics: Based on KIDS, our study team compiled the data into USI Cross-Site Qualitative Summary Tables and produced relevant Rubric scales which will be utilized to develop inferential models.

- AP, SAT, and ACT: We have received five year AP, SAT, and ACT test result data from the College Board, Educational Testing Service, and ACT, Inc., respectively. We recompiled the 21 site reports' data and transferred it to the K-1 data templates. The compiled data is also being reformatted for SPSS analysis. Initial review of sites' AP and SAT data show upward trends in test takers; this will require more detailed analysis.

- Enacted Curriculum Survey: The purpose of the Enacted Curriculum Survey is to analyze current mathematics and science instructional practices at the classroom level based on teacher responses to the questionnaires regarding: classroom practices, course-work background, professional development, curriculum influences, resources and equipment, teacher attitudes, and school conditions. Survey responses were received by mail. The survey results will be reported in relation to the analysis of findings from the four site visits conducted in 1999. The results will provide an analysis of the extent to which teaching practices and curriculum in schools with high implementation of the USI reforms differ from practices and curriculum in low implementation/ average schools. We will also analyze the extent to which the high reform schools exhibit teaching toward challenging content standards in mathematics and science.

- SI Urban Study Web Site: Systemic Research, Inc. hosts a web site for the SI Urban Study Forum (www.siurbanstudy.org) to open a communication channel among researchers and evaluators currently working on the National Science Foundation's Systemic Initiatives Research/ Evaluation/ Impact Studies. The Forum presents each study's abstract, research design, methods, accomplishments, directory, and disseminated news and publications.

Evaluative Study Team	Advisory Panel Members
• Dr. Jason J. Kim (PI) / Systemic Research, Inc. • Dr. Rolf Blank (Co-PI) / Council of Chief State School Officers • Dr. Pendred Noyce (Co-PI) / Noyce Foundation • Dr. Lloyd Richardson (Co-PI) / University of Missouri- St. Louis • Dr. Melva Ware / University of Missouri- St. Louis • Dr. Hunhee Ken Lee / Systemic Research, Inc. • Ms. Jennifer Manise / Council of Chief State School Officers • Mrs. Linda Crasco / Systemic Research, Inc. • Mr. Dong-Hoon Don Lee /Systemic Research, Inc.	• Dr. Lloyd Cooke / LMC Association • Dr. David Grissmer / RAND Corp. • Ms. Sharon Lewis / Council of Great City Schools • Dr. William Schmidt / Michigan State University • Ms. Clara Tolbert / Philadelphia USI • Dr. Yuwadee Wongbundhit / Miami-Dade USI **<u>NSF Program Directors:</u>** • Dr. Bernice Anderson / Division of Research, Evaluation and Communication, Directorate for Education and Human Resources • Ms. Celestine Pea / Division of Educational System Reform, Directorate for Education and Human Resources

APPENDIX B:
BRIEF DESCRIPTION OF FOUR USI SCHOOL DISTRICTS

Baltimore

Baltimore City Public Schools teamed up with Morgan State University to become one of the first cities to participate in the National Science foundation's Urban Systemic Initiative. Baltimore Urban Systemic Initiative (BUSI) is creating a culture of math, science and technology success for all of its 104,000 students in 179 schools by changing the way these subjects are taught. The emphasis is on quality curricula, professional development, policy changes and instructional support.

Highlights of BUSI include the aligning of curricula to national standards, the utilization of Instructional Support Teachers, and increased graduation requirements of three years each of mathematics and laboratory science. Thanks to BUSI, all schools have been provided with teaching tools from hands-on science materials at the elementary level , to microscopes at all middle schools, to renovations of the laboratories at the nine high schools. The results have been higher Maryland School Performance Assessment Program (MSPAP) and Grade 8 Maryland Functional Math Test (MFMT) scores, year round elementary school science instruction (from the pre USI practice of only one third year) and higher enrollment in mathematics and science classes.

The system-wide changes BUSI initiated will continue to prepare Baltimore's children for success long after the program period is over.

Dallas

The Dallas Systemic Initiative (DUSI) goal is that all Dallas Independent School District students will upon graduation be prepared to succeed in the scientific and technological workplace. The goal will be accomplished in three ways: (1) improve the scientific and mathematical literacy of all students, (2) provide mathematics and science fundamentals and (3) prepare an increasing number of students for careers in science, mathematics, engineering and technology.

DUSI emphasizes six elements for success: (1) program leadership, (2) total quality management (3) integrated curriculum, (4) interactive learning, (5) teacher enhancement, and (6) aligned assessment and accountability. The program targets all 150,000 students in 215 schools.

DUSI has allowed Dallas to implement the K-12 curriculum based on standards-based, nationally recognized programs. The curriculum is supported by ongoing professional development and educational technology in the classroom.

DUSI has also been instrumental in forming new policies and directing resources towards mathematics and science education. Important partnerships have been forged with leading companies such as Texas Instruments, IBM and Mobil Oil Corporation and Higher Education Institutions including the University of Texas and Texas A & M University.

Detroit

The goals of the Detroit Urban Systemic Initiative is to (1) improve the mathematical and scientific literacy of all 177,000 students in 260 schools, (2) provide the mathematics and science fundamentals to permit all students to participate fully in a technological society, (3) enable a significantly greater number of students to pursue careers in mathematics, science and technology and (4) facilitate a district-wide climate of change that assures adoption and maintenance of strategies and programs assessable to all students.

DUSI embraces the Constructivist approach to teaching and learning. Constructivist learning is not passive- students learn by constructing meaning from hands-on activities and by building on their own past experiences and knowledge. Teachers must adapt their instructional strategies to individual student learning styles. DUSI supports extensive professional development to assist teachers with the knowledge, techniques and confidence to implement the Constructivist methods.

DUSI has also been instrumental in the development of curriculum standards, student support programs such as Saturday Academies and formation of business, higher education and community partnerships.

Phoenix

The vision of the Phoenix Urban Systemic Initiative (PUSI) is to create a culture for learning and change that enables all students to function successfully in the mathematical, scientific and technological oriented society of today. This vision is articulated by the PUSI's goals: (1) to improve the scientific, mathematical and technological literacy of all students (2) to provide the mathematics and science fundamentals which will permit all students to participate fully in a technological society, (3) to enable a significantly greater number of these students to pursue careers in mathematics, science, engineering and technology, and (4) to produce systemic reform in science, mathematics, and technology education through fundamental, comprehensive, and coordinated change which will result in improved outcomes for all students.

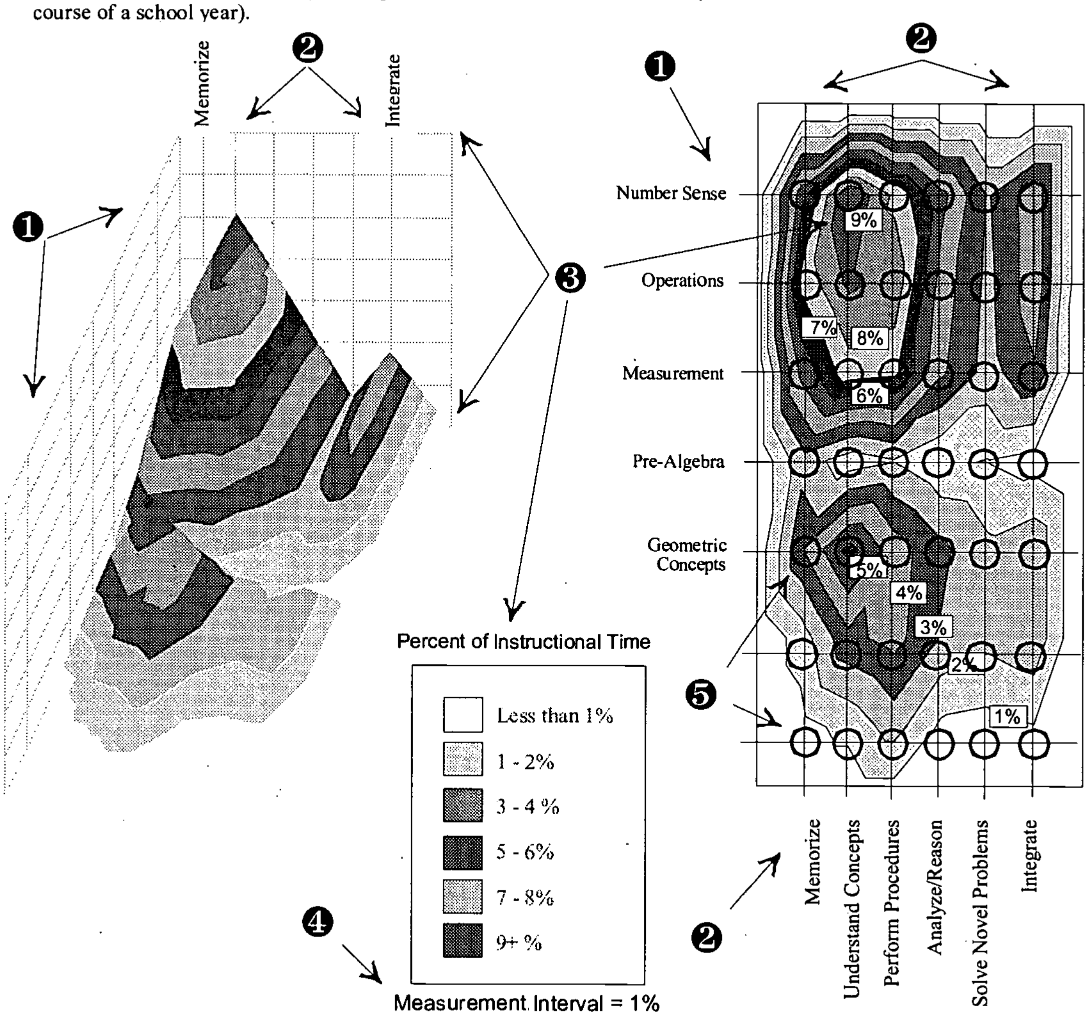
PUSI is comprised of 92 public schools in the Phoenix inner city, Arizona State University, the Arizona Science Center, Maricopa County Community College District and state and municipal agencies and community based organizations managed by the Unitary Management Team. The primary focus is on curriculum reform and professional development of all mathematics and science teachers. The program is organized into six components (1) curriculum/instruction, (2) staff development, (3) instructional support, (4) cross-jurisdictional education linkages, (5) parental involvement and (6) business/industry and community linkages

APPENDIX C:
INTERPRETING CONTENT MAPS

Content maps provide a three-dimensional representation of instructional content using a surface area chart which results in a graphic very similar to topographical maps. The grid overlaying each map identifies a list of topics areas (indicated by horizontal grid lines; see ❶ below) and six categories of cognitive expectations for students (indicated by vertical lines; see ❷ below). The intersection of each topic area and category of cognitive expectation represents a measurement node (see ❺ below). Each measurement node indicates a measure of instructional time for a given topic area and category of cognitive expectation based upon teacher reports. The resulting map is based upon the values at each of these measurement nodes. It should be noted that the spaces between each measurement node, that is the surface of the map, are abstractions and are not based upon real data, the image of the map is simply a computer generated graphic based upon the values for each intersecting measurement node. The map display is utilized to portray the third dimension (percent of instructional time; see ❸ below) onto this grid utilizing shading and contour lines to indicate the percent of instructional time spent (on average across teachers) for each topic by cognitive expectation intersection.

