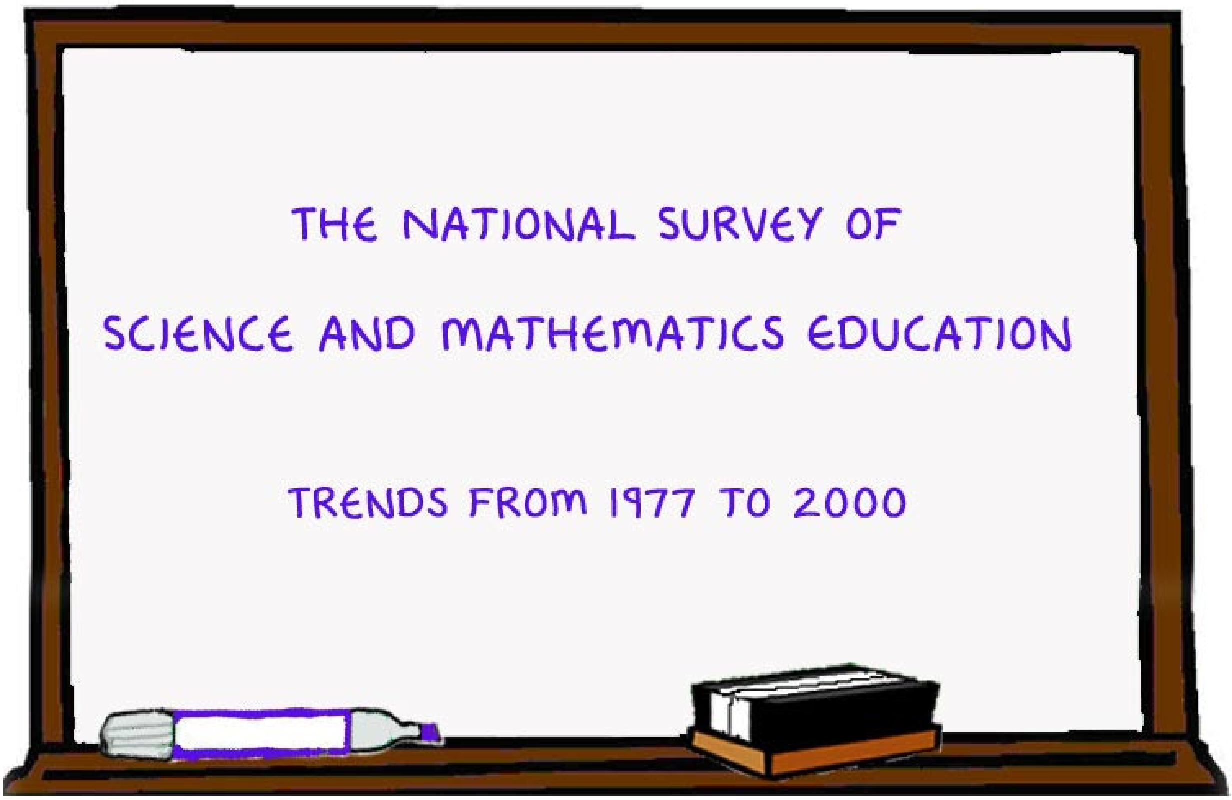

May 2002

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THE NATIONAL SURVEY OF SCIENCE AND MATHEMATICS EDUCATION: TRENDS FROM 1977 TO 2000

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This report is available on the Web at:
2000survey.horizon-research.com

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Background and Purpose

In 2000, the National Science Foundation supported the fourth in a series of national surveys of science and mathematics education through a grant to Horizon Research, Inc. The first survey was conducted in 1977 as part of a major needs assessment of science and mathematics education consisting of a comprehensive review of the literature; case studies of 11 districts throughout the United States; and a national survey of teachers, principals, and district and state personnel. A second survey of teachers and principals was conducted in 1985–86 to identify trends since 1977, and a third survey was conducted in 1993.

The 2000 National Survey of Science and Mathematics Education was designed to provide up-to-date information and to identify trends in the areas of teacher background and experience, curriculum and instruction, and the availability and use of instructional resources. Among the questions addressed by the survey:

- How well prepared are science and mathematics teachers in terms of both content and pedagogy?

- What are teachers trying to accomplish in their science and mathematics instruction, and what activities do they use to meet these objectives?

- To what extent do teachers support reform notions embodied in the National Research Council's *National Science Education Standards* and the National Council of Teachers of Mathematics' *Principles and Standards for School Mathematics*?

- What are the barriers to effective and equitable science and mathematics education?

Complete details of the study—sample design, sampling error considerations, instrument development, data collection, and file preparation and analysis—as well as copies of the instruments are included in the technical report,[†] which is available free of charge on the Internet at http://2000survey.horizon-research.com/reports/status.php.

The current report focuses on trends in science and mathematics education, in most cases between 1993 and 2000, but in some instances dating back to 1977 or 1985–86. The response rates for the teacher questionnaire ranged from 74 percent to 86 percent, and for the principal/program questionnaire, from 79 to 88 percent. Generally, while 1993 and 2000 data are reported for grades 1–4, 5–8, and 9–12, comparisons that go back to the earlier surveys are typically shown for grades 1–3, 4–6, 7–9, and 10–12 since that is how they were presented in those reports and the raw data are not available for additional analyses. A few items have been revised between administrations of the surveys (e.g., in 1993 teachers were asked how often

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[†] Weiss, I.R., Banilower, E.R., McMahon, K.C., and Smith, P.S. *Report of the 2000 National Survey of Science and Mathematics Education.* Chapel Hill, NC: Horizon Research, Inc., 2001.

students “work in small groups,” in 2000 the item asked how often students “work in groups”); these changes and similar details are described in the endnotes.

The standard errors for the estimates presented in this report are included in parentheses in the tables and represented as error bars in figures. In a few cases, standard errors for 1993 data are estimated using the average design effect for the subject and grade range of interest; these instances are referenced in the endnotes. Statistically significant changes ($p < 0.05$) between 1993 and 2000 are asterisked (*) in each table. When more than two years of data are presented, the 2000 data are compared to both 1993 data and the earliest year’s data available. In these instances, an overall alpha of 0.05 was maintained using the Bonferroni adjustment. The narrative sections of the report point out only those differences which are substantial as well as statistically significant at the 0.05 level.

The report is organized into major topical areas. Section One focuses on science and mathematics teachers’ backgrounds and beliefs. Basic demographic data are presented along with information about course background, perceptions of preparedness, and pedagogical beliefs. The second section examines data on the professional status of teachers, including perceptions of their autonomy in making curriculum and instruction decisions, and their opportunities for continued professional development. Section Three presents information about the time spent on science and mathematics instruction in the elementary grades, and about science and mathematics course offerings at the secondary level. The fourth section examines the instructional objectives of science and mathematics classes, and the activities used to achieve these objectives, followed by a discussion of the availability and use of various types of instructional resources in Section Five. Section Six presents data about a number of factors which are likely to affect science and mathematics instruction, including school-wide programs, practices, and problems.

Section One

Teacher Backgrounds and Beliefs

In 2000, grade 9–12 science teachers were slightly more diverse as a group than they were in 1993. However, at all grade levels, in both science and mathematics, the proportion of teachers who are members of minority groups is far lower than it is among the students they are teaching (over 30 percent). (See Tables 1.1 and 1.2.) In grades 1–6, the vast majority of science and mathematics teachers are females. There has been an influx of females among science teachers in grades 7–12 and among mathematics teachers in grades 10–12 since 1993, continuing a trend evident since 1977. (See Figures 1.1 and 1.2.)

Table 1.1
Race/Ethnicity[1] of the Science Teaching Force, by Grade Range: 1993 and 2000

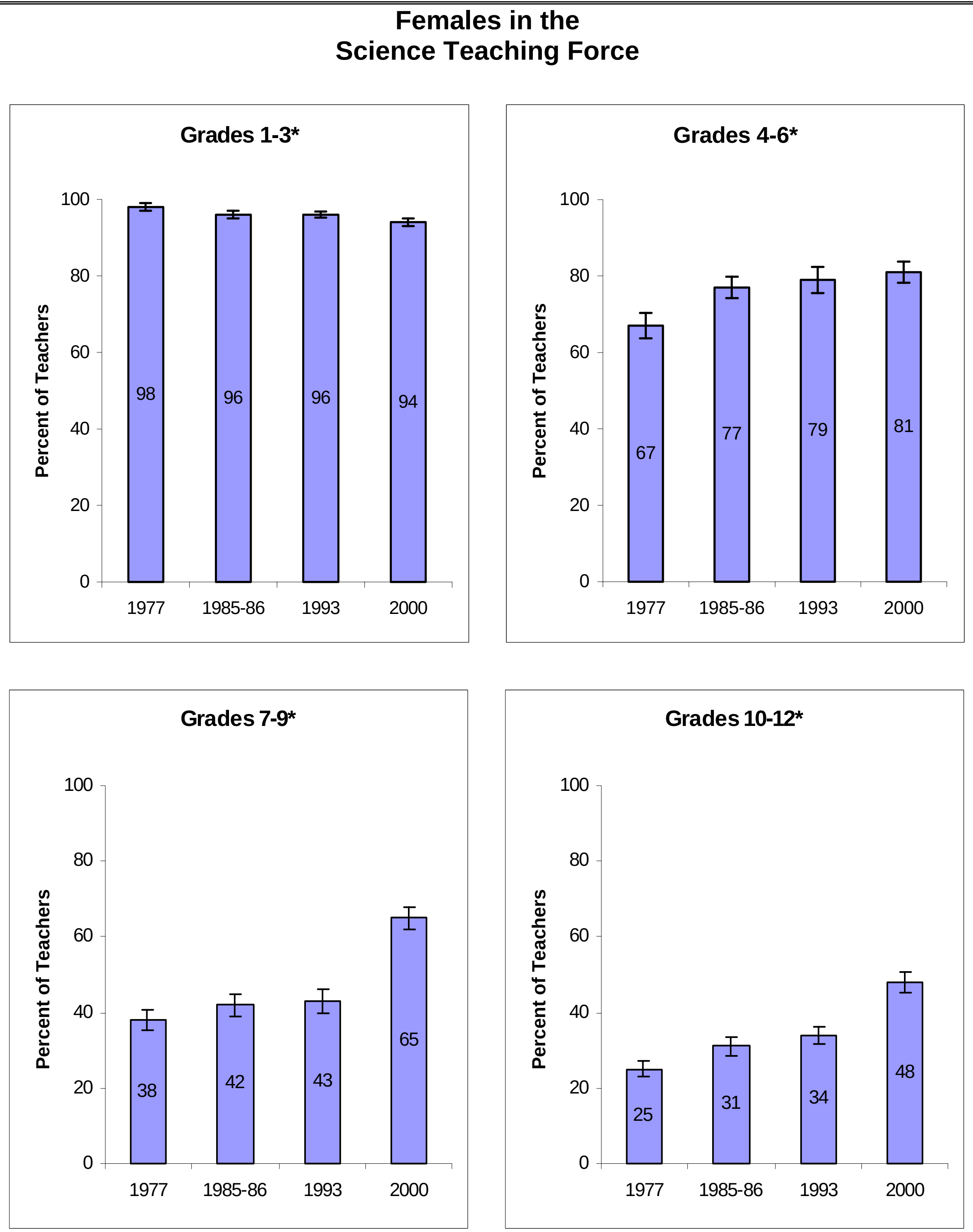
	Percent of Teachers			
	1993		2000	
Grades 1–4				
American Indian or Alaskan Native	0	(0.3)	1*	(0.4)
Black or African-American	6	(1.8)	5	(1.0)
Hispanic or Latino	5	(1.2)	3	(1.1)
White	88	(2.2)	88	(1.9)
Asian or Pacific Islander	0	(0.3)	—	—
Asian	—	—	1	(1.0)
Native Hawaiian or Other Pacific Islander	—	—	0	(0.1)
Grades 5–8				
American Indian or Alaskan Native	0	(0.3)	1	(0.5)
Black or African-American	6	(1.4)	5	(1.1)
Hispanic or Latino	1	(0.7)	3	(1.0)
White	89	(2.6)	87	(1.8)
Asian or Pacific Islander	3	(1.7)	—	—
Asian	—	—	1	(0.6)
Native Hawaiian or Other Pacific Islander	—	—	0	(0.1)
Grades 9–12				
American Indian or Alaskan Native	1	(0.4)	2	(0.5)
Black or African-American	3	(0.4)	4	(0.8)
Hispanic or Latino	1	(0.3)	3*	(0.5)
White	95	(0.8)	90*	(1.2)
Asian or Pacific Islander	1	(0.1)	—	—
Asian	—	—	2	(0.6)
Native Hawaiian or Other Pacific Islander	—	—	0	(0.1)

* $p < 0.05$

Table 1.2
Race/Ethnicity[2] of the Mathematics Teaching Force, by Grade Range: 1993 and 2000