The increase (or decrease) in instructional time represented by each shaded band is referred to as the measurement interval (see ❹ below). To determine the amount of instructional time for a given measurement node, count the number of contour lines between the nearest border and the node, and multiply by the measurement interval.

The graphic at left below displays the three dimensional counterpart of the image represented by the content map displayed on the right. Both graphs indicate that Understanding Concepts related to Number Sense and Operations occupies the majority of time spent on grade four mathematics instruction (9% or more of instructional time over the course of a school year).

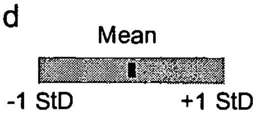


APPENDIX D:
ADDITIONAL ITEM PROFILES AND CONTENT MAPS

Chart D.1

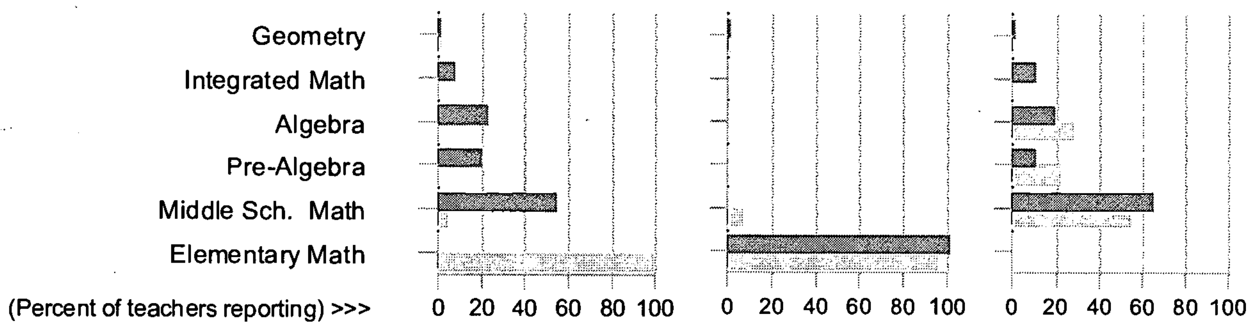
Class Description - Mathematics

Legend

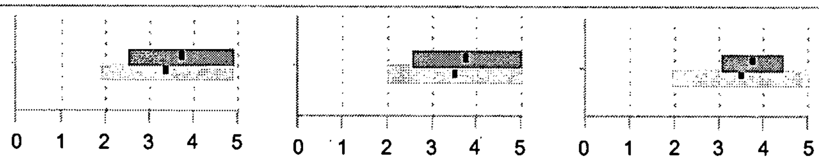


Four District USI Sample		
By Grade Level	**Elementary**	**Middle Sch.**
Middle (32) Elementary (39)	Implementation (11) Comparison (17)	Implementation (11) Comparison (15)

Which term best describes the target class, or course, you are teaching?



How many students are in this class?

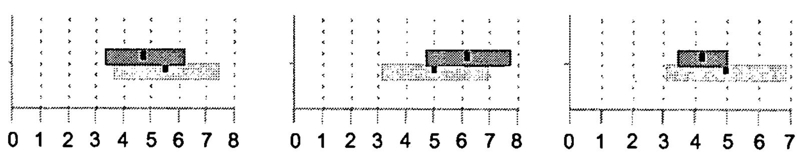


Response Codes:

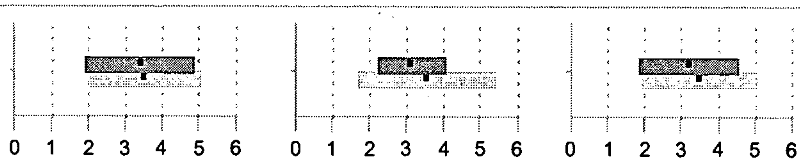
0 = 10 or less	*1= 11 to 15*	*2= 16 to 20*
3 = 21 to 25	*4 = 26 to 30*	*5 = 31 or more*

During a typical week, approximately how many hours will this class spend in mathematics instruction?

(Number of instructional hours) >>>



What is the average length of each class period for this class?



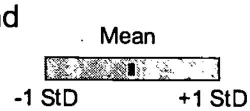
Response Codes:

0 = N/A	*1= 30 to 40 min.*	*2 = 41 to 50 min.*
3 = 51 to 60 min.	*4 = 61 to 90 min.*	*5 = 91 to 120 min.*
6 = Varies due to block scheduling or integrated instruction.		

Chart D.2

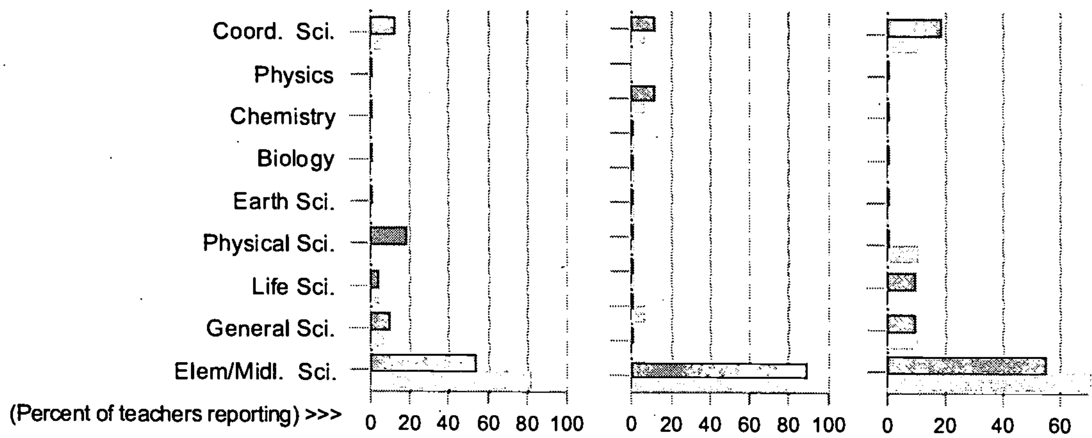
Class Description - Science

Legend

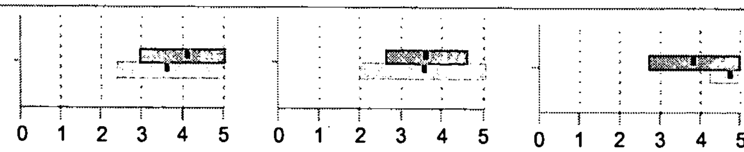


Four District USI Sample		
By Grade Level	**Elementary**	**Middle Sch.**
Middle (35) Elementary (38)	Implementation (10) Comparison (18)	Implementation (12) Comparison (11)

Which term best describes the target class, or course, you are teaching?



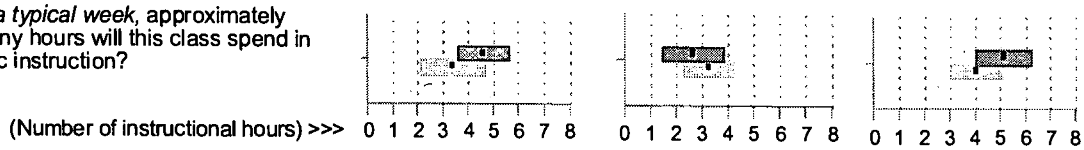
How many students are in this class?



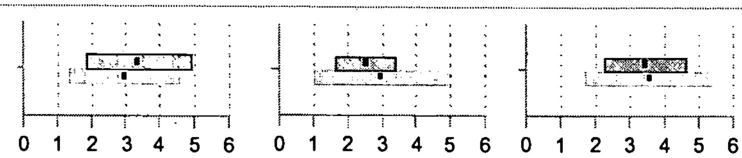
Response Codes:

0 = 10 or less *1= 11 to 15* *2= 16 to 20*
3 = 21 to 25 *4 = 26 to 30* *5 = 31 or more*

During a typical week, approximately how many hours will this class spend in scientific instruction?



What is the average length of each class period for this class?



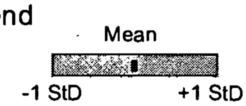
Response Codes:

0 = N/A *1= 30 to 40 min.* *2 = 41 to 50 min.*
3 = 51 to 60 min. *4 = 61 to 90 min.* *5 = 91 to 120 min.*
6 = Varies due to block scheduling or integrated instruction.

Chart D.3

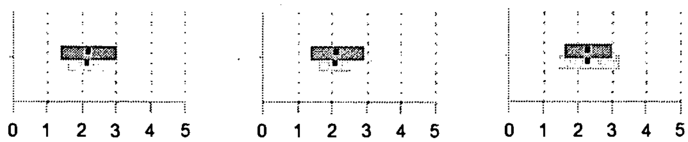
Use of Homework in Mathematics

Legend



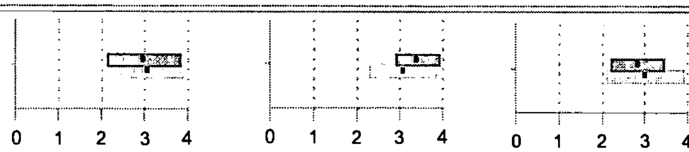
Four District USI Sample		
By Grade Level	**Elementary**	**Middle Sch.**
Middle (32) Elementary (39)	Implementation (11) Comparison (17)	Implementation (11) Comparison (15)

How many minutes does the typical student spend on a normal homework assignment?



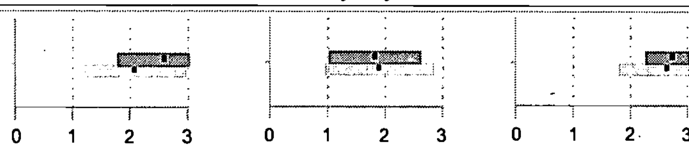
Response Codes: *0 = No homework assigned 1= < 15 minutes 2 = 15- 30 minutes 3 = 31-60 minutes 4 = 61-90 minutes 5 = > 90 minutes*

How often do you usually assign mathematics homework?



Response Codes: *0 = Never 1= < Once per week 2 = 1-2 times/week 3 = 3-4 times/week 4 = Every day*

Does homework count towards student grades?



Response Codes: *0 = Never 1= Usually does not 2 = Usually does 3 = Always does*

What percentage of the time that students spend on mathematics homework do they:

- Do arithmetic computation or procedures.
- Show steps required in doing a procedure or solving an equation.
- Explain their reasoning or thinking in solving a problem.
- Work on a demonstration, presentation, or proof of their mathematics work.
- Collect data or information as part of mathematics homework.
- Write a report for a mathematics project.

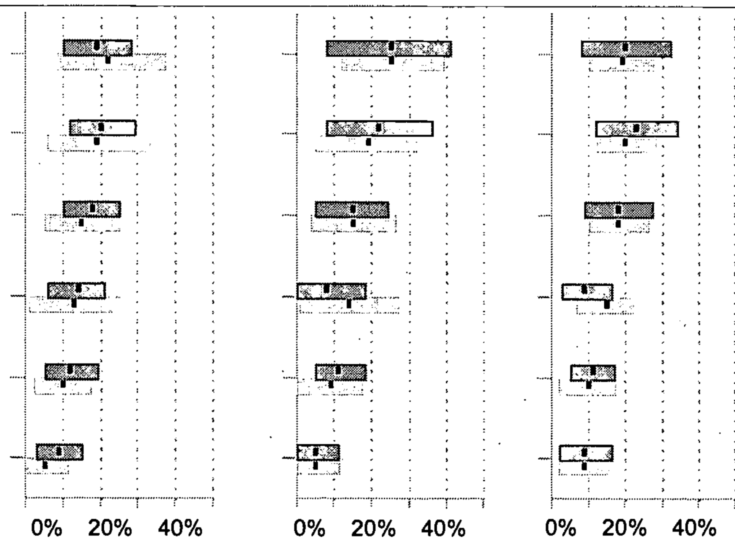


Chart D.4

Use of Homework in Science

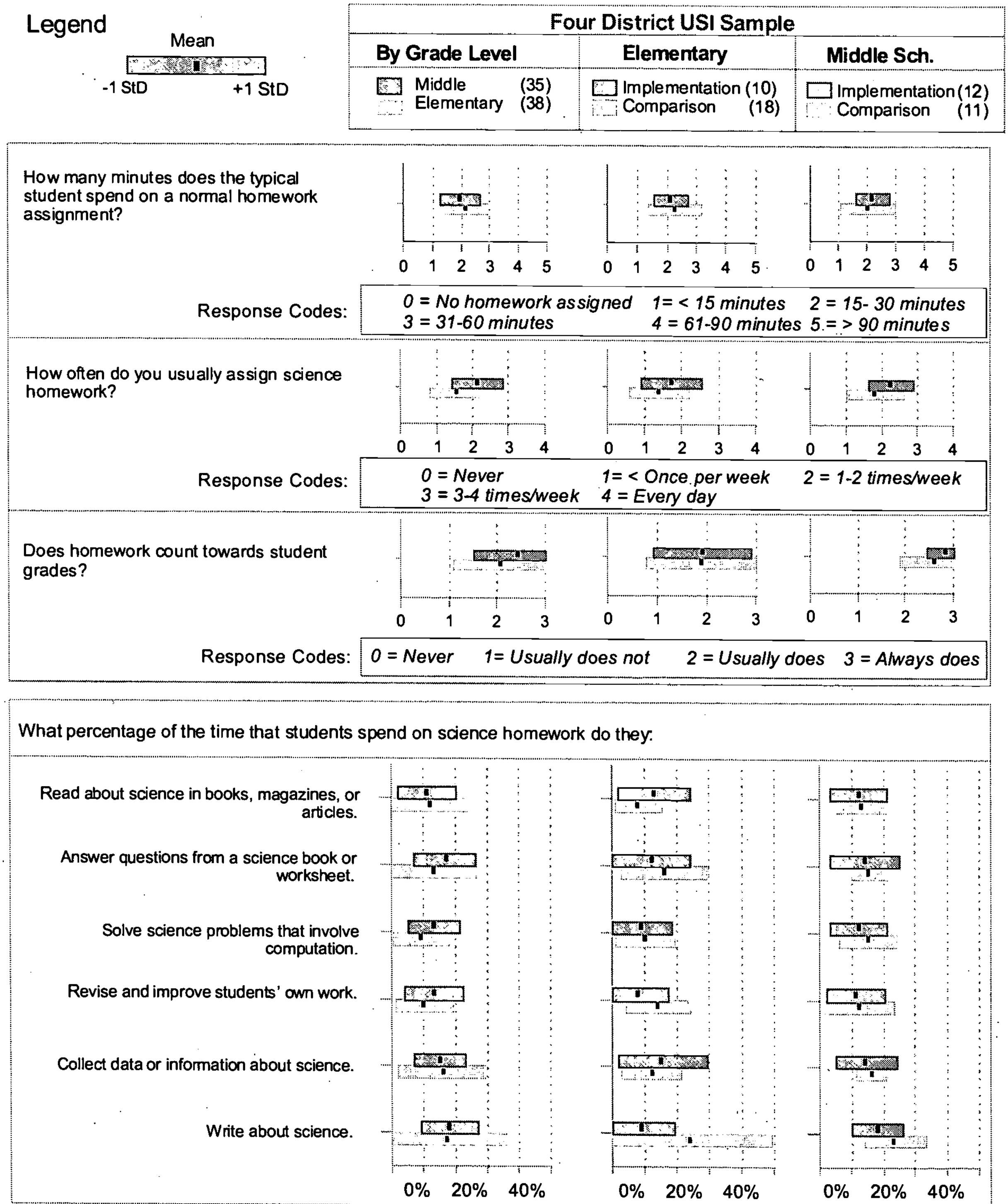


Chart D.5

Instructional Activities - Mathematics

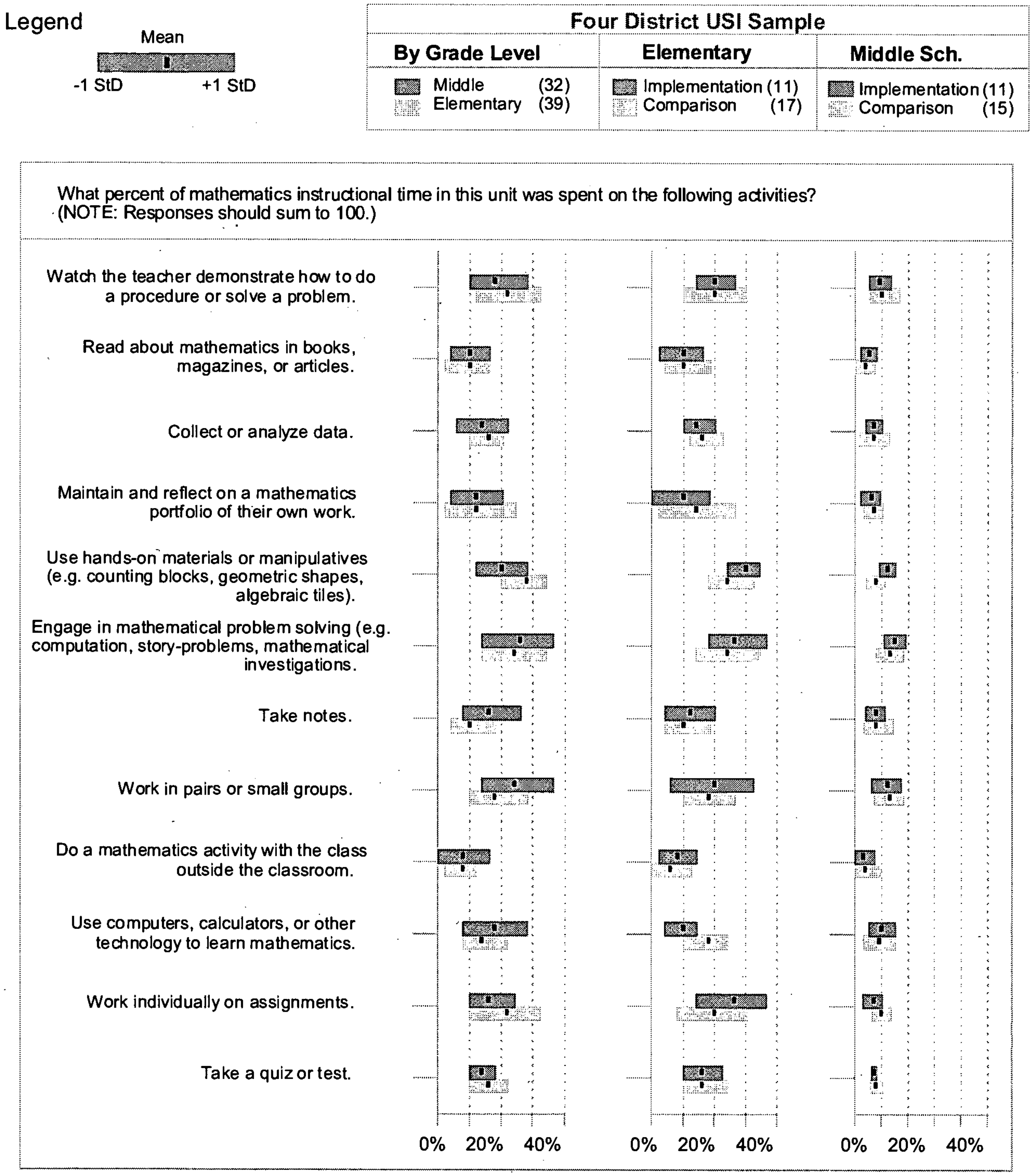


Chart D.6

Instructional Activities - Science

Legend: Mean; -1 StD; +1 StD

Four District USI Sample		
By Grade Level	Elementary	Middle Sch.
Middle (35)	Implementation (10)	Implementation (12)
Elementary (38)	Comparison (18)	Comparison (11)

What percent of science instructional time in this unit was spent on the following activities? (NOTE: Responses should sum to 100.)