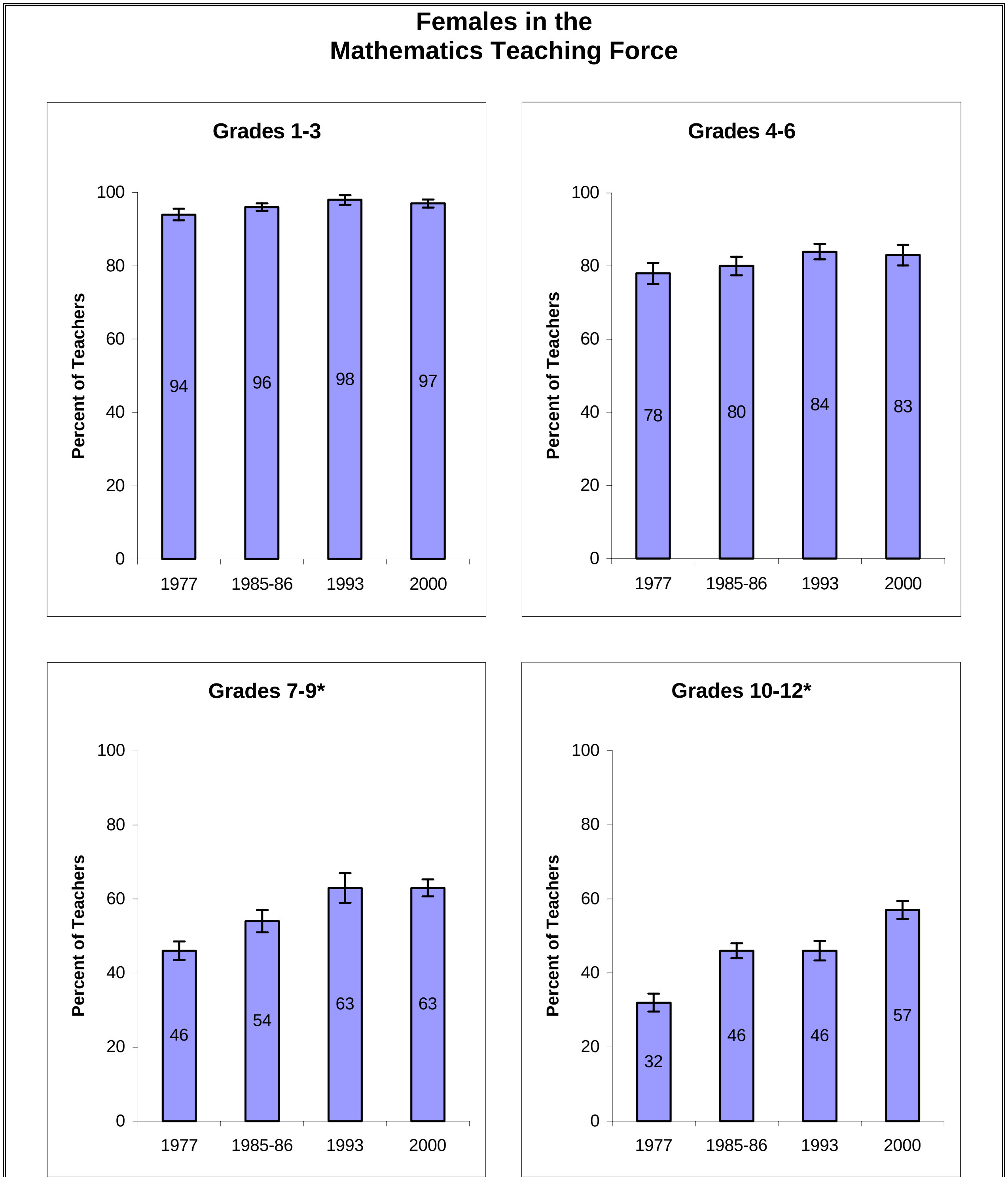
	Percent of Teachers			
	1993		2000	
Grades 1–4				
American Indian or Alaskan Native	0	(0.3)	1*	(0.3)
Black or African-American	4	(0.7)	4	(0.9)
Hispanic or Latino	5	(1.8)	4	(1.2)
White	90	(1.1)	90	(1.5)
Asian or Pacific Islander	1	(0.1)	—	—
Asian	—	—	0	(0.2)
Native Hawaiian or Other Pacific Islander	—	—	0	(0.1)
Grades 5–8				
American Indian or Alaskan Native	0	(0.2)	1*	(0.3)
Black or African-American	5	(0.7)	8	(1.6)
Hispanic or Latino	4	(1.2)	6	(1.4)
White	90	(1.7)	86	(2.1)
Asian or Pacific Islander	1	(0.7)	—	—
Asian	—	—	1	(0.6)
Native Hawaiian or Other Pacific Islander	—	—	0	(0.3)
Grades 9–12				
American Indian or Alaskan Native	0	(0.2)	1*	(0.3)
Black or African-American	4	(0.8)	4	(0.8)
Hispanic or Latino	1	(0.5)	2	(0.4)
White	92	(1.1)	91	(1.1)
Asian or Pacific Islander	2	(0.7)	—	—
Asian	—	—	1	(0.3)
Native Hawaiian or Other Pacific Islander	—	—	0	(0.2)

* $p < 0.05$



* Grades 1–3: 2000 ≠ 1977; Grades 4–6: 2000 ≠ 1977; Grades 7–9: 2000 ≠ 1993, 2000 ≠ 1977; Grades 10–12: 2000 ≠ 1993, 2000 ≠ 1977, $p < 0.05$

Figure 1.1



* Grades 7–9: 2000 ≠ 1977; Grades 10–12: 2000 ≠ 1993, 2000 ≠ 1977, $p < 0.05$

Figure 1.2

Although the average age of science and mathematics teachers (roughly 42 years old) has remained essentially unchanged since 1993, the distribution has shifted somewhat, with a greater percentage of teachers in 2000 at the extremes of the range (Tables 1.3 and 1.4). The experience levels of science and mathematics teachers in 1993 and 2000 are presented in Tables 1.5 and 1.6.

Table 1.3
Age of the Science Teaching Force, by Grade Range: 1993 and 2000

	Percent of Teachers			
	1993		2000	
Grades 1–4				
≤ 30 years	16	(2.3)	21	(2.2)
31–40 years	26	(2.6)	19*	(1.9)
41–50 years	40	(2.9)	33	(2.3)
51 + years	18	(2.4)	27*	(2.2)
Grades 5–8				
≤ 30 years	11	(1.4)	19*	(2.8)
31–40 years	28	(3.0)	22	(3.1)
41–50 years	36	(3.4)	30	(3.1)
51 + years	25	(3.9)	29	(3.7)
Grades 9–12				
≤ 30 years	13	(1.1)	20*	(2.5)
31–40 years	23	(3.2)	23	(1.7)
41–50 years	41	(3.4)	29*	(1.9)
51 + years	23	(2.7)	28	(1.7)

* $p < 0.05$

Table 1.4
Age of the Mathematics Teaching Force, by Grade Range: 1993 and 2000

	Percent of Teachers			
	1993		2000	
Grades 1–4				
≤ 30 years	17	(2.2)	21	(2.3)
31–40 years	27	(2.6)	21	(2.1)
41–50 years	32	(2.3)	31	(2.7)
51 + years	23	(2.4)	27	(2.6)
Grades 5–8				
≤ 30 years	15	(3.4)	21	(2.6)
31–40 years	21	(1.9)	23	(2.6)
41–50 years	46	(2.9)	27*	(3.0)
51 + years	18	(3.1)	30*	(3.4)
Grades 9–12				
≤ 30 years	13	(1.8)	16	(1.4)
31–40 years	23	(2.7)	24	(1.5)
41–50 years	42	(2.3)	29*	(2.0)
51 + years	22	(1.9)	30*	(1.7)

* $p < 0.05$

Table 1.5
Years of Teaching Experience of the Science Teaching Force, by Grade Range: 1993 and 2000

	Percent of Teachers			
	1993		2000	
Grades 1–4				
0–2 years	13	(2.1)	15	(1.8)
3–5 years	10	(1.5)	17*	(1.8)
6–10 years	15	(1.7)	16	(2.1)
11–20 years	43	(2.7)	25*	(2.2)
≥ 21 years	19	(2.7)	27*	(2.6)
Grades 5–8				
0–2 years	12	(1.9)	16	(2.7)
3–5 years	11	(1.6)	9	(1.5)
6–10 years	19	(2.7)	19	(2.6)
11–20 years	34	(3.1)	24*	(3.3)
≥ 21 years	25	(3.1)	32	(3.1)
Grades 9–12				
0–2 years	11	(1.2)	16*	(2.2)
3–5 years	10	(1.1)	16*	(1.7)
6–10 years	14	(3.1)	18	(1.4)
11–20 years	30	(1.9)	21*	(1.6)
≥ 21 years	35	(2.6)	29	(1.7)

* $p < 0.05$

Table 1.6
Years of Teaching Experience of the Mathematics Teaching Force, by Grade Range: 1993 and 2000

	Percent of Teachers			
	1993		2000	
Grades 1–4				
0–2 years	12	(1.8)	18*	(2.0)
3–5 years	14	(1.3)	14	(1.6)
6–10 years	17	(2.3)	15	(1.7)
11–20 years	36	(2.3)	23*	(2.1)
≥ 21 years	22	(2.7)	31*	(2.6)
Grades 5–8				
0–2 years	12	(2.2)	20*	(3.2)
3–5 years	9	(1.4)	12	(1.8)
6–10 years	22	(3.5)	16	(2.4)
11–20 years	34	(2.8)	21*	(2.5)
≥ 21 years	22	(2.9)	31*	(3.3)
Grades 9–12				
0–2 years	10	(1.2)	13	(1.4)
3–5 years	9	(1.2)	15*	(1.6)
6–10 years	20	(3.3)	14	(1.5)
11–20 years	28	(1.6)	24	(1.7)
≥ 21 years	33	(1.9)	34	(2.0)

* $p < 0.05$

As can be seen in Table 1.7, relatively new teachers in 2000, those with five years of experience or less, are more likely to have completed a graduate degree than their counterparts in 1993, perhaps a reflection of the shift in teacher education programs away from undergraduate majors in education towards a four-plus-one Masters of Arts in Teaching program.

Table 1.7
Science and Mathematics Teachers with Degrees Beyond the Bachelor's, by Prior Years Teaching Experience: 1993 and 2000

	Percent of Teachers			
	1993		2000	
Science				
0–2 Years	8	(1.8)	21*	(3.9)
3–5 Years	19	(3.5)	30	(4.8)
6–10 Years	36	(3.9)	44	(5.0)
11–20 Years	45	(4.0)	48	(3.8)
≥ 21 Years	55	(3.1)	66*	(3.7)
Mathematics				
0–2 Years	12	(2.5)	21	(4.4)
3–5 Years	18	(4.0)	35*	(4.8)
6–10 Years	41	(4.9)	45	(4.3)
11–20 Years	43	(3.8)	46	(4.3)
≥ 21 Years	53	(3.5)	57	(3.2)

* $p < 0.05$

The average number of semesters of college science taken by grade 5–8 teachers fell from 10.3 in 1993 to 8.5 in 2000. The average number of semesters of science did not change significantly for grade 1–4 or grade 9–12 science teachers. (See Table 1.8)

Table 1.8
Number of Semesters[3] of College Coursework in Science, by Grade Range: 1993 and 2000

	Percent of Teachers			
	1993		2000	
Grades 1–4				
Fewer than 6 Semesters	50	(3.3)	57	(2.5)
6–10 Semesters	31	(2.6)	29	(2.5)
11–14 Semesters	11	(1.6)	7	(1.9)
15–20 Semesters	6	(1.4)	5	(1.1)
More than 20 Semesters	1	(0.6)	2	(0.6)
Average number of semesters	6.8	(0.3)	6.1	(0.2)
Grades 5–8				
Fewer than 6 Semesters	28	(4.1)	41*	(3.9)
6–10 Semesters	31	(3.4)	33	(3.8)
11–14 Semesters	16	(2.6)	10	(1.7)
15–20 Semesters	17	(3.0)	10*	(1.5)
More than 20 Semesters	8	(1.2)	5	(1.0)
Average number of semesters	10.3	(0.6)	8.5*	(0.3)
Grades 9–12				
Fewer than 6 Semesters	1	(0.5)	0	(0.2)
6–10 Semesters	12	(1.6)	8	(1.9)
11–14 Semesters	20	(2.0)	17	(1.4)
15–20 Semesters	39	(2.1)	46*	(2.2)
More than 20 Semesters	28	(1.7)	29	(1.9)
Average number of semesters	17.6	(0.3)	18.2	(0.3)

* $p < 0.05$

The National Science Teachers Association (NSTA) has recommended that for the preparation of elementary and middle school science teachers, in addition to coursework in science education, "conceptual content should be balanced among life, earth/space, physical, and environmental science, including natural resources" (NSTA, 1998). Using completion of at least one college course as a criterion, Table 1.9 shows that the percentage of grade 1–4 teachers meeting this recommendation, just over half, has not changed between 1993 and 2000. However, the percentage of grade 5–8 teachers meeting this requirement has risen from 54 percent in 1993 to 63 percent in 2000, indicating that, even though they are taking fewer science courses overall, the courses they are taking are more diverse.

Table 1.9
Science Teachers Meeting NSTA
Course-Background Standards, by Grade Range: 1993 and 2000

	Percent of Teachers			
	1993		2000	
Grades 1–4				
Coursework in each science discipline plus science education	51	(3.4)	52	(3.0)
Lack science education only	12	(1.6)	11	(1.9)
Lack one science discipline	28	(2.2)	25	(2.2)
Lack two science disciplines	9	(1.4)	9	(1.4)
Lack three science disciplines	1	(0.5)	3*	(0.7)
Grades 5–8				
Coursework in each science discipline plus science education	54	(3.6)	63*	(2.5)
Lack science education only	14	(3.0)	11	(1.9)
Lack one science discipline	25	(3.2)	17*	(2.1)
Lack two science disciplines	7	(1.9)	9	(2.2)
Lack three science disciplines	0	(0.2)	0	(0.2)

* $p < 0.05$

Trend data also show that the percentage of classes taught by teachers with in-depth preparation in the field has remained essentially the same since 1993. (See Table 1.10.) Biology courses continue to be most likely, and earth science courses least likely, to be taught by teachers with six or more college courses in that field.

Table 1.10
Science Classes Taught by Teachers with Six or More College Courses in Field, in Another Science Field, and Lacking In-Depth Preparation in Any Science: 1993 and 2000

	Percent of Classes											
	Six or More Courses in Field				Not In-Depth in Field, But Six or More in Another Science				Not In-Depth in Any Science			
	1993		2000		1993		2000		1993		2000	
Grades 7–12												
Life science/biology	82	(5.6)	85	(2.5)	3	(1.2)	3	(1.2)	14	(5.7)	12	(2.2)
Earth science	45	(5.3)	39	(5.2)	34	(8.2)	36	(5.5)	21	(8.2)	24	(5.6)
Physical science	75	(4.2)	67	(6.8)	11	(2.5)	11	(2.9)	14	(3.9)	22	(7.2)
Grades 9–12												
Biology	94	(1.9)	94	(1.8)	3	(1.6)	1	(0.8)	3	(1.1)	4	(1.6)
Chemistry	82	(3.4)	74	(4.2)	18	(3.6)	17	(3.3)	1	(0.4)	9*	(2.8)
Physics	74	(6.0)	64	(5.8)	22	(5.7)	26	(5.4)	4	(2.9)	10	(3.7)

* $p < 0.05$

Turning to mathematics, Table 1.11 shows that teachers in the higher grades continue to have much stronger course backgrounds in mathematics than do their colleagues in the earlier grades. However, in all three grade ranges, teachers in 2000 report taking more mathematics courses than teachers in 1993.

Table 1.11
Number of Semesters[4] of College Coursework in Mathematics, by Grade Range: 1993 and 2000

	Percent of Teachers				Percent of Classes			
	1993[5]		2000		1993[5]		2000	
Grades 1–4								
Fewer than 6 Semesters	90	(1.7)	82*	(2.1)	90	(1.7)	81*	(2.3)
6–10 Semesters	8	(1.7)	17*	(2.1)	7	(1.7)	18*	(2.2)
More than 10 Semesters	3	(0.7)	1*	(0.5)	3	(0.7)	1*	(0.5)
Grades 5–8								
Fewer than 6 Semesters	74	(2.0)	58*	(2.7)	54	(2.2)	41*	(2.5)
6–10 Semesters	17	(1.7)	26*	(2.6)	28	(2.0)	30	(2.4)
More than 10 Semesters	9	(1.3)	16*	(1.8)	19	(1.7)	29*	(2.5)
Grades 9–12								
Fewer than 6 Semesters	9	(1.1)	5*	(1.0)	8	(1.1)	4*	(0.9)
6–10 Semesters	38	(1.7)	18*	(1.8)	38	(1.7)	17*	(1.6)
More than 10 Semesters	52	(1.8)	77*	(1.8)	55	(1.8)	79*	(1.7)

* $p < 0.05$

Elementary teachers are typically assigned to teach science, mathematics, and other academic subjects to one group of students. Historically, elementary teachers have felt better qualified in reading than in other subjects, a pattern which has continued through 2000. (See Table 1.12.)

Table 1.12
Self-Contained Grade 1–6 Teachers Feeling Very Well Qualified to Teach Each Subject: 1977, 1985–86, 1993, and 2000

	Percent of Teachers							
	1977[6]		1985–86		1993		2000	
Reading/Language Arts	63	(1.7)	86	(1.0)	76	(1.9)	76*	(1.7)
Mathematics	49	(1.8)	69	(1.3)	60	(2.4)	61*	(1.8)
Social Studies	39	(1.7)	51	(1.4)	61	(1.7)	52*	(2.0)
Life Science	—	—	27	(1.2)	26	(2.0)	30	(1.9)
Earth Science	—	—	—	—	30	(2.3)[7]	25	(1.5)

* Reading/Language Arts: 2000 ≠ 1977; Mathematics: 2000 ≠ 1977; Social Studies: 2000 ≠ 1993, 2000 ≠ 1977, $p < 0.05$

Table 1.13 shows middle and high school mathematics teachers' perceptions of their qualifications to teach a number of topics. Compared to 1993, a larger percentage of middle school mathematics teachers feel very well qualified in each of 4 of the 8 topics: estimation, measurement, patterns and relationships, and numeration and number theory. At the high school level, a larger percentage of mathematics teachers in 2000 indicated they were very well qualified in 2 of the 8 topics: estimation and measurement. Fewer felt very well qualified to teach calculus.

Table 1.13
Mathematics Teachers Considering Themselves Very Well Qualified to Teach Each of a Number of Subjects, by Grade Range: 1993 and 2000

	Percent of Teachers			
	1993		2000	
Grades 5–8				
Estimation	64	(3.3)	83*	(2.8)
Measurement	60	(3.2)	81*	(2.9)
Algebra	44	(3.1)	49	(3.6)
Patterns and relationships	52	(3.3)	73*	(3.7)
Geometry and spatial sense	50	(3.0)	57	(4.3)
Topics from discrete mathematics[8]	10	(2.0)	8	(1.8)
Numeration and number theory[8]	58	(2.8)	76*	(3.5)
Calculus[8]	4	(0.8)	4	(0.9)
Grades 9–12				
Estimation	72	(2.2)	85*	(1.7)
Measurement	79	(2.2)	85*	(1.7)
Algebra	95	(0.8)	94	(1.1)
Patterns and relationships	71	(2.8)	75	(2.0)
Geometry and spatial sense	69	(3.3)	70	(2.3)
Topics from discrete mathematics[8]	20	(1.7)	16	(1.5)
Numeration and number theory[8]	67	(2.9)	64	(2.2)
Calculus[8]	29	(1.8)	24*	(1.8)

* $p < 0.05$

The National Survey of Science and Mathematics Education also collected trend data on teachers' perceptions of their pedagogical preparedness. Table 1.14 shows the percentage of science teachers considering themselves well prepared for each of a number of tasks. The most striking change is the increase in the percentage of grade 5–8 and 9–12 teachers indicating they are well prepared to have students work in cooperative learning groups. Other changes in grades 9–12 are increases in teachers' feelings of preparedness to teach students that are heterogeneous in ability and to encourage the participation of minorities in science. In 2000, a larger percentage of grade 5–8 science teachers indicated that they feel well prepared to use the textbook as a resource rather than as the primary instructional tool. Fewer grade 1–4 teachers feel well prepared to involve parents in the science education of their children, a surprising and discouraging finding.

Table 1.14
Science Teachers Considering Themselves Well Prepared[§]
for Each of a Number of Tasks, by Grade Range: 1993 and 2000

	Percent of Teachers			
	1993		2000	
Grades 1–4				
Use cooperative learning groups[9]	83	(2.2)	83	(2.1)
Use the textbook as a resource rather than the primary instructional tool	77	(3.1)	74	(2.8)
Teach groups that are heterogeneous in ability	89	(2.3)	86	(2.1)
Teach students who have limited English proficiency	32	(2.7)	29	(2.7)
Encourage participation of females in science	92	(2.0)	92	(1.4)
Encourage participation of minorities in science	87	(2.3)	87	(1.8)
Involve parents in the science education of their children	57	(3.6)	46*	(2.7)
Grades 5–8				
Use cooperative learning groups[9]	83	(2.5)	92*	(1.5)
Use the textbook as a resource rather than the primary instructional tool	70	(3.0)	81*	(3.1)
Teach groups that are heterogeneous in ability	90	(1.9)	85	(2.7)
Teach students who have limited English proficiency	25	(3.4)	27	(3.1)
Encourage participation of females in science	94	(1.7)	93	(2.1)
Encourage participation of minorities in science	86	(2.4)	87	(2.6)
Involve parents in the science education of their children	56	(3.1)	51	(3.7)
Grades 9–12				
Use cooperative learning groups[9]	64	(3.4)	86*	(1.5)
Use the textbook as a resource rather than the primary instructional tool	80	(3.0)	85	(1.5)
Teach groups that are heterogeneous in ability	71	(2.9)	80*	(1.9)
Teach students who have limited English proficiency	23	(2.1)	21	(1.8)
Encourage participation of females in science	90	(3.0)	95	(0.7)
Encourage participation of minorities in science	80	(3.3)	89*	(1.3)
Involve parents in the science education of their children	43	(3.0)	44	(2.1)

* $p < 0.05$

§ Includes teachers responding "very well prepared" or "fairly well prepared" to each statement.

In mathematics, only teachers in grades 9–12 showed changes in their feelings of pedagogical preparedness from 1993 to 2000. (See Table 1.15.) A larger percentage of grade 9–12 mathematics teachers feel well prepared to have students work in cooperative groups and to use the textbook as a resource. In contrast, fewer grade 9–12 teachers than in 1993 feel well prepared to teach students who have limited English proficiency and to involve parents in the mathematics education of their children.

Table 1.15
Mathematics Teachers Considering Themselves Well Prepared[§]
for Each of a Number of Tasks, by Grade Range: 1993 and 2000

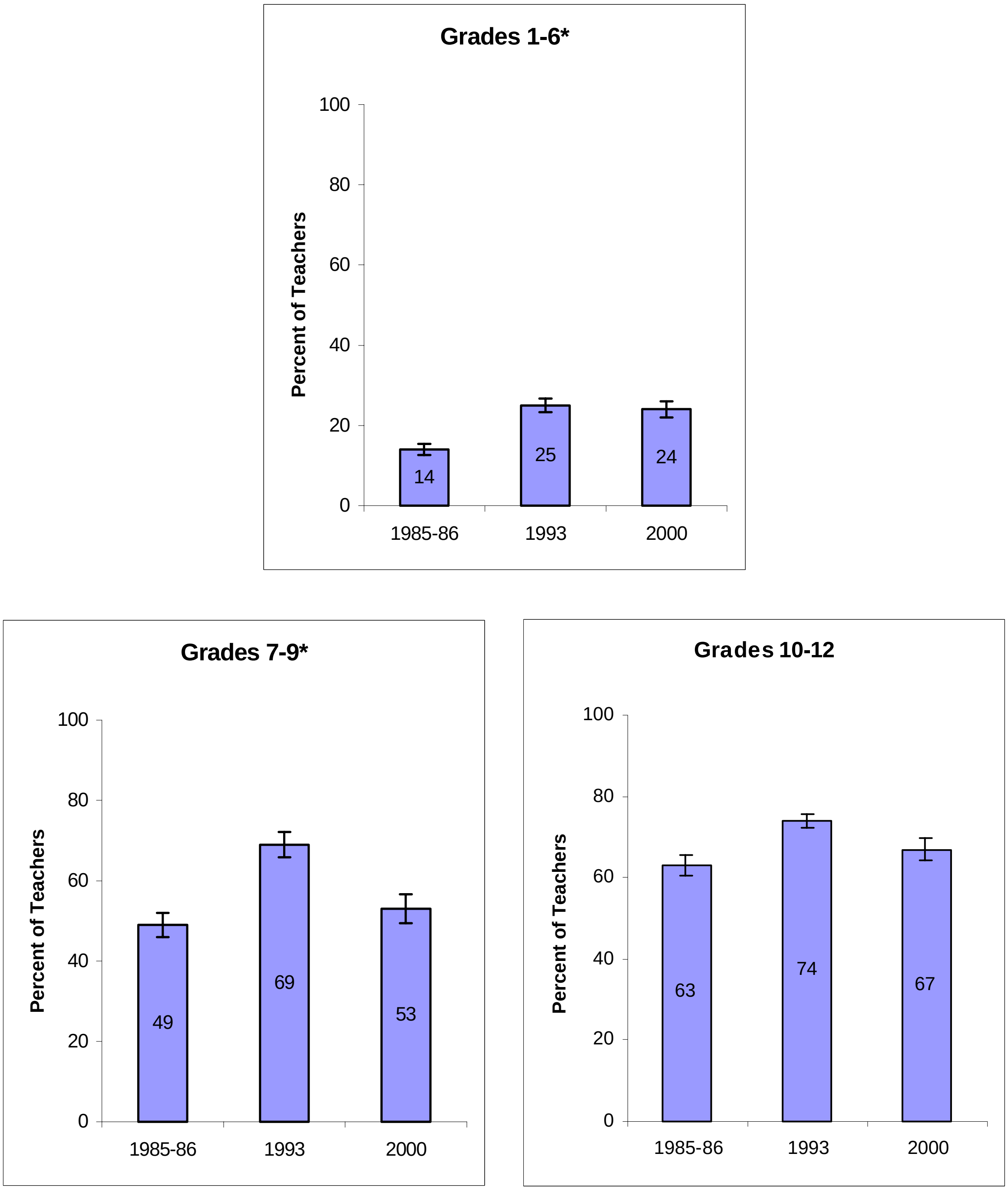
	Percent of Teachers			
	1993		2000	
Grades 1–4				
Use cooperative learning groups[10]	87	(1.7)	86	(2.0)
Use the textbook as a resource rather than the primary instructional tool	79	(1.1)	79	(1.8)
Teach groups that are heterogeneous in ability	89	(1.8)	85	(2.2)
Teach students who have limited English proficiency	28	(3.1)	34	(2.8)
Encourage participation of females in mathematics	95	(1.6)	98	(0.7)
Encourage participation of minorities in mathematics	84	(2.9)	90	(1.6)
Involve parents in the mathematics education of their children	67	(2.6)	70	(2.5)
Grades 5–8				
Use cooperative learning groups[10]	82	(2.6)	85	(2.6)
Use the textbook as a resource rather than the primary instructional tool	67	(3.8)	71	(2.8)
Teach groups that are heterogeneous in ability	85	(2.5)	81	(3.1)
Teach students who have limited English proficiency	33	(3.3)	26	(3.0)
Encourage participation of females in mathematics	95	(1.1)	96	(0.9)
Encourage participation of minorities in mathematics	84	(2.6)	88	(2.2)
Involve parents in the mathematics education of their children	57	(2.6)	51	(3.0)
Grades 9–12				
Use cooperative learning groups[10]	66	(2.9)	76*	(1.8)
Use the textbook as a resource rather than the primary instructional tool	62	(3.0)	71*	(1.9)
Teach groups that are heterogeneous in ability	71	(2.3)	73	(2.0)
Teach students who have limited English proficiency	25	(2.4)	18*	(1.5)
Encourage participation of females in mathematics	92	(1.5)	94	(0.9)
Encourage participation of minorities in mathematics	83	(1.6)	86	(1.4)
Involve parents in the mathematics education of their children	49	(2.3)	37*	(2.0)

* $p < 0.05$

§ Includes teachers responding “very well prepared” or “fairly well prepared” to each statement.

When asked if they consider themselves to be “master” teachers, science and mathematics teachers in 2000 responded similarly to those in 1993 with the exception of grade 7–9 science teachers (Figures 1.3 and 1.4). There were no changes since 1993 in the percentages of teachers who indicated that they enjoyed teaching their subject. (See Figures 1.5 and 1.6.)