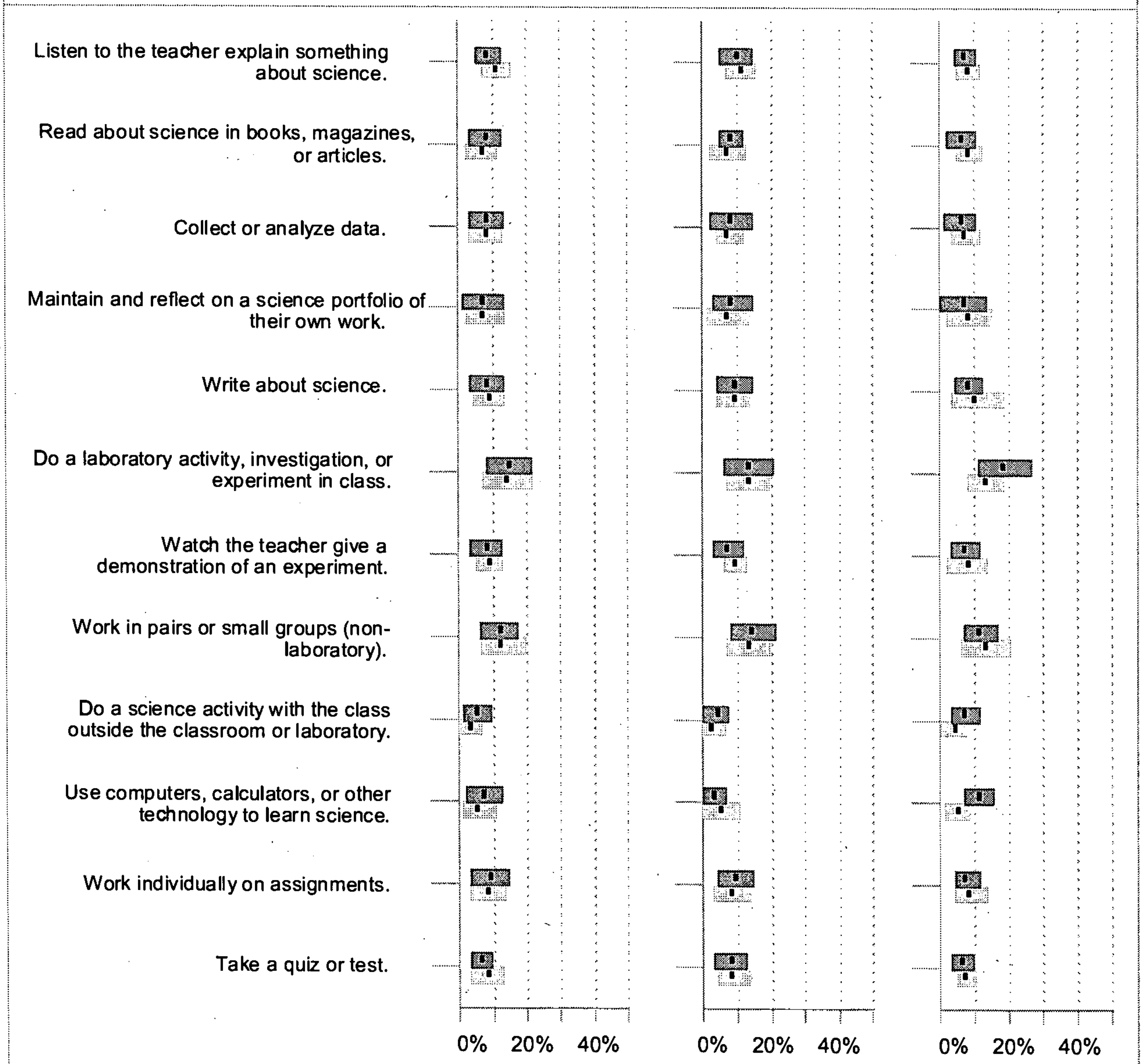


Chart D.7

Use of Hands-on Materials in Mathematics

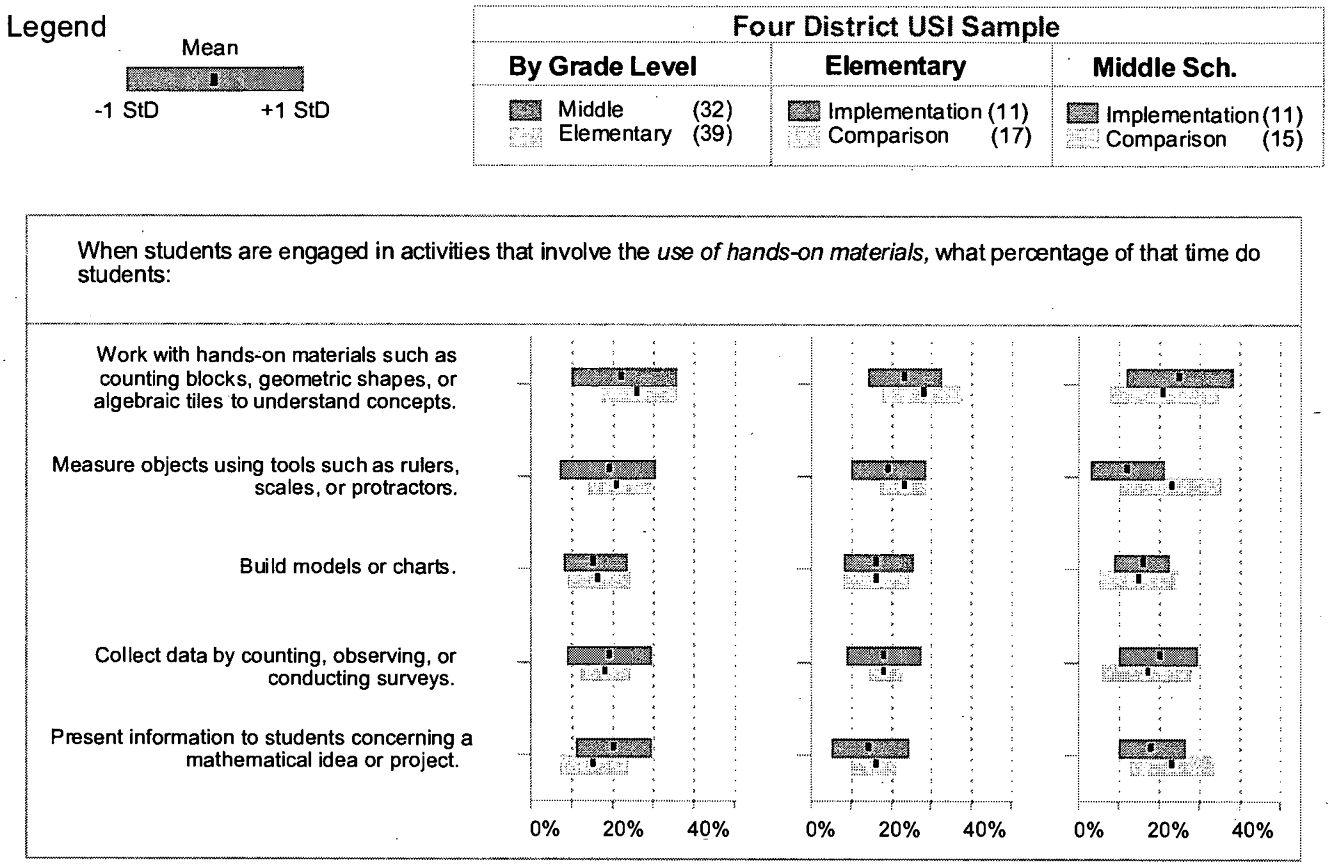


Chart D.8

Student Reflection on Scientific Ideas

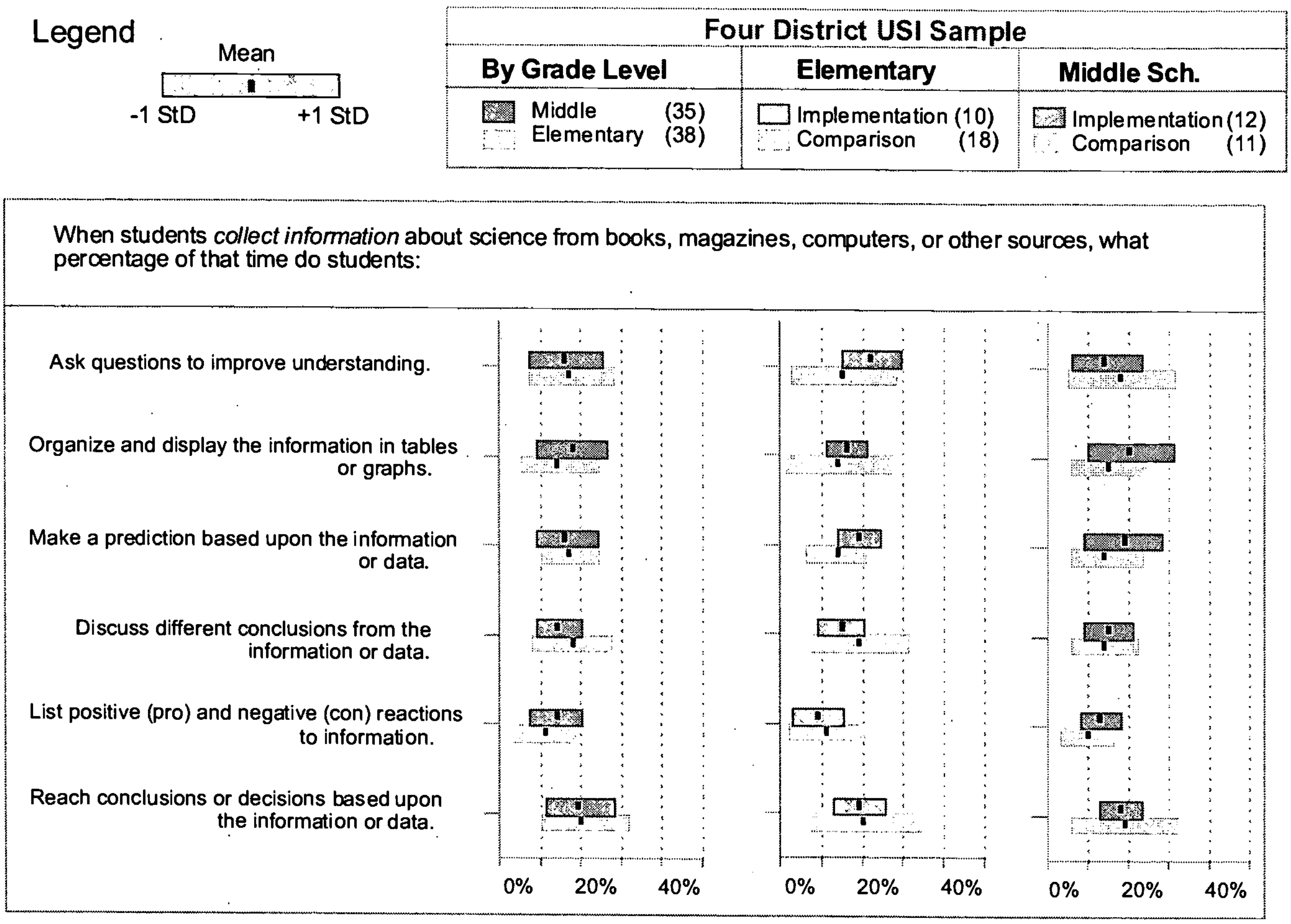


Chart D.9

Influences on Instructional Practice in Mathematics

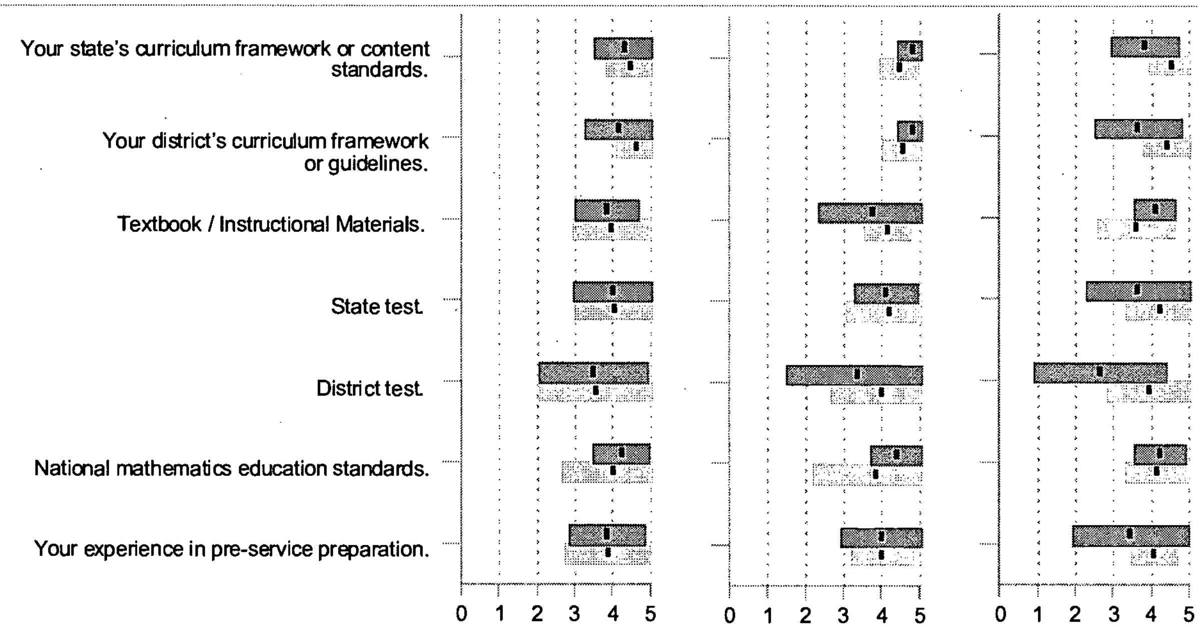
Legend

Mean

-1 StD +1 StD

Four District USI Sample		
By Grade Level	**Elementary**	**Middle Sch.**
Middle (32) Elementary (39)	Implementation (11) Comparison (17)	Implementation (11) Comparison (15)