Science Teachers Considering Themselves a "Master" Teacher of the Subject[§]

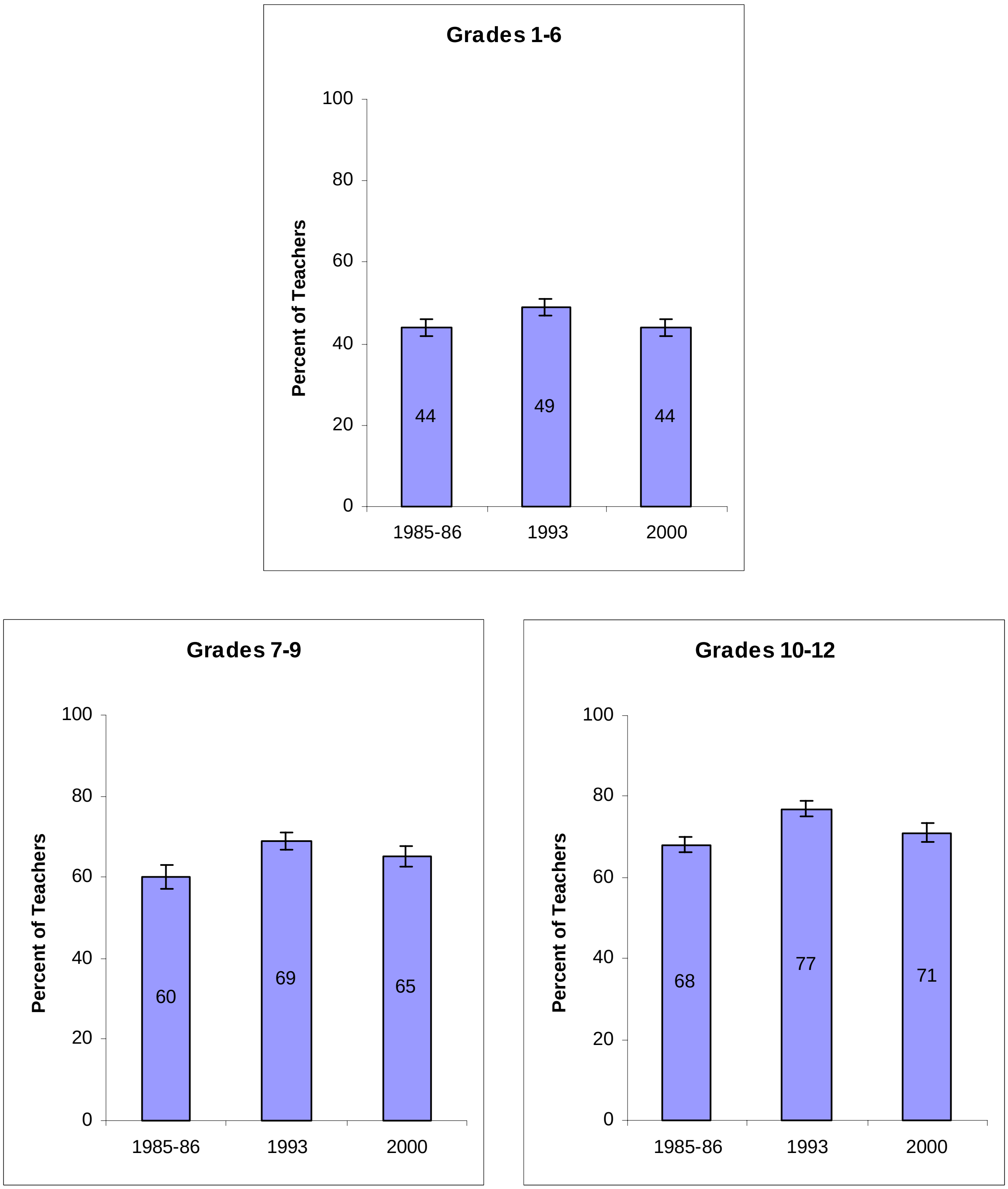


* Grades 1–6: 2000 ≠ 1985-86; Grades 7–9: 2000 ≠ 1993, $p < 0.05$

§ Includes teachers responding "strongly agree" or "agree" to the statement: "I consider myself a 'master' science teacher."

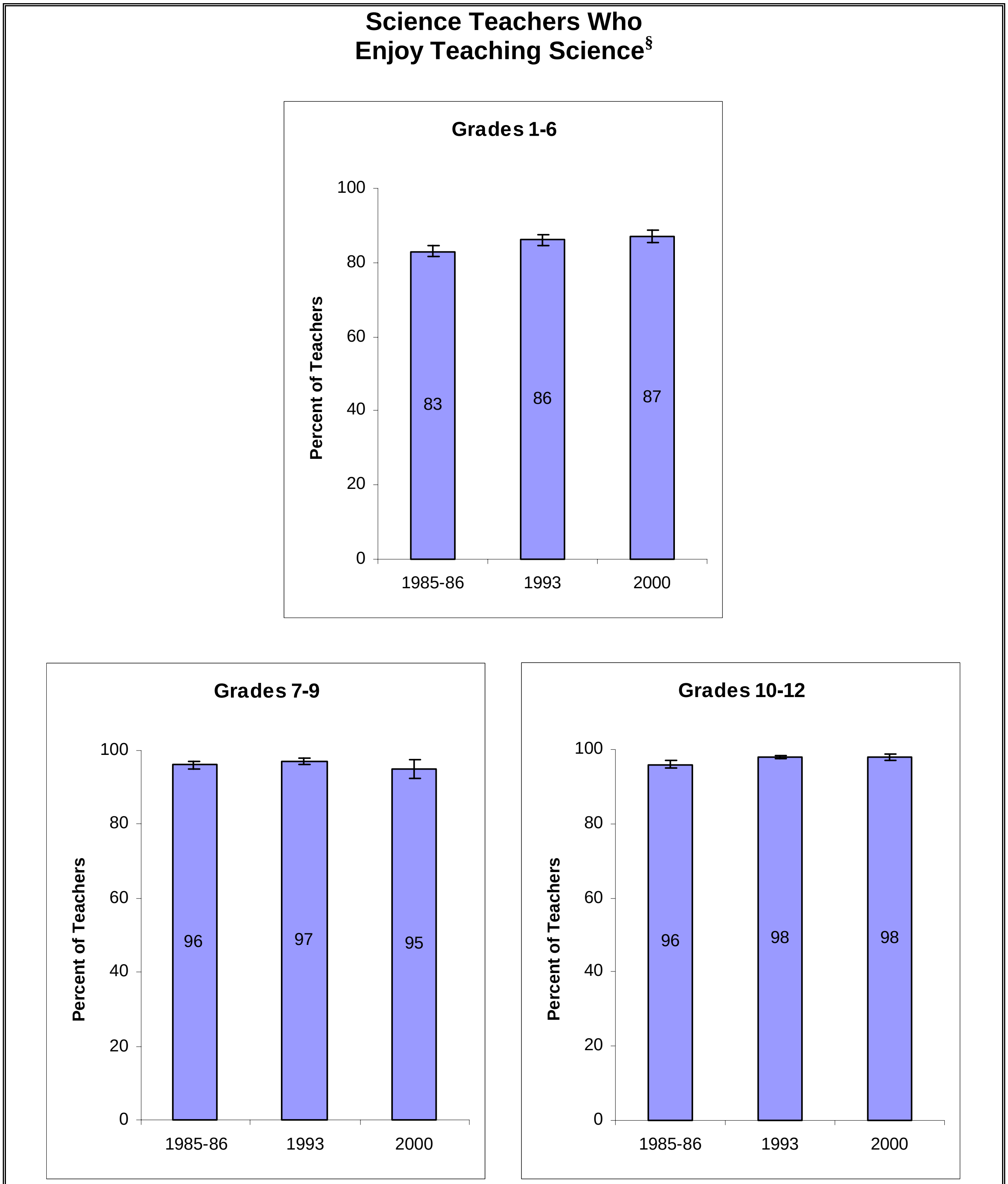
Figure 1.3

Mathematics Teachers Considering Themselves a "Master" Teacher of the Subject§



§ Includes teachers responding "strongly agree" or "agree" to the statement: "I consider myself a 'master' mathematics teacher."

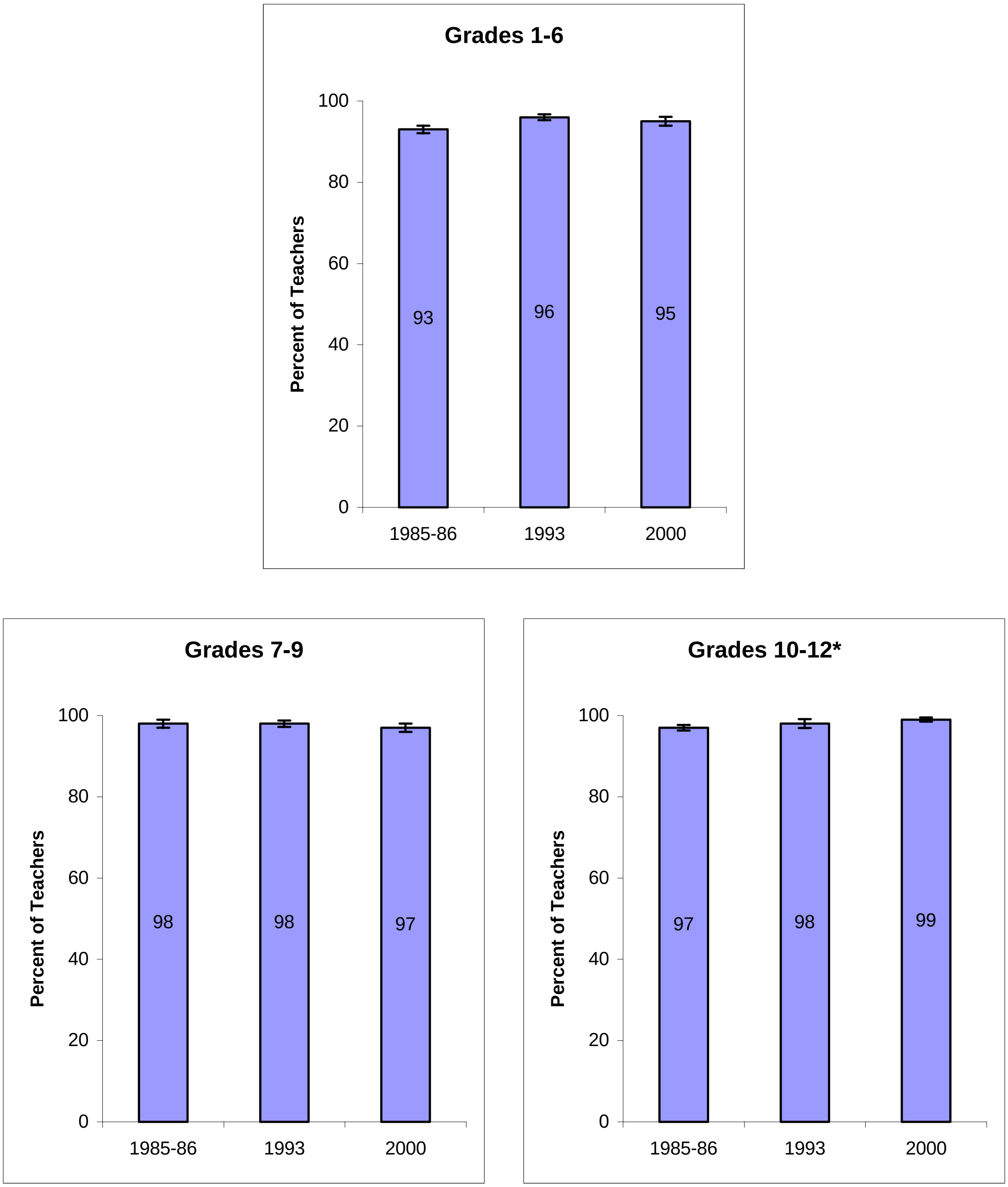
Figure 1.4



§ Includes teachers responding “strongly agree” or “agree” to the statement: “I enjoy teaching science.”

Figure 1.5

Mathematics Teachers Who Enjoy Teaching Mathematics§



* Grades 10–12: 2000 ≠ 1977, $p < 0.05$

§ Includes teachers responding "strongly agree" or "agree" to the statement: "I enjoy teaching mathematics."

Figure 1.6

Section Two

Teachers as Professionals

A number of factors help define the professional lives of teachers. Among these are the collegiality within their schools, the amount of control they feel over their work, and the opportunities they have to participate in professional development. The 1993 and 2000 National Surveys collected data on each of these factors.

Data on science teacher collegiality indicate only a few changes since 1993 (see Tables 2.1 and 2.2). A larger percentage of teachers in each grade range reported in 2000 having time during the school week to collaborate with their colleagues. But even with the increase, only about 1 in 4 teachers agreed that they had such time. Apparently, this increased collaboration was not focused on decisions related to curriculum. Grade 1–4 and 9–12 teachers were less likely in 2000 than in 1993 to report that science teachers in their school contributed to such decisions.

Table 2.1
Science Teachers Agreeing§ with Each of a Number of Statements Related to Teacher Collegiality, by Grade Range: 1993 and 2000

	Percent of Teachers			
	1993		2000	
Grades 1–4				
My colleagues and I regularly share ideas and materials related to science teaching[11]	55	(2.5)	53	(2.8)
Most science teachers in this school contribute actively to making decisions about the science curriculum	44	(2.8)	29*	(2.8)
I have time during the regular school week to work with my colleagues on science curriculum and teaching	14	(1.6)	22*	(2.6)
Science teachers in this school regularly observe each other teaching classes as part of sharing and improving instructional strategies	11	(1.8)	4*	(1.0)
Grades 5–8				
My colleagues and I regularly share ideas and materials related to science teaching[11]	56	(3.1)	59	(4.2)
Most science teachers in this school contribute actively to making decisions about the science curriculum	47	(3.8)	48	(3.6)
I have time during the regular school week to work with my colleagues on science curriculum and teaching	14	(2.4)	25*	(2.7)
Science teachers in this school regularly observe each other teaching classes as part of sharing and improving instructional strategies	11	(1.8)	5*	(1.2)
Grades 9–12				
My colleagues and I regularly share ideas and materials related to science teaching[11]	72	(2.1)	66	(2.3)
Most science teachers in this school contribute actively to making decisions about the science curriculum	66	(2.3)	56*	(2.5)
I have time during the regular school week to work with my colleagues on science curriculum and teaching	16	(3.6)	27*	(2.4)
Science teachers in this school regularly observe each other teaching classes as part of sharing and improving instructional strategies	14	(3.1)	10	(1.1)

* $p < 0.05$
§ Includes teachers responding "strongly agree" or "agree" to each statement.

The picture is quite similar for mathematics teachers. Again, grade 1–4 and 9–12 teachers were less likely to report in 2000 that teachers contribute to decisions about the mathematics curriculum, while teachers in grades 5–8 and 9–12 were more likely to report having time to collaborate with other teachers on mathematics curriculum and teaching.

Table 2.2
Mathematics Teachers Agreeing§ with Each of a Number of Statements Related to Teacher Collegiality, by Grade Range: 1993 and 2000

	Percent of Teachers			
	1993		2000	
Grades 1–4				
My colleagues and I regularly share ideas and materials related to mathematics teaching[12]	65	(2.3)	56*	(2.7)
Most mathematics teachers in this school contribute actively to making decisions about the mathematics curriculum	47	(1.8)	37*	(2.7)
I have time during the regular school week to work with my colleagues on mathematics curriculum and teaching	21	(1.9)	24	(2.3)
Mathematics teachers in this school regularly observe each other teaching classes as part of sharing and improving instructional strategies	12	(1.8)	6*	(1.3)
Grades 5–8				
My colleagues and I regularly share ideas and materials related to mathematics teaching[12]	52	(3.2)	54	(3.5)
Most mathematics teachers in this school contribute actively to making decisions about the mathematics curriculum	46	(2.8)	40	(3.0)
I have time during the regular school week to work with my colleagues on mathematics curriculum and teaching	17	(1.8)	30*	(4.0)
Mathematics teachers in this school regularly observe each other teaching classes as part of sharing and improving instructional strategies	10	(2.1)	7	(1.3)
Grades 9–12				
My colleagues and I regularly share ideas and materials related to mathematics teaching[12]	67	(2.8)	62	(2.4)
Most mathematics teachers in this school contribute actively to making decisions about the mathematics curriculum	69	(2.6)	58*	(2.1)
I have time during the regular school week to work with my colleagues on mathematics curriculum and teaching	16	(1.6)	28*	(1.6)
Mathematics teachers in this school regularly observe each other teaching classes as part of sharing and improving instructional strategies	11	(1.8)	8	(1.0)

* $p < 0.05$

§ Includes teachers responding “strongly agree” or “agree” to each statement.

One of the most obvious differences between 1993 and 2000 is the amount of control science and mathematics teachers perceive themselves to have over decisions related to curriculum. (See Tables 2.3 and 2.4.) In each subject and grade range category, teachers were less likely in 2000 to report strong control over determining course goals and objectives. There was a similar trend in most groups toward less control over selecting the content, topics, and skills to be taught.

Table 2.3
Science Classes Where Teachers Report Having Strong Control§ Over Various Curriculum and Instructional Decisions, by Grade Range: 1993 and 2000

	Percent of Classes			
	1993		2000	
Grades 1–4				
Determining the amount of homework to be assigned	72	(2.1)	67	(2.6)
Selecting teaching techniques	66	(2.1)	56*	(3.4)
Choosing criteria for grading students	60	(3.4)	49*	(2.7)
Setting the pace for covering topics	56	(2.5)	44*	(3.3)
Selecting the sequence in which topics are covered	56	(2.0)	43*	(3.4)
Selecting other instructional materials [besides textbooks]	30	(2.0)	27	(2.3)
Determining course goals and objectives	32	(1.9)	13*	(2.1)
Selecting content, topics, and skills to be taught	27	(2.5)	13*	(2.1)
Selecting textbooks/instructional programs[13]	11	(1.5)	7	(1.7)
Grades 5–8				
Determining the amount of homework to be assigned	75	(3.1)	75	(2.4)
Selecting teaching techniques	72	(3.0)	68	(2.6)
Choosing criteria for grading students	66	(3.1)	63	(3.0)
Setting the pace for covering topics	63	(2.8)	56	(2.6)
Selecting the sequence in which topics are covered	62	(3.0)	59	(2.9)
Selecting other instructional materials [besides textbooks]	42	(2.8)	40	(2.8)
Determining course goals and objectives	40	(3.0)	24*	(2.6)
Selecting content, topics, and skills to be taught	36	(2.6)	22*	(2.4)
Selecting textbooks/instructional programs[13]	25	(2.3)	22	(2.4)
Grades 9–12				
Determining the amount of homework to be assigned	81	(2.5)	83	(1.5)
Selecting teaching techniques	79	(3.0)	80	(1.6)
Choosing criteria for grading students	69	(2.5)	71	(1.7)
Setting the pace for covering topics	71	(2.6)	63*	(2.2)
Selecting the sequence in which topics are covered	68	(2.7)	64	(2.1)
Selecting other instructional materials [besides textbooks]	55	(3.8)	52	(2.5)
Determining course goals and objectives	53	(3.7)	39*	(2.5)
Selecting content, topics, and skills to be taught	50	(3.3)	42	(2.6)
Selecting textbooks/instructional programs[13]	45	(4.2)	36	(2.4)

* $p < 0.05$

§ Includes teachers selecting “5” on a five-point scale with “1” labeled as “no control” and “5” labeled as “strong control.”

Teachers are much more likely to perceive control over decisions related to pedagogy, and these levels have stayed fairly constant since 1993. One exception concerns the pace of instruction; grade 1–4 and 9–12 science and mathematics teachers were less likely in 2000 than in 1993 to report strong control over setting the pace for covering topics, perhaps reflecting the general loss of control they feel over curriculum. This loss is also evident in the decreasing percent of mathematics classes in all three grade ranges where teachers report having strong control over selecting textbooks/instructional programs, especially in grades 9–12. Grade 1–4 science and mathematics teachers appear the most likely to report a loss of control over aspects of pedagogy. (See Tables 2.3 and 2.4.) Otherwise, the majority of teachers appear still to have strong control over most decisions about how they teach their subject.

Table 2.4
Mathematics Classes Where Teachers Report Having Strong Control§ Over Various Curriculum and Instructional Decisions, by Grade Range: 1993 and 2000

	Percent of Classes			
	1993		2000	
Grades 1–4				
Determining the amount of homework to be assigned	68	(3.1)	67	(2.9)
Selecting teaching techniques	69	(2.7)	62	(2.8)
Choosing criteria for grading students	53	(2.7)	44*	(2.9)
Setting the pace for covering topics	60	(3.3)	44*	(3.1)
Selecting the sequence in which topics are covered	52	(2.1)	35*	(2.8)
Selecting other instructional materials [besides textbooks]	36	(2.3)	29*	(2.0)
Determining course goals and objectives	29	(3.1)	11*	(1.7)
Selecting content, topics, and skills to be taught	22	(2.0)	9*	(1.5)
Selecting textbooks/instructional programs[14]	12	(1.4)	5*	(1.1)
Grades 5–8				
Determining the amount of homework to be assigned	72	(2.9)	72	(2.5)
Selecting teaching techniques	71	(2.7)	71	(2.7)
Choosing criteria for grading students	63	(2.7)	56*	(2.3)
Setting the pace for covering topics	55	(3.1)	49	(2.5)
Selecting the sequence in which topics are covered	52	(2.9)	50	(3.2)
Selecting other instructional materials [besides textbooks]	40	(2.1)	41	(2.4)
Determining course goals and objectives	33	(1.8)	20*	(2.6)
Selecting content, topics, and skills to be taught	27	(2.2)	20	(3.1)
Selecting textbooks/instructional programs[14]	20	(2.0)	14*	(1.7)
Grades 9–12				
Determining the amount of homework to be assigned	79	(1.8)	82	(1.5)
Selecting teaching techniques	76	(1.4)	74	(1.6)
Choosing criteria for grading students	66	(2.3)	70	(1.7)
Setting the pace for covering topics	56	(2.4)	50*	(1.9)
Selecting the sequence in which topics are covered	54	(2.4)	52	(2.0)
Selecting other instructional materials [besides textbooks]	52	(2.2)	44*	(2.3)
Determining course goals and objectives	41	(2.4)	27*	(2.0)
Selecting content, topics, and skills to be taught	39	(2.4)	27*	(2.0)
Selecting textbooks/instructional programs[14]	35	(2.6)	25*	(2.1)

* $p < 0.05$

§ Includes teachers selecting "5" on a five-point scale with "1" labeled as "no control" and "5" labeled as "strong control."

A potential explanation for this change in teachers' perceptions lies in the increasing influence exerted by state testing programs. As shown in Table 2.5, teachers in both subjects and all grade ranges were much more likely in 2000 than in 1993 to agree that the testing program in their state/district dictates what they teach.

Table 2.5
Science and Mathematics Teachers Agreeing§ That the State/District Testing Program Dictates What They Teach, by Grade Range: 1993 and 2000

	Percent of Teachers			
	1993[15]		2000	
Science				
Grades 1–4	38	(2.7)	58*	(2.9)
Grades 5–8	40	(3.4)	56*	(3.3)
Grades 9–12	30	(2.7)	57*	(2.4)
Mathematics				
Grades 1–4	60	(2.5)	79*	(1.8)
Grades 5–8	52	(3.7)	74*	(3.3)
Grades 9–12	40	(2.5)	65*	(2.4)

* $p < 0.05$
§ Includes teachers responding "strongly agree" or "agree" to each statement.

There has been little change since 1993 in participation in professional development. As shown in Tables 2.6 and 2.7, fewer than 25 percent of teachers in grades 1–4 and 5–8 report spending more than 35 hours in subject-specific professional development over the last three years, compared to more than 40 percent of high school teachers. For high school mathematics teachers, the increase was significant.

Table 2.6
Time Science Teachers Spent on In-Service Education in Science in Last Three Years, by Grade Range: 1993 and 2000

	Percent of Teachers			
	1993		2000	
Grades 1–4				
None	26	(2.8)	26	(2.4)
Less than 6 hours	30	(1.8)	27	(2.3)
6–15 hours	22	(2.1)	25	(2.4)
16–35 hours	14	(1.9)	13	(2.0)
More than 35 hours	9	(1.8)	10	(1.6)
Grades 5–8				
None	17	(1.9)	15	(2.4)
Less than 6 hours	22	(2.6)	15*	(2.4)
6–15 hours	27	(4.2)	27	(3.5)
16–35 hours	14	(2.8)	25*	(3.7)
More than 35 hours	20	(2.4)	18	(2.5)
Grades 9–12				
None	12	(1.5)	8*	(1.0)
Less than 6 hours	14	(1.8)	8*	(1.5)
6–15 hours	18	(3.0)	16	(1.3)
16–35 hours	19	(1.4)	23	(1.7)
More than 35 hours	38	(3.1)	45	(2.0)

* $p < 0.05$

Table 2.7
Time Mathematics Teachers Spent on In-Service Education in Mathematics in Last Three Years, by Grade Range: 1993 and 2000

	Percent of Teachers			
	1993		2000	
Grades 1–4				
None	17	(1.5)	15	(2.0)
Less than 6 hours	22	(2.0)	21	(2.3)
6–15 hours	29	(2.4)	31	(2.4)
16–35 hours	18	(2.4)	18	(1.8)
More than 35 hours	15	(2.0)	15	(2.0)
Grades 5–8				
None	15	(1.5)	14	(3.3)
Less than 6 hours	22	(3.5)	15	(2.7)
6–15 hours	23	(2.5)	29	(3.0)
16–35 hours	24	(2.5)	19	(2.3)
More than 35 hours	17	(2.0)	23	(2.5)
Grades 9–12				
None	10	(1.8)	7	(1.3)
Less than 6 hours	14	(2.8)	8	(1.4)
6–15 hours	21	(1.8)	17	(1.7)
16–35 hours	24	(2.6)	25	(1.8)
More than 35 hours	31	(2.2)	43*	(2.2)

* $p < 0.05$

As can be seen in Tables 2.8 and 2.9, teachers' participation in various professional activities has also remained fairly constant from 1993 to 2000.

Table 2.8
Science Teachers Participating in Various Science-Related Professional Activities in Last Twelve Months, by Grade Range: 1993 and 2000

	Percent of Teachers			
	1993		2000	
Grades 1–4				
Served on a school or district science curriculum committee	17	(3.4)	14	(1.7)
Served on a school or district science textbook selection committee	14	(2.0)	13	(1.8)
Taught any in-service workshops in science or science teaching	5	(1.1)	2*	(0.6)
Received any local, state, or national grants or awards for science teaching	3	(0.7)	2	(0.7)
Grades 5–8				
Served on a school or district science curriculum committee	26	(2.3)	35*	(3.1)
Served on a school or district science textbook selection committee	19	(2.1)	28*	(2.9)
Taught any in-service workshops in science or science teaching	9	(1.2)	10	(2.2)
Received any local, state, or national grants or awards for science teaching	8	(1.3)	6	(1.6)
Grades 9–12				
Served on a school or district science curriculum committee	40	(2.7)	41	(2.1)
Served on a school or district science textbook selection committee	37	(2.9)	37	(2.1)
Taught any in-service workshops in science or science teaching	16	(2.0)	15	(1.3)
Received any local, state, or national grants or awards for science teaching	17	(0.7)	16	(1.3)

* $p < 0.05$

Table 2.9
Mathematics Teachers Participating in Various Mathematics-Related Professional Activities in Last Twelve Months, by Grade Range: 1993 and 2000

	Percent of Teachers			
	1993		2000	
Grades 1–4				
Served on a school or district mathematics curriculum committee	18	(1.9)	15	(1.8)
Served on a school or district mathematics textbook selection committee	16	(2.0)	15	(2.0)
Taught any in-service workshops in mathematics or mathematics teaching	6	(1.4)	3	(0.8)
Received any local, state, or national grants or awards for mathematics teaching	3	(0.7)	1*	(0.5)
Grades 5–8				
Served on a school or district mathematics curriculum committee	25	(2.6)	29	(2.5)
Served on a school or district mathematics textbook selection committee	31	(2.7)	28	(3.0)
Taught any in-service workshops in mathematics or mathematics teaching	6	(0.8)	13*	(2.0)
Received any local, state, or national grants or awards for mathematics teaching	3	(0.8)	4	(0.9)
Grades 9–12				
Served on a school or district mathematics curriculum committee	51	(2.5)	38*	(2.1)
Served on a school or district mathematics textbook selection committee	47	(2.9)	41	(2.2)
Taught any in-service workshops in mathematics or mathematics teaching	13	(1.2)	14	(1.2)
Received any local, state, or national grants or awards for mathematics teaching	8	(0.6)	7	(0.8)

* $p < 0.05$

Section Three

Science and Mathematics Classes

In both 1993 and 2000, the National Survey of Science and Mathematics Education asked teachers to indicate the number of minutes spent in the most recent lesson in a randomly selected class. Since some subjects may not be taught every day in some classes, teachers were also asked to indicate if the selected lesson had taken place on the most recent school day. As can be seen in Table 3.1, in grades 1–4, mathematics continues to be taught more often than science, though the gap is closing. In 1993, 95 percent of grade 1–4 classes received instruction in mathematics on a typical day, compared to only 62 percent for science. In 2000, the percentage of classes receiving science instruction on a typical day increased to 72 percent. There have been no significant changes in grades 5–8 and 9–12, where instruction tends to be departmentalized, and students receive instruction in each subject every time the class meets.