Indicate the degree to which each of the following influences what you teach in this mathematics class:



Response Codes:

0 = Not Applicable
1 = Strong Negative Influence
2 = Somewhat Negative Influence
3 = Little or No Influence
4 = Somewhat Positive Influence
5 = Strong Positive Influence

Chart D.10

Influences on Instructional Practice in Science

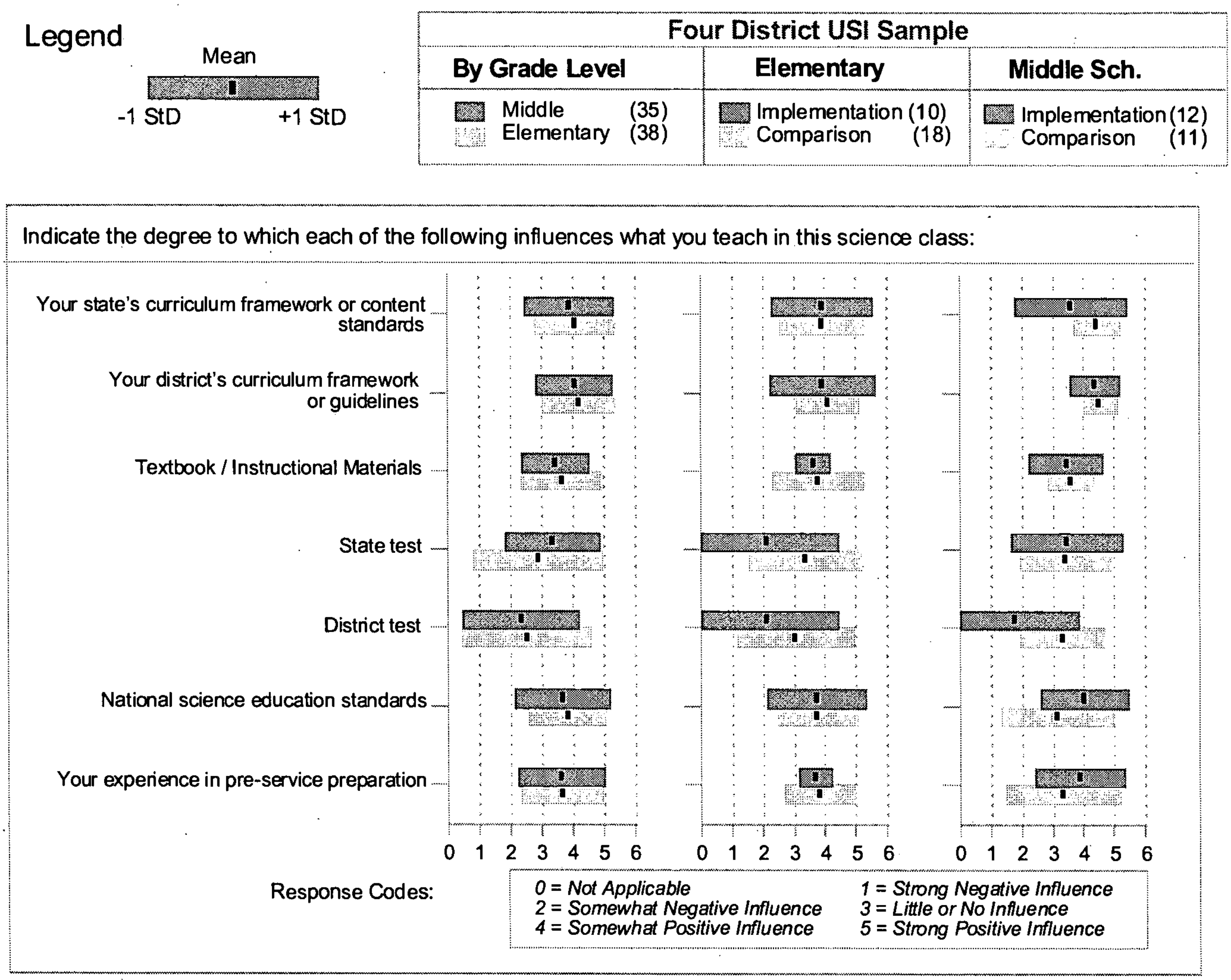


Chart D.11

Teacher Readiness (Part 1) - Mathematics

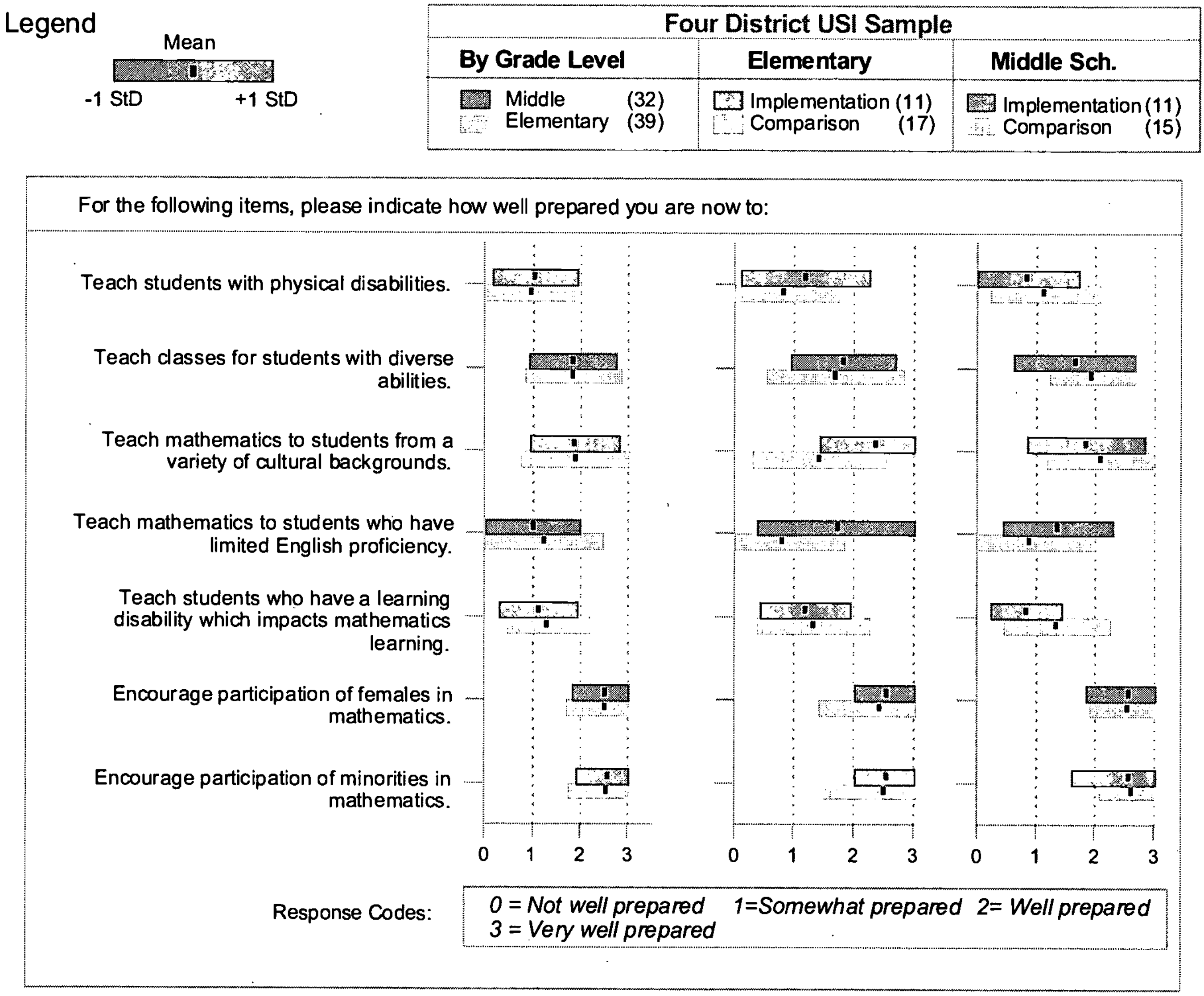


Chart D.12

Teacher Readiness (Part 2) - Mathematics

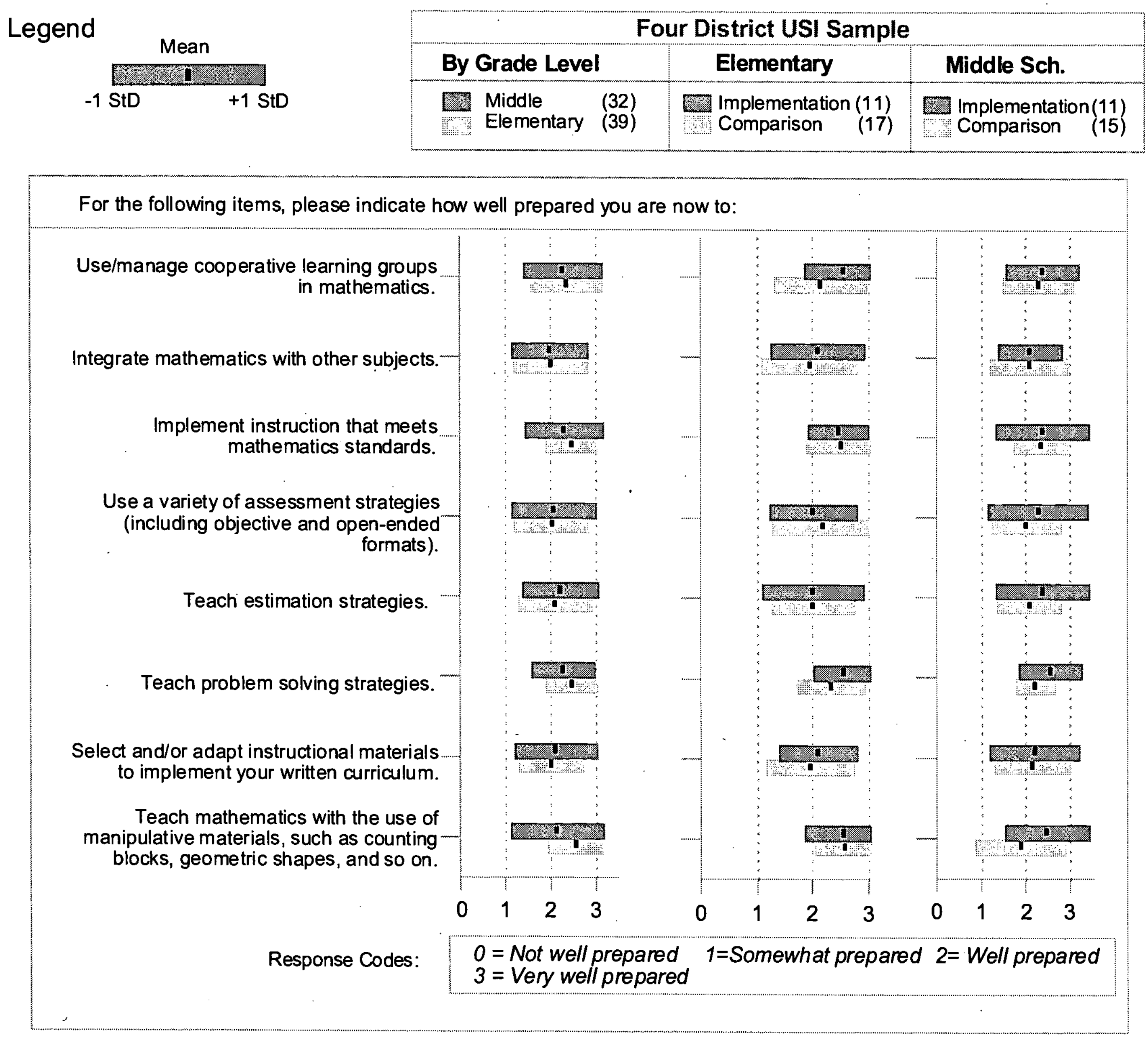


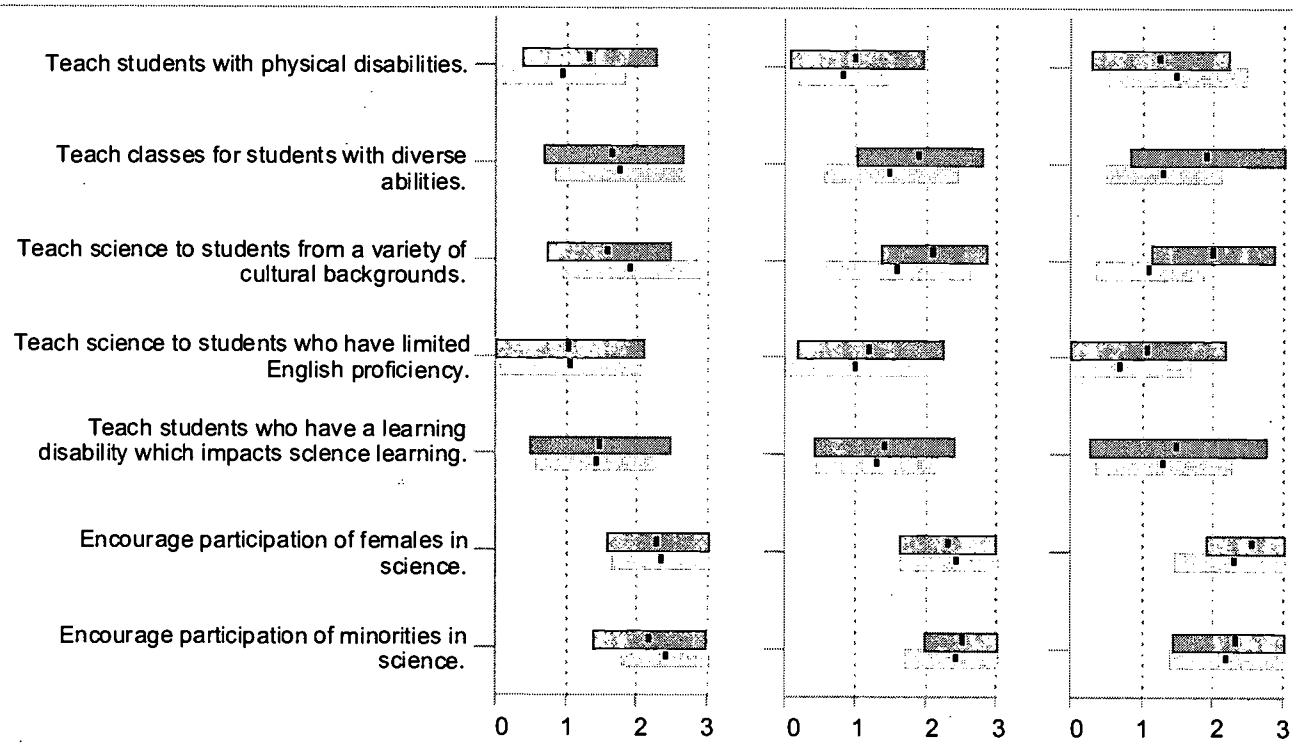
Chart D.13

Teacher Readiness (Part 1) - Science

Legend: Mean; -1 StD; +1 StD

Four District USI Sample		