Table 3.1
Science and Mathematics Lessons Taught on Most Recent Day of School, by Grade Range: 1993 and 2000

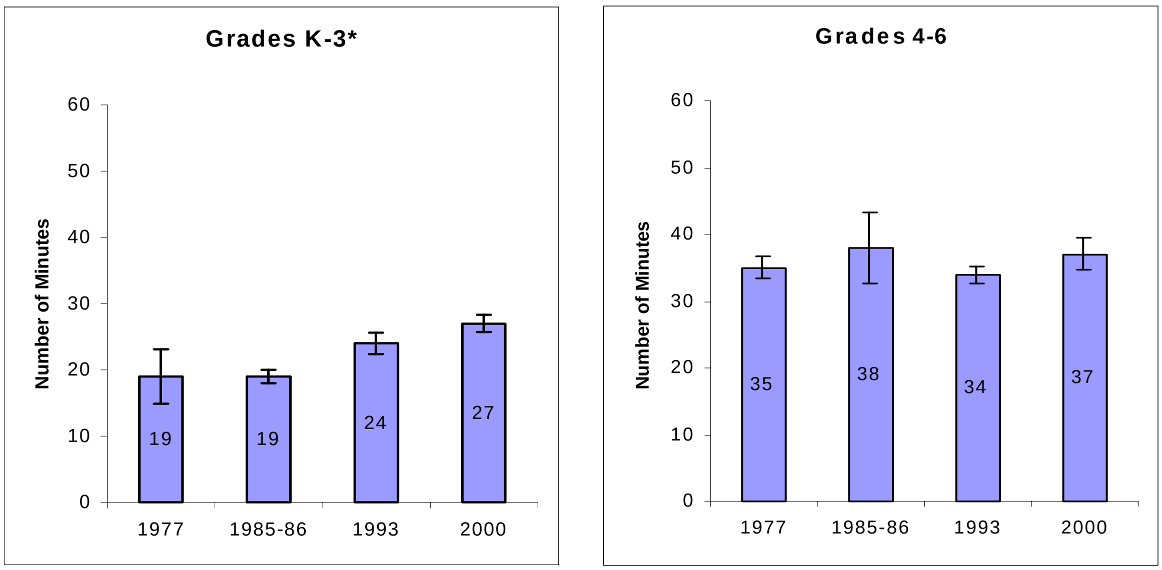
	Percent of Classes			
	1993		2000	
Science				
Grades 1–4	62	(2.8)	72*	(2.4)
Grades 5–8	85	(2.2)	90	(1.9)
Grades 9–12	94	(1.0)	93	(1.1)
Mathematics				
Grades 1–4	95	(1.1)	95	(1.2)
Grades 5–8	93	(1.8)	93	(1.8)
Grades 9–12	93	(1.1)	92	(1.0)

* $p < 0.05$

As can be seen in Figures 3.1 and 3.2, between 1977 and 2000 the time spent on science in grades K–3 increased slightly and the time spent on mathematics has increased in both grades K–3 and 4–6. Time spent on mathematics in grades 4–6 also increased between 1993 and 2000. Although time spent on science in grades K–3 increased slightly between 1977 and 2000, science still receives much less attention than mathematics.

A similar pattern was found when teachers were asked about their typical instruction rather than their most recent lesson. Elementary teachers were asked for the approximate number of minutes per day they spent teaching mathematics, science, social studies, and reading/language arts. Examining the responses of only those teachers who teach all four subject areas, the amount of time spent on mathematics has increased steadily since 1977 (Figures 3.3 and 3.4). The amount of time spent on science, while greater than in 1977, is the same as in 1993.

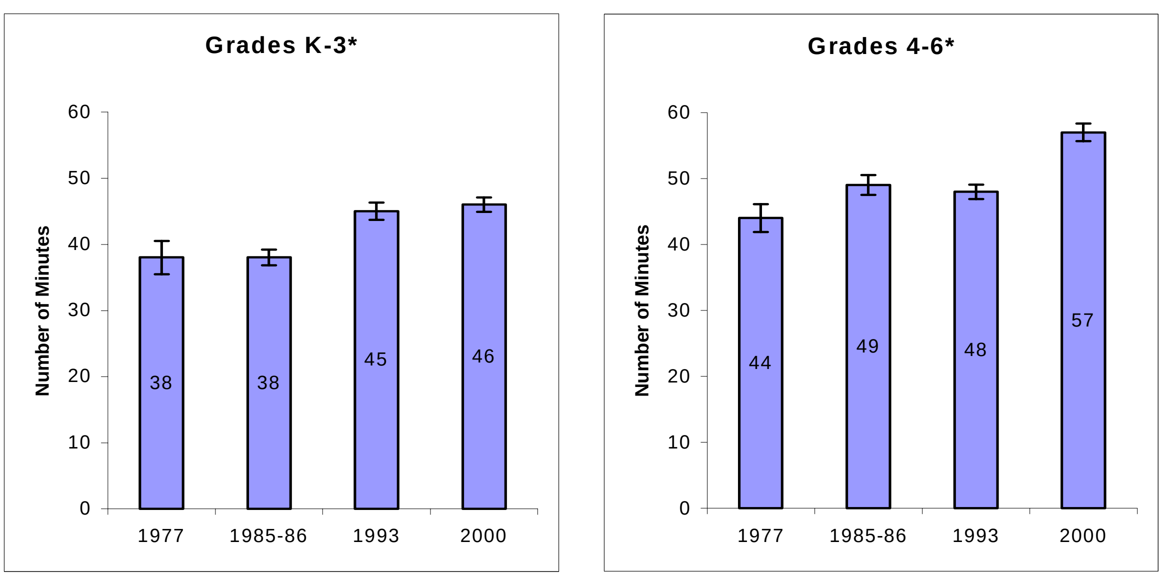
Average Number of Minutes Per Day Spent in Elementary School Science Class[16, 17]



* Grades K–3: 2000 ≠ 1977, $p < 0.05$

Figure 3.1

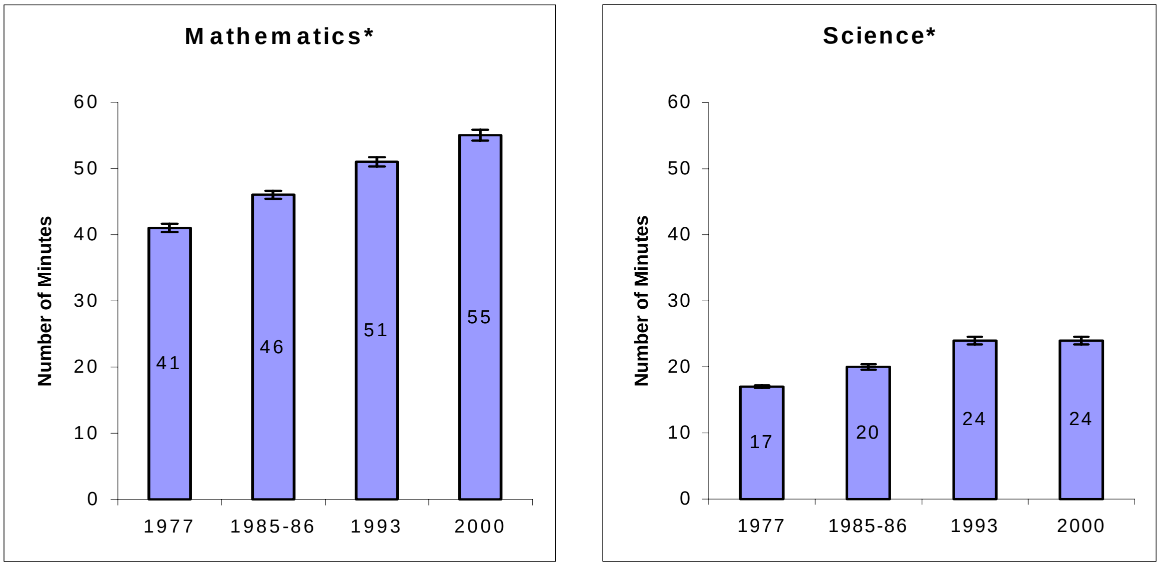
Average Number of Minutes Per Day Spent In Elementary School Mathematics Class[18, 19]



* Grades K–3: 2000 ≠ 1977; Grades 4–6: 2000 ≠ 1993, 2000 ≠ 1977, $p < 0.05$

Figure 3.2

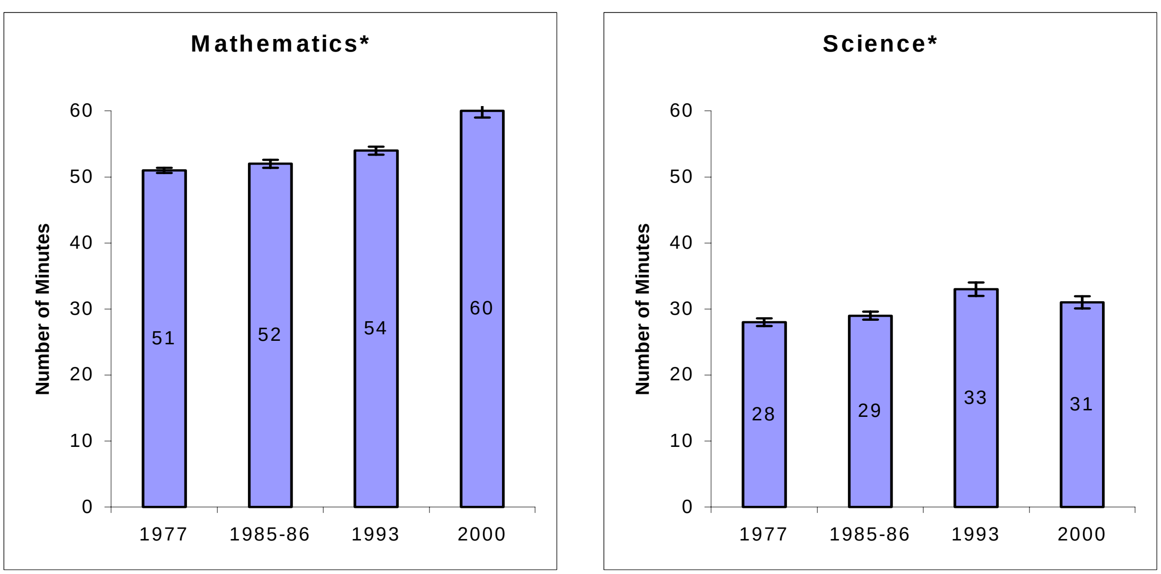
Average Number of Minutes Per Day Spent Teaching Each Subject in Grade 1–3 Self-Contained Classrooms[20, 21]



* Reading/Language Arts: 2000 ≠ 1993, 2000 ≠ 1977; Mathematics: 2000 ≠ 1993, 2000 ≠ 1977; Science: 2000 ≠ 1977, $p < 0.05$

Figure 3.3

Average Number of Minutes Per Day Spent Teaching Each Subject in Grade 4–6 Self-Contained Classrooms[22]



* Reading/Language Arts: 2000 ≠ 1993, 2000 ≠ 1977; Mathematics: 2000 ≠ 1993, 2000 ≠ 1977; Social Studies: 2000 ≠ 1993; Science: 2000 ≠ 1977, $p < 0.05$

Figure 3.4

Data from the program questionnaire sent to each school in the sample shed light on middle and high school course offerings. Table 3.2 shows the percentage of schools with grades 7 or 8 offering various science courses. Although the percentage of these schools offering life, earth, and physical science has remained fairly stable, there has been an increase in the offering of general or integrated science.

Table 3.2
Schools Offering Various Science Courses, Grades 7 or 8[23]: 1993 and 2000

	Percent of Schools			
	1993		2000	
Life science	68	(5.5)	63	(4.2)
Earth science	53	(4.9)	48	(4.2)
Physical science	36	(4.8)	43	(4.3)
General or integrated science[24]	42	(5.8)	65*	(4.3)

* $p < 0.05$

In high schools, there appears to be a trend towards increased offering of advanced science courses, with more schools offering 2nd year or AP chemistry and physics. (See Table 3.3.) Fewer high schools are offering general science, and more are offering environmental science and integrated science.

Table 3.3
Schools Offering Various Science Courses in Grades 10, 11, or 12: 1993 and 2000

	Percent of Schools			
	1993		2000	
Biology				
1st Year	96	(1.8)	91	(2.9)
1st Year, Applied	22	(2.1)	28	(3.7)
Any 1st Year	98	(1.0)	95	(1.7)
2nd Year, AP	22	(2.8)	28	(3.1)
2nd Year, Advanced	49	(3.0)	48	(3.7)
2nd Year, Other	20	(2.4)	23	(3.0)
Any 2nd Year	74	(1.9)	69	(4.6)
Chemistry				
1st Year	94	(2.2)	91	(3.2)
1st Year, Applied	14	(2.0)	13	(2.0)
Any 1st Year	94	(2.2)	91	(3.1)
2nd Year, AP	18	(1.6)	24*	(2.6)
2nd Year, Advanced	16	(1.5)	17	(2.2)
Any 2nd Year	18	(1.6)	36*	(3.5)
Physics				
1st Year	88	(3.9)	81	(4.1)
1st Year, Applied	9	(1.5)	14	(2.2)
Any 1st Year	88	(3.8)	83	(4.1)
2nd Year, AP	10	(1.1)	15*	(1.9)
2nd Year, Advanced	5	(1.1)	6	(1.2)
Any 2nd Year	14	(1.3)	20*	(2.3)
Physical Science	44	(3.0)	48	(3.6)
Earth Science				
Astronomy/Space Science	6	(1.1)	19*	(2.8)
Geology	5	(1.5)	8	(2.0)
Meteorology	1	(0.5)	3	(1.2)
Oceanography/Marine Science	7	(1.0)	10	(1.9)
1st Year	30	(3.0)	31	(3.0)
1st Year, Applied	2	(0.3)	8	(3.2)
Any 1st Year	38	(3.3)	34	(3.5)
2nd Year, Advanced	2	(0.6)	2	(0.8)
Other Science				
General Science	29	(3.4)	19*	(3.0)
Environmental Science	24	(2.3)	39*	(3.4)
Coordinated Science	2	(0.6)	4	(2.4)
Integrated Science	4	(1.3)	12*	(1.9)
Other				
Coordinated/Integrated Science	6	(1.4)	16*	(2.9)
General, Coordinated, or Integrated Science	34	(3.2)	32	(3.3)

* $p < 0.05$

Turning to mathematics, there have been no significant changes in the courses being offered in schools with grade 7 or grade 8. (See Table 3.4.) "Regular" mathematics is still the most widely offered course in both grades, and Algebra 1 is offered in about 60 percent of schools that include grades 7 and/or 8.