By Grade Level	Elementary	Middle Sch.
Middle (35) Elementary (38)	Implementation (10) Comparison (18)	Implementation (12) Comparison (11)

For the following items, please indicate how well prepared you are now to:



Response Codes: *0 = Not well prepared 1=Somewhat prepared 2= Well prepared 3 = Very well prepared*

Chart D.14

Teacher Readiness (Part 2) - Science

Legend: Mean; -1 StD; +1 StD

Four District USI Sample		
By Grade Level	**Elementary**	**Middle Sch.**
Middle (35) Elementary (38)	Implementation (10) Comparison (18)	Implementation (12) Comparison (11)

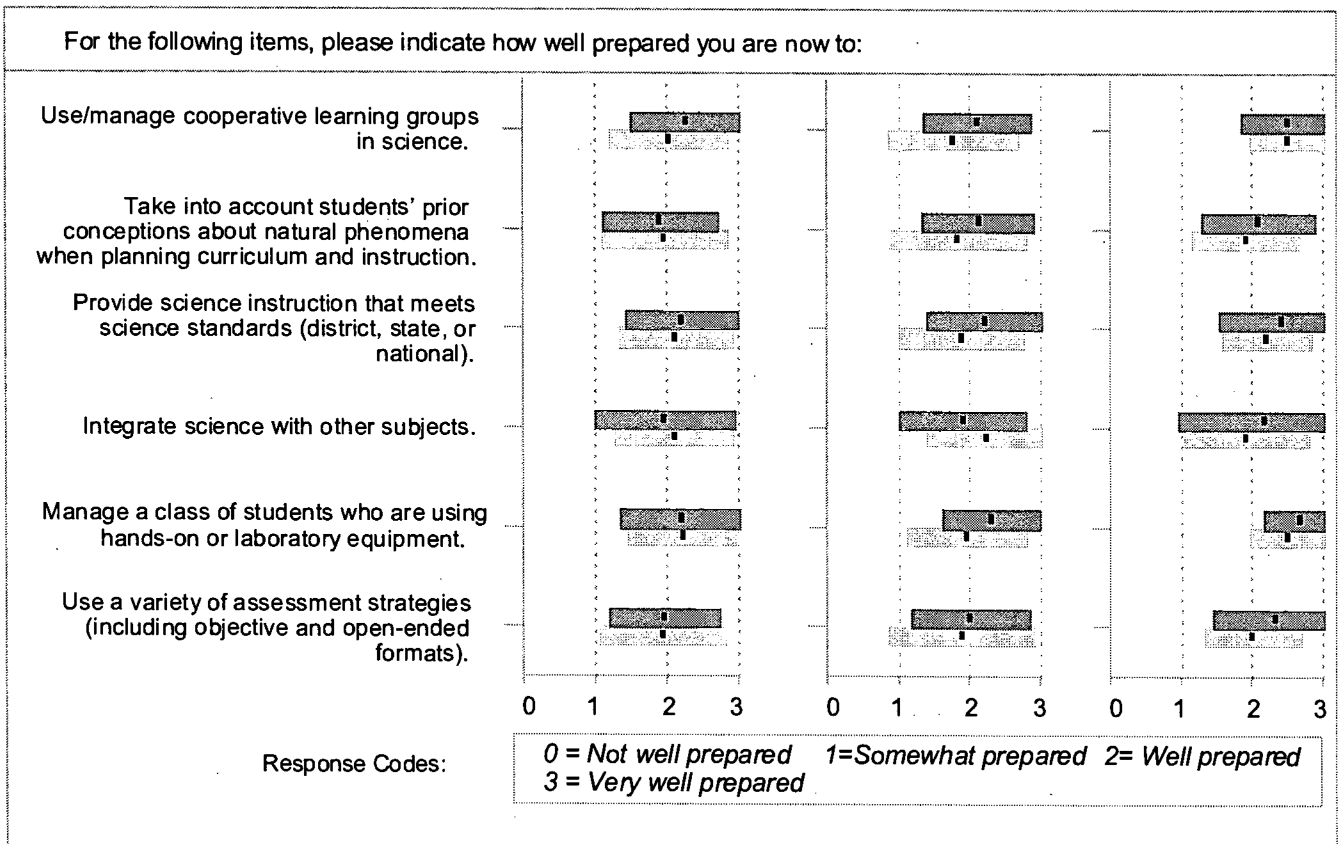


Chart D.15

Teacher Opinions (Mathematics):
a) Beliefs About Student Learning, b) Professional Collegiality