Table 3.4
Schools Offering Various
Mathematics Courses, Grades 7 or 8: 1993 and 2000

	Percent of Schools			
	1993		**2000**	
Grades 7				
Remedial Mathematics	33	(5.4)	27	(3.6)
Regular Mathematics	91	(2.4)	88	(3.1)
Accelerated Mathematics	51	(6.0)	41	(4.1)
Grade 8				
Remedial Mathematics	32	(4.8)	30	(3.6)
Regular Mathematics	79	(5.1)	76	(3.7)
Enriched Mathematics	34	(4.4)	25	(3.3)
Grade 7 or 8				
Algebra 1	58	(5.5)	62	(4.3)

* $p < 0.05$

However, there have been two notable changes in the mathematics courses offered at the high school level. First, there has been a marked decrease in the percentage of schools offering "review" mathematics courses. (See Table 3.5.) There has also been an increase in the percentage of schools offering courses in probability and statistics. Both of these changes may reflect an influence of the NCTM *Standards* that call for an end to low-level mathematics courses and for including additional topics such as probability, statistics, and discrete mathematics in the mathematics curriculum.

Table 3.5
Schools Offering Various Mathematics Courses in Grades 10, 11, or 12: 1993 and 2000

	Percent of Schools			
	1993		2000	
Review Mathematics				
Level 1 (e.g., Remedial Mathematics)	41	(2.7)	28*	(2.5)
Level 2 (e.g., Consumer Mathematics)	56	(3.7)	27*	(2.5)
Level 3 (e.g., General Mathematics 3)	28	(3.5)	17*	(2.4)
Level 4 (e.g., General Mathematics 4)	11	(3.2)	10	(1.8)
Informal Mathematics				
Level 1 (e.g., Pre-Algebra)	57	(3.5)	50	(3.5)
Level 2 (e.g., Basic Geometry)	31	(3.3)	23	(2.7)
Level 3 (e.g., after Pre-Algebra, but not Algebra 1)	17	(2.6)	17	(2.1)
Formal Mathematics				
Level 1 (e.g., Algebra 1 or Integrated Math 1)	98	(1.2)	98	(0.8)
Level 2 (e.g., Geometry or Integrated Math 2)	97	(1.4)	94	(2.2)
Level 3 (e.g., Algebra 2 or Integrated Math 3)	97	(1.5)	96	(2.0)
Level 4 (e.g., Algebra 3 or Pre-Calculus)	90	(2.7)	89	(2.9)
Level 5 (e.g., Calculus)	41	(2.8)	43	(3.5)
Level 5, AP	34	(2.7)	36	(3.2)
Other Mathematics Courses				
Probability and Statistics	13	(2.0)	23*	(2.7)
Mathematics integrated with other subjects	3	(0.8)	4	(0.8)

* $p < 0.05$

The program questionnaire provided information about the percentage of the nation's schools offering various science and mathematics courses; in order to distinguish between courses offered but rarely taken, and those with large enrollments, the teacher questionnaire asked each teacher to provide the title of a randomly selected class. As can be seen in Table 3.6, in grades 7–8, life science accounted for only 25 percent of science classes in 2000, down from 44 percent in 1993, with the opposite pattern for general/integrated science. The distribution of grade 9–12 science classes in 2000 was not markedly different from that in 1993.

Table 3.6
Grade 7–8 and Grade 9–12
Science Classes: 1993 and 2000

	Percent of Classes			
	1993		2000	
Grades 7–8[25]				
Life Science	44	(5.0)	25*	(3.6)
Earth Science	21	(3.6)	17	(3.2)
Physical Science	12	(2.1)	12	(2.8)
General or integrated science[26]	23	(3.7)[27]	46*	(4.0)
Grades 9–12				
1st Year Biology	33	(2.1)	30	(2.1)
Advanced Biology	7	(1.3)	6	(0.8)
1st Year Chemistry	16	(1.1)	19	(1.2)
Advanced Chemistry	2	(2.1)	3	(1.6)
1st Year Physics	7	(0.6)	10*	(1.0)
Advanced Physics	2	(0.5)	2	(0.3)
Physical Science	15	(1.5)	7*	(1.0)
Earth Science	10	(2.2)	7	(1.0)
General Science	4	(1.2)	3	(0.7)
Integrated/Coordinated/Other Science	4	(0.7)	14*	(1.3)

* $p < 0.05$

As can be seen in Table 3.7, the distribution of mathematics classes in grades 7–8 and 9–12 has remained fairly stable, with some increase in Algebra 1 classes in grades 7–8 and some decrease in review/general mathematics classes at the high school level.

Table 3.7
Grade 7–8 and Grade 9–12
Mathematics Classes: 1993 and 2000

	Percent of Classes			
	1993		2000	
Grades 7–8				
Remedial Mathematics, 7	2	(0.7)	6*	(1.2)
Regular Mathematics, 7	32	(3.3)	30	(2.5)
Accelerated Mathematics, 7	18	(2.8)	11	(2.3)
Remedial Mathematics, 8	3	(0.9)	1*	(0.4)
Regular Mathematics, 8	22	(3.1)	21	(2.5)
Enriched Mathematics, 8	14	(2.4)	15	(2.5)
Algebra 1, Grade 7 or 8	10	(2.1)	17*	(2.3)
Grades 9–12				
Algebra 1/Mathematics 1	22	(1.5)	23	(1.7)
Geometry/Mathematics 2	21	(1.7)	20	(1.4)
Algebra 2/Mathematics 3	19	(1.8)	18	(1.4)
Advanced Mathematics/Calculus	15	(1.2)	19	(1.7)
Informal/Basic Mathematics	13	(1.3)	12	(1.2)
Review/General Mathematics	10	(1.3)	5*	(0.8)

* $p < 0.05$

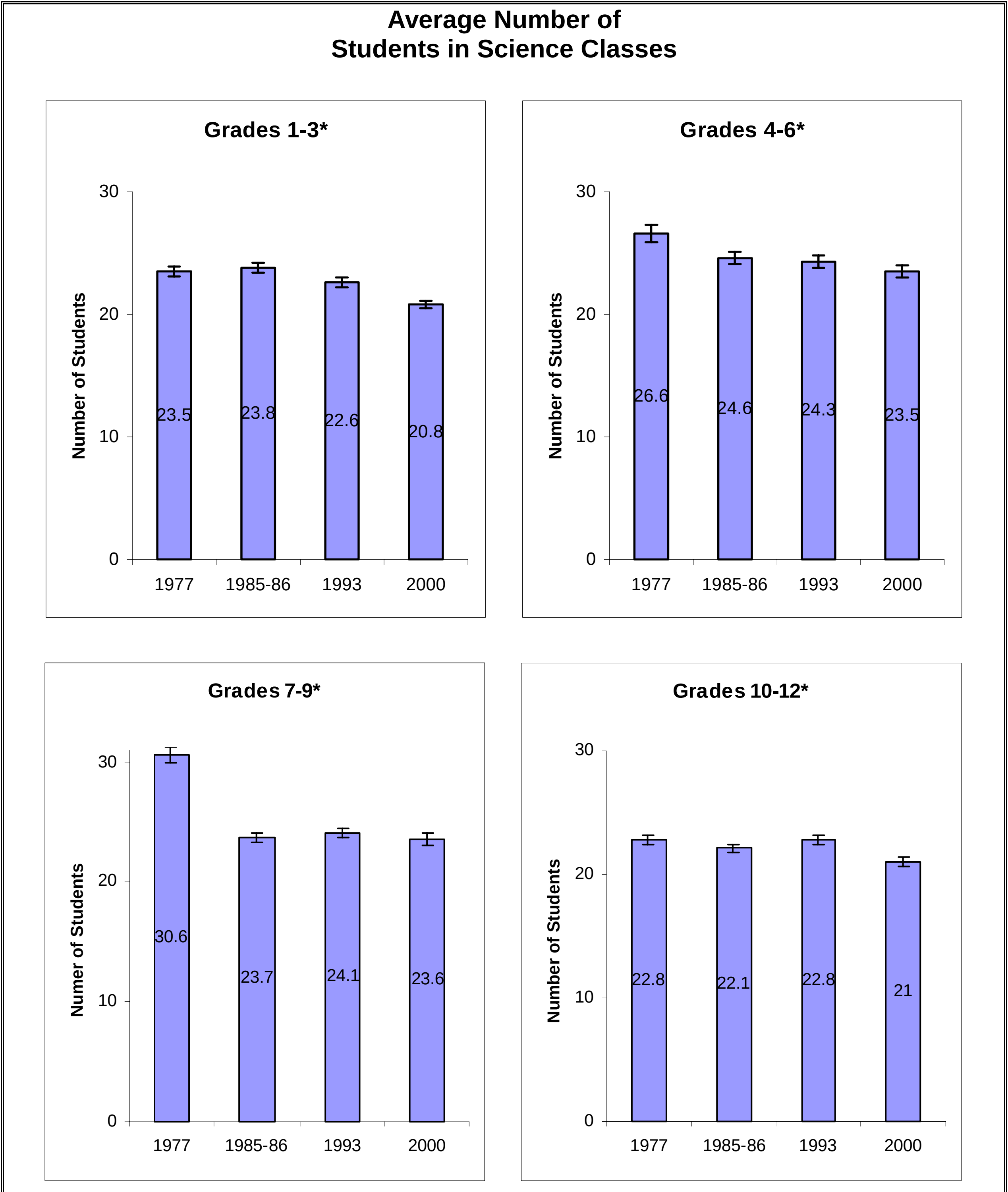
Data from this series of surveys show a pattern of decreased class sizes in all grade ranges in both science and mathematics since 1977. (See Figures 3.5 and 3.6.) In addition, grade 1–3 science and mathematics classes are smaller in 2000 than they were in 1993, reflecting the class size reduction efforts of the past few years.

As can be seen in Table 3.8, trend data also show that a smaller percentage of grade 9–12 science classes had students assigned to them by ability level in 2000. There was no change in the use of this practice in science at the other grade levels, or in mathematics, where ability grouping continues to be more prevalent than in science.

Table 3.8
Students Assigned to Science and Mathematics Classes by Ability Level, by Grade Range: 1993 and 2000

	Percent of Classes			
	1993		2000	
Science				
Grades 1–4	6	(2.6)	6	(1.3)
Grades 5–8	15	(1.7)	14	(1.5)
Grades 9–12	50	(2.5)	40*	(2.3)
Mathematics				
Grades 1–4	14	(2.3)	11	(1.9)
Grades 5–8	46	(2.5)	46	(2.2)
Grades 9–12	66	(1.8)	65	(2.0)

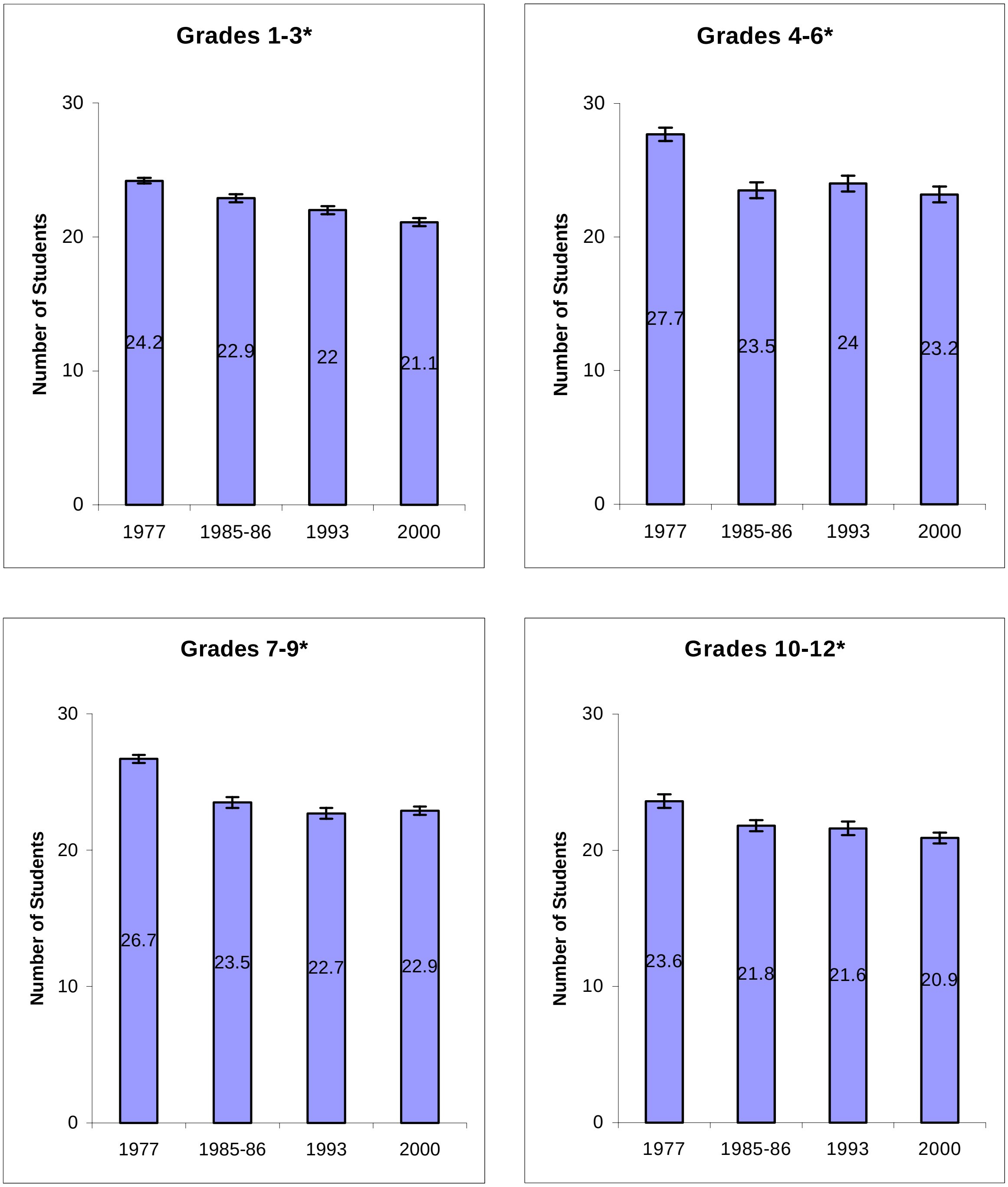
* $p < 0.05$



* Grades 1–3: 2000 ≠ 1993, 2000 ≠ 1977; Grades 4–6: 2000 ≠ 1977; Grades 7–9: 2000 ≠ 1977; Grades 10–12: 2000 ≠ 1993, 2000 ≠ 1977, $p < 0.05$

Figure 3.5

Average Number of Students in Mathematics Classes



* Grades 1–3: 2000 ≠ 1993, 2000 ≠ 1977; Grades 4–6: 2000 ≠ 1977; Grades 7–9: 2000 ≠ 1977; Grades 10–12: 2000 ≠ 1977, $p < 0.05$

Figure 3.6

Regardless of whether students were assigned to their class by ability level, teachers were asked to indicate the ability make-up of the randomly selected class. Table 3.9 shows that in science, the ability distribution of science classes has not changed much between 1993 and 2000. There are some significant differences in mathematics, but no clear pattern emerged.