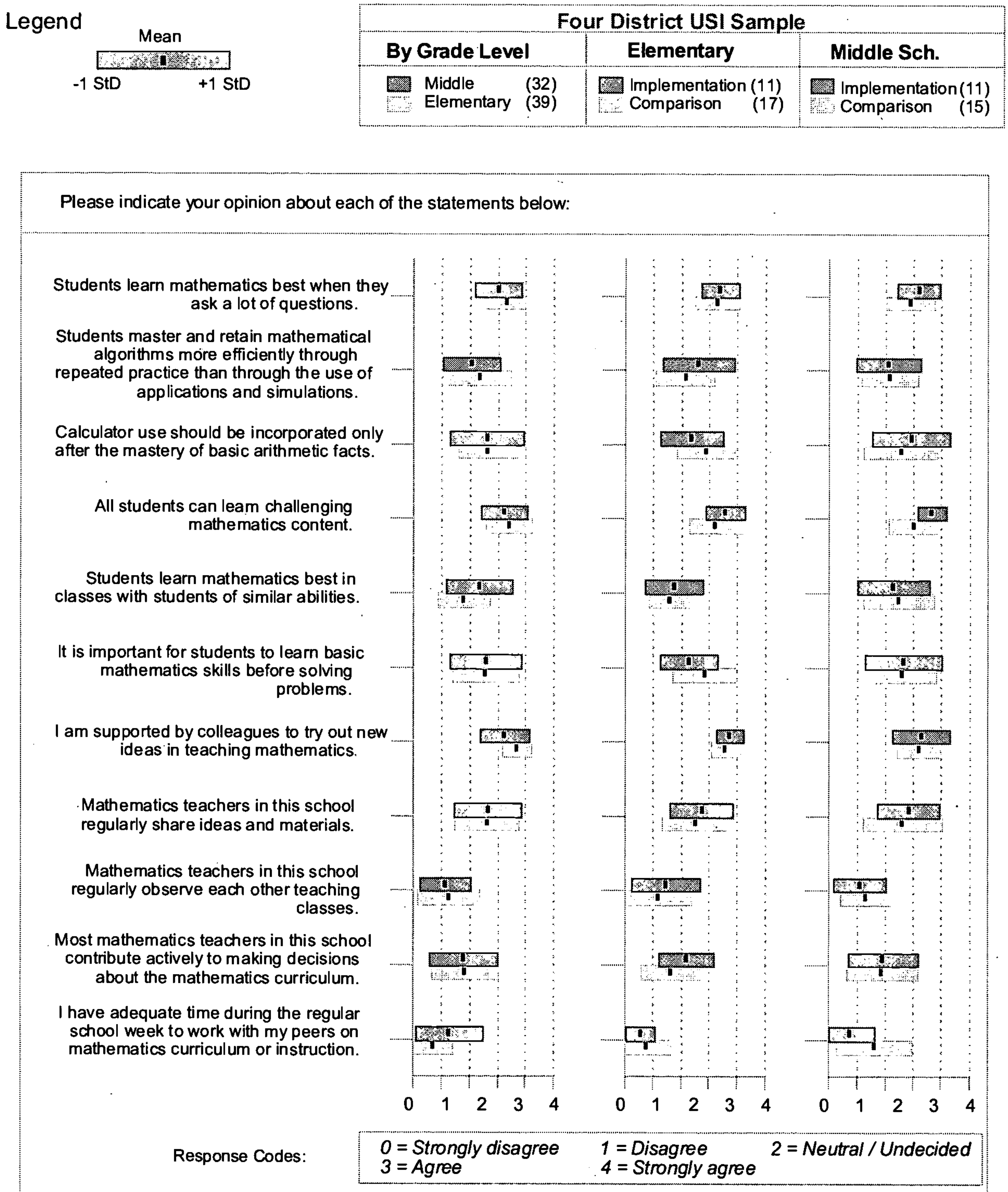


Chart D.16

Teacher Opinions (Science):

a) Beliefs About Student Learning, b) Professional Collegiality

Legend: Mean; -1 StD; +1 StD

Four District USI Sample		
By Grade Level	Elementary	Middle Sch.
Middle (35) Elementary (38)	Implementation (10) Comparison (18)	Implementation (12) Comparison (11)

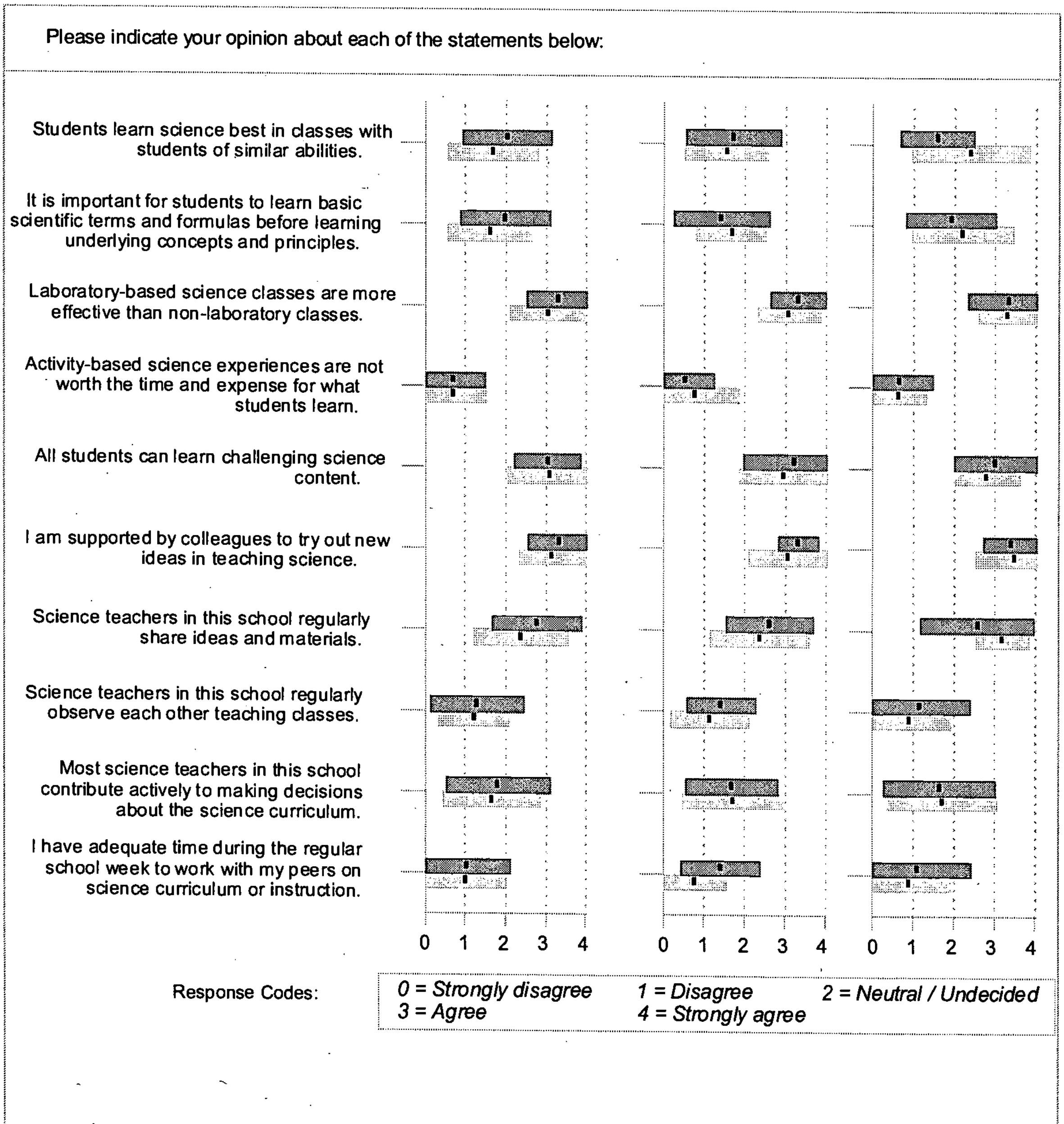


Chart D.17
Grade 4 Mathematics - Content Maps
Four USI Districts

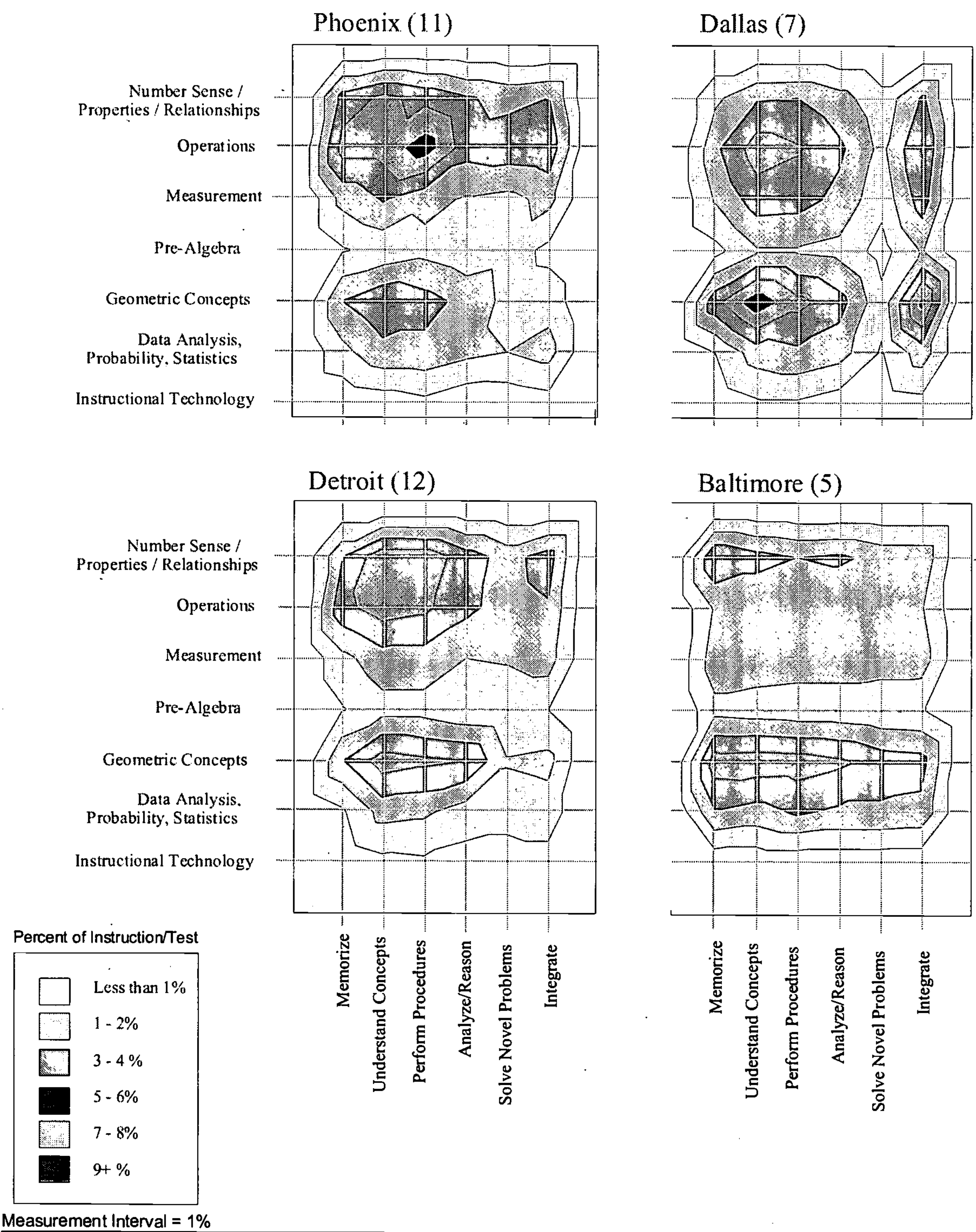


Chart D.18
Grade 8 Mathematics - Content Maps
Four USI Districts

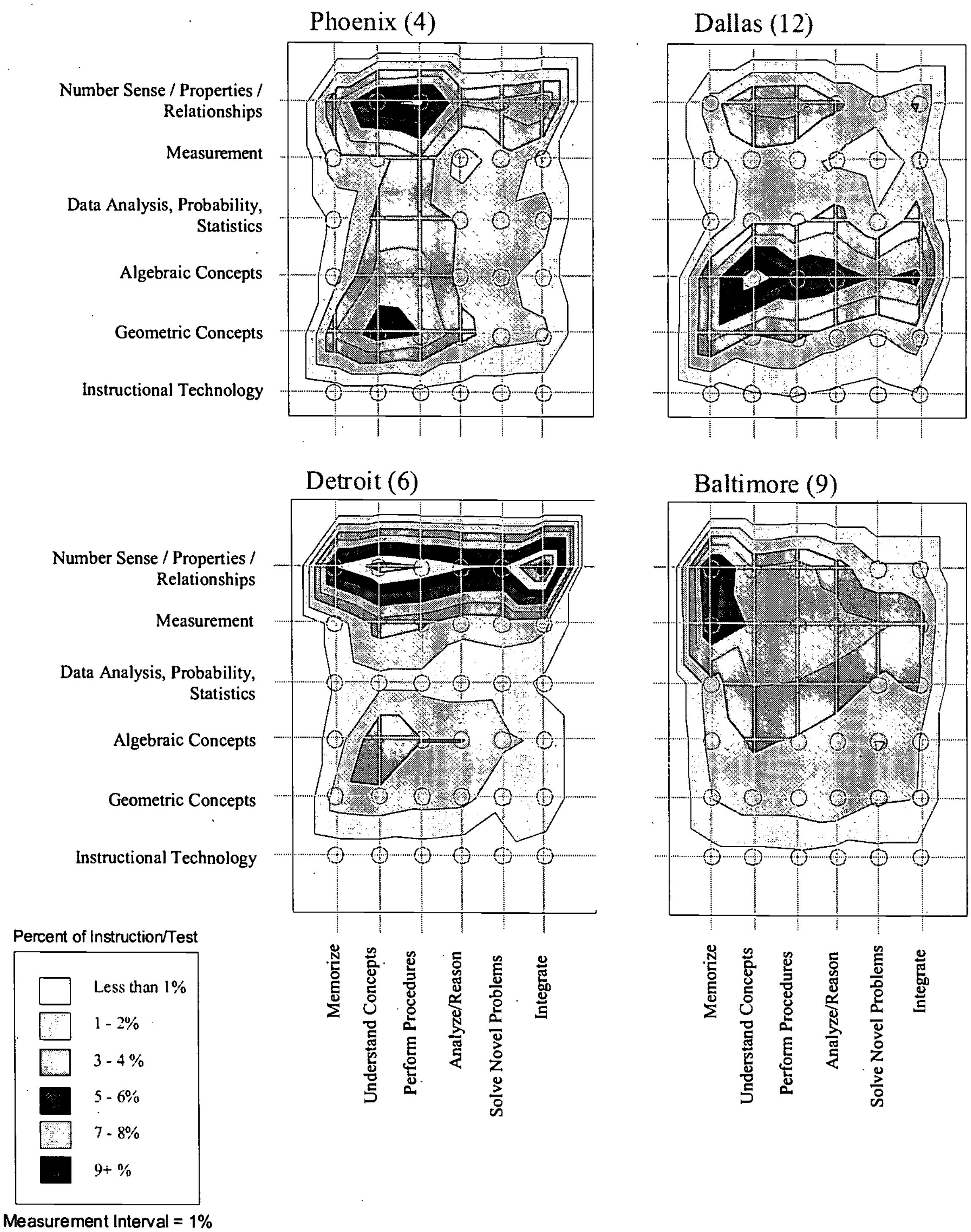


Chart D.19
Grade 4 Science - Content Maps
Four USI Districts

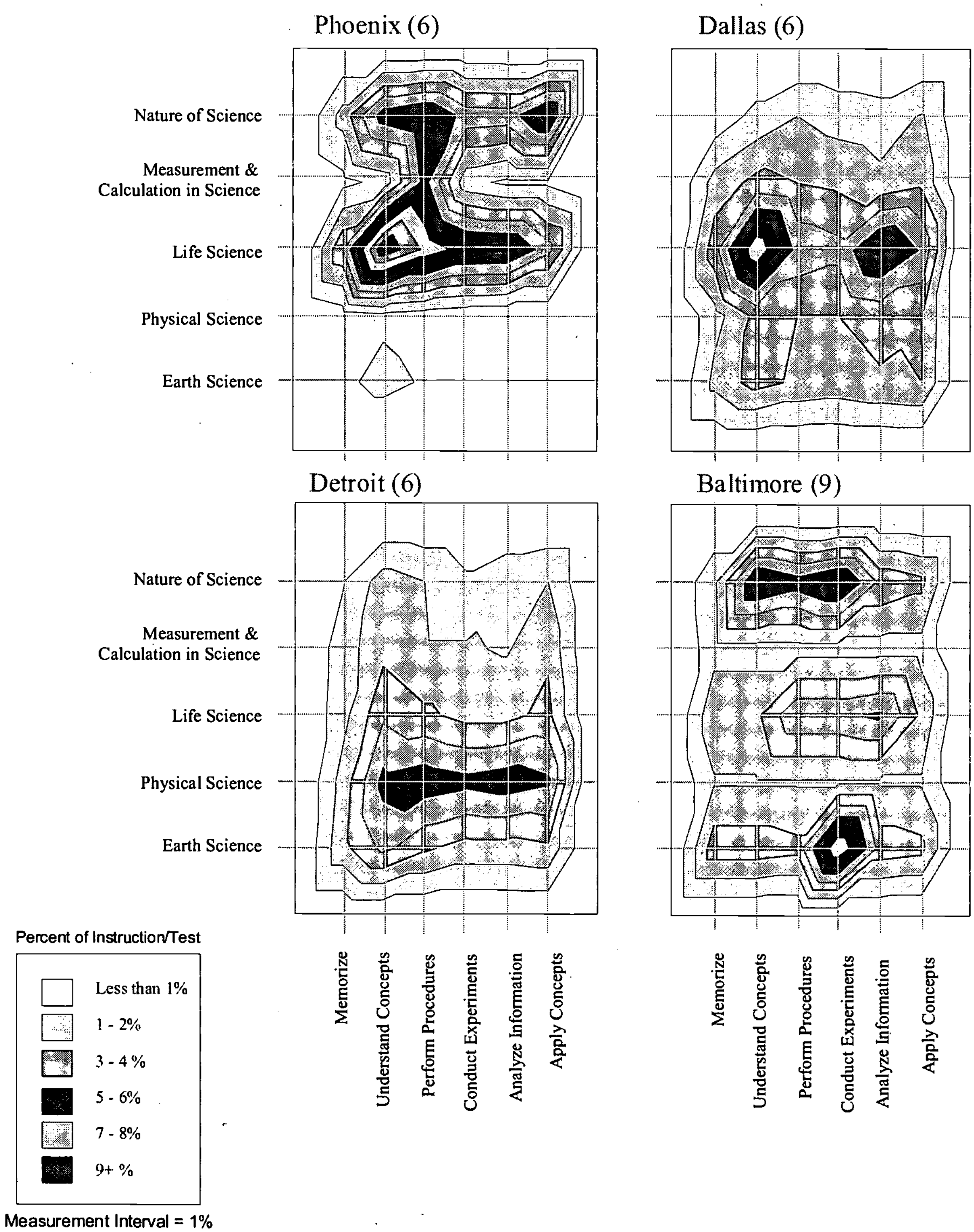
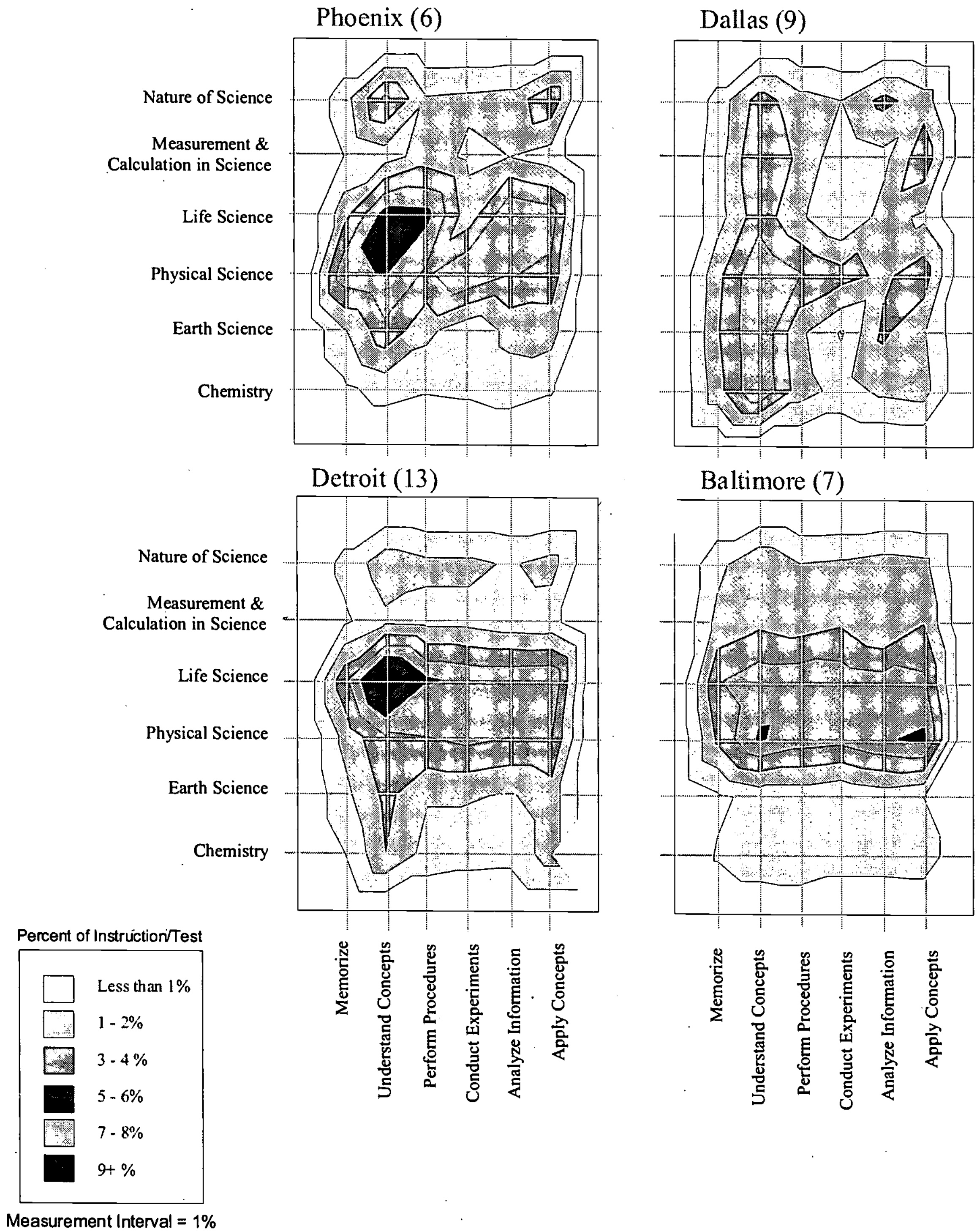


Chart D.20

Grade 8 Science - Content Maps

Four USI Districts



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