Table 3.9
Ability Grouping in Science
Classes, by Grade Range: 1993 and 2000

	Percent of Classes			
	1993		2000	
Grades 1–4				
Fairly homogeneous and low in ability	6	(1.8)	6	(1.8)
Fairly homogeneous and average in ability	24	(2.2)	28	(2.5)
Fairly homogeneous and high in ability	4	(1.1)	5	(1.4)
Heterogeneous, with a mixture of two or more ability levels	66	(2.6)	61	(2.8)
Grades 5–8				
Fairly homogeneous and low in ability	4	(0.5)	8*	(1.4)
Fairly homogeneous and average in ability	26	(2.2)	23	(2.3)
Fairly homogeneous and high in ability	12	(1.9)	11	(1.4)
Heterogeneous, with a mixture of two or more ability levels	58	(2.4)	58	(2.3)
Grades 9–12				
Fairly homogeneous and low in ability	10	(1.7)	7	(0.9)
Fairly homogeneous and average in ability	26	(1.9)	29	(2.1)
Fairly homogeneous and high in ability	27	(3.0)	27	(2.1)
Heterogeneous, with a mixture of two or more ability levels	37	(1.5)	37	(2.0)

* $p < 0.05$

Table 3.10
Ability Grouping in Mathematics
Classes, by Grade Range: 1993 and 2000

	Percent of Classes			
	1993		2000	
Grades 1–4				
Fairly homogeneous and low in ability	6	(0.9)	5	(1.2)
Fairly homogeneous and average in ability	24	(2.1)	20	(2.1)
Fairly homogeneous and high in ability	7	(1.7)	5	(1.1)
Heterogeneous, with a mixture of two or more ability levels	63	(2.6)	70*	(2.4)
Grades 5–8				
Fairly homogeneous and low in ability	8	(1.1)	12*	(1.4)
Fairly homogeneous and average in ability	25	(2.7)	26	(2.1)
Fairly homogeneous and high in ability	22	(2.5)	18	(2.1)
Heterogeneous, with a mixture of two or more ability levels	46	(2.3)	44	(2.4)
Grades 9–12				
Fairly homogeneous and low in ability	11	(1.3)	17*	(1.3)
Fairly homogeneous and average in ability	34	(1.5)	31	(1.6)
Fairly homogeneous and high in ability	24	(2.4)	26	(1.8)
Heterogeneous, with a mixture of two or more ability levels	32	(2.0)	26*	(1.9)

* $p < 0.05$

Tables 3.11 and 3.12 show ability grouping in selected high school science and mathematics courses. The data indicate that there have been no statistically significant changes in the use of ability grouping in these courses between 1993 and 2000.

Table 3.11
Ability Grouping in Selected High School Science Courses, by Courses: 1993 and 2000

	Percent of Classes			
	1993		2000	
1st Year Biology				
Low Ability	12	(3.7)	9	(1.8)
Average Ability	33	(3.8)	34	(4.5)
High Ability	16	(2.7)	17	(2.5)
Heterogeneous	39	(5.8)	41	(3.9)
1st Year Chemistry				
Low Ability	3	(1.2)	3	(0.9)
Average Ability	35	(3.7)	30	(3.7)
High Ability	36	(5.0)	33	(3.9)
Heterogeneous	26	(3.3)	35	(4.2)
1st Year Physics				
Low Ability	1	(0.9)	1	(0.4)
Average Ability	23	(4.1)	20	(4.5)
High Ability	50	(6.8)	46	(6.2)
Heterogeneous	26	(5.0)	33	(6.7)

Table 3.12
Ability Grouping in Selected High School Mathematics Courses, by Courses: 1993 and 2000

	Percent of Classes			
	1993		2000	
Geometry/Integrated Math 2				
Low Ability	5	(2.0)	7	(1.9)
Average Ability	37	(4.6)	36	(3.7)
High Ability	20	(2.7)	25	(3.8)
Heterogeneous	39	(4.2)	32	(4.5)
Algebra 2/Integrated Math 3				
Low Ability	4	(1.2)	4	(1.5)
Average Ability	33	(3.8)	33	(3.7)
High Ability	35	(7.5)	29	(3.7)
Heterogeneous	28	(5.6)	34	(3.8)
Algebra 3/Integrated Math 4/Calculus				
Low Ability	1	(0.5)	2	(1.1)
Average Ability	15	(2.6)	18	(3.8)
High Ability	62	(3.3)	59	(6.7)
Heterogeneous	23	(3.7)	20	(7.3)

Teachers were also asked if the randomly selected science/mathematics class included students who were formally classified as learning disabled, limited English proficient (LEP), mentally handicapped, or physically handicapped. As can be seen in Tables 3.13 and 3.14, in both science and mathematics there have been increases in the percentage of grade 1–4 classes including LEP students. While only a few of the changes are statistically significant, there does appear to be a trend towards greater inclusion of special needs students in science and mathematics classes.

Table 3.13
Science Classes with One or More Students with Particular Special Needs, by Grade Range: 1993 and 2000

	Percent of Classes			
	1993		2000	
Grades 1–4				
Learning Disabled	53	(3.2)	56	(2.7)
Limited English Proficiency	22	(2.3)	36*	(3.0)
Mentally Handicapped	9	(1.4)	9	(1.5)
Physically Handicapped	4	(0.8)	7	(1.5)
Grades 5–8				
Learning Disabled	54	(3.3)	63*	(2.6)
Limited English Proficiency	18	(2.0)	22	(2.3)
Mentally Handicapped	7	(1.2)	9	(1.5)
Physically Handicapped	6	(1.3)	7	(1.3)
Grades 9–12				
Learning Disabled	31	(2.7)	37	(2.2)
Limited English Proficiency	14	(1.3)	17	(1.5)
Mentally Handicapped	2	(0.3)	3	(0.8)
Physically Handicapped	5	(1.0)	4	(0.7)

* $p < 0.05$

Table 3.14
Mathematics Classes with One or More Students with Particular Special Needs, by Grade Range: 1993 and 2000

	Percent of Classes			
	1993		2000	
Grades 1–4				
Learning Disabled	52	(2.6)	52	(2.6)
Limited English Proficiency	20	(2.1)	33*	(3.0)
Mentally Handicapped	5	(0.6)	7	(1.3)
Physically Handicapped	6	(1.1)	6	(1.1)
Grades 5–8				
Learning Disabled	40	(2.6)	47	(2.6)
Limited English Proficiency	16	(2.1)	20	(1.7)
Mentally Handicapped	2	(0.6)	2	(0.5)
Physically Handicapped	4	(1.4)	4	(0.9)
Grades 9–12				
Learning Disabled	24	(1.4)	31*	(1.8)
Limited English Proficiency	15	(1.4)	16	(1.3)
Mentally Handicapped	1	(0.2)	2	(0.5)
Physically Handicapped	2	(0.4)	4*	(0.6)

* $p < 0.05$

Tables 3.15 and 3.16 show the percentage of science and mathematics classes with LEP students by region and by community type. In both science and mathematics, there have been sizable increases in the percentage of classes containing LEP students in the south and west, reflecting recent immigration patterns.

Table 3.15
Science Classes with One or More Limited English Proficiency Students, by Region and Community Type: 1993 and 2000

	Percent of Classes			
	1993		2000	
Region				
Midwest	11	(1.8)	17	(2.8)
Northeast	17	(2.5)	17	(3.7)
South	13	(1.9)	24*	(2.3)
West	33	(3.3)	49*	(4.0)
Community Type				
Urban	28	(2.9)	32	(2.8)
Suburban	22	(2.1)	28	(2.4)
Rural	6	(1.4)	13	(3.3)

* $p < 0.05$

Table 3.16
Mathematics Classes with One or More Limited English Proficiency Students, by Region and Community Type: 1993 and 2000

	Percent of Classes			
	1993		2000	
Region				
Midwest	8	(1.7)	13*	(1.9)
Northeast	14	(2.5)	14	(2.5)
South	12	(0.8)	23*	(2.7)
West	34	(2.5)	45*	(3.8)
Community Type				
Urban	21	(2.9)	33*	(2.5)
Suburban	21	(1.6)	23	(2.3)
Rural	9	(1.6)	11	(2.1)

* $p < 0.05$

Although the percentage of females in science courses remained the same in all grade ranges from 1993 to 2000, there has been an increase in the percentage of non-Asian minority students in grades 9–12, particularly in chemistry and physics courses. (See Table 3.17.) The increase in non-Asian minority enrollment is also evident in mathematics in grades 9–12, in Algebra 1, Geometry, and Algebra 2 courses. (See Table 3.18.)

Table 3.17
Female and Non-Asian Minority Students in Science Classes, by Grade Range and Courses: 1993 and 2000

	Percent of Students							
	Female				Non-Asian Minority			
	1993		2000		1993		2000	
Grades								
Grades 1–4	48	(0.6)	49	(0.5)	26	(2.4)	32	(3.1)
Grades 5–8	50	(0.7)	50	(0.7)	24	(2.1)	29	(2.3)
Grades 9–12	50	(1.1)	52	(0.6)	18	(1.2)	25*	(1.6)
Grades 9–12 Courses								
1st Year Biology	52	(1.7)	52	(1.0)	22	(2.9)	25	(2.1)
1st Year Chemistry	53	(1.8)	56	(1.3)	12	(1.7)	21*	(2.4)
1st Year Physics	42	(2.9)	46	(1.9)	11	(2.1)	19*	(3.5)

* $p < 0.05$

Table 3.18
Female and Non-Asian Minority Students in Mathematics Classes, by Grade Range and Courses: 1993 and 2000

	Percent of Students							
	Female				Non-Asian Minority			
	1993		2000		1993		2000	
Grades								
Grades 1–4	50	(0.4)	49	(0.6)	24	(2.0)	31*	(2.8)
Grades 5–8	49	(0.7)	50	(0.7)	25	(2.7)	28	(2.3)
Grades 9–12	50	(0.7)	52*	(0.6)	19	(1.0)	26*	(1.5)
Grades 9–12 Courses								
Review/Informal Mathematics	45	(1.6)	46	(2.6)	34	(2.9)	41	(4.8)
Algebra 1	50	(1.3)	53	(1.5)	20	(2.4)	36*	(2.9)
Geometry/Mathematics 2	53	(1.5)	54	(1.2)	13	(1.3)	21*	(2.4)
Algebra 2/Mathematics 3	53	(2.1)	54	(1.3)	13	(1.9)	23*	(2.3)
Advanced Mathematics	49	(1.6)	52	(1.2)	8	(1.3)	12	(1.7)

* $p < 0.05$

Section Four

Instructional Objectives and Activities

The 1993 and 2000 National Surveys provide three sources of information about science and mathematics teaching. One series of items listed various instructional strategies and asked teachers to indicate the frequency with which they used each in a randomly selected class. A second item listed a number of activities and asked teachers to indicate which occurred in the most recent lesson in their randomly selected class. Finally, a third item asked teachers to indicate the number of minutes devoted to each of several activities in their most recent lesson. The data for science instruction from these three items are presented in Tables 4.1–4.4. While several of the differences between 1993 and 2000 are statistically significant, science instruction does not appear to have changed substantially in the last seven years.

There has been a reduction in the frequency of some “traditional” activities. A smaller proportion of teachers in each grade range in 2000 reported students spending class time reading about science. The decrease is evident both in teachers’ reports of the frequency of their instructional activities (Table 4.1) and in their description of activities used in their most recent lesson (Table 4.2). This change is most apparent in science instruction in grades 1–4, where the percentage of teachers reporting that students read about science in their most recent lesson decreased from 62 in 1993, to 45 in 2000.

Roughly half of the teachers in each grade range reported in 2000 that their students completed textbook/worksheet problems in the most recent lesson, representing a small decrease from 1993. (See Table 4.2.)

Data on trends in the use of lecture in science instruction are less clear. The percentage of classes in which students “listen and take notes during a presentation by the teacher” on a weekly basis suggests that the use of lecture has decreased since 1993. (See Table 4.1.) At the same time, teachers’ reports of the amount of class time spent on whole class lecture/discussion indicate no change except in grades 5–8 science. (See Table 4.3.) Further, the percent of classes reporting *any* whole class lecture/discussion in the most recent lesson has not changed since 1993. (See Table 4.4.) The fact that lecture and discussion are included in the same item, in this instance, prevent inferences about trends in the use of the individual strategies.

The use of computers in science instruction is striking in its lack of change. Even in 2000, 10 percent or fewer of science lessons included students using computers. (See Table 4.2.) With one exception, there was also no change in the frequency of students doing hands-on/laboratory activities; grade 1–4 teachers were more likely in 2000 to report using this strategy at least weekly. (See Table 4.1.) However, Figure 4.1 shows that there was no increase between 1993 and 2000 in teachers’ report of using hands-on activities in their most recent lesson.

Table 4.1
Science Classes Where Teachers Report that Students Take Part in Various Instructional Activities at Least Once a Week, by Grade Range: 1993 and 2000

	Percent of Classes			
	1993		2000	
Grades 1–4				
Do hands-on/laboratory science activities	41	(2.6)	50*	(3.1)
Listen and take notes during presentation by teacher	25	(2.3)	17*	(1.7)
Prepare written science reports	8	(2.0)	4	(0.9)
Read from a science textbook in class	51	(3.6)	34*	(2.7)
Use computers as a tool[28]	38	(2.5)	6*	(1.3)
Watch a science demonstration[28]	30	(2.5)	30	(2.9)
Work in groups[28]	60	(3.5)	66	(2.9)
Grades 5–8				
Do hands-on/laboratory science activities	59	(2.3)	65	(2.7)
Listen and take notes during presentation by teacher	67	(2.3)	54*	(2.6)
Prepare written science reports	15	(2.1)	16	(2.0)
Read from a science textbook in class	55	(3.2)	46*	(3.2)
Use computers as a tool[28]	18	(2.0)	11*	(1.7)
Watch a science demonstration[28]	48	(3.1)	42	(3.3)
Work in groups[28]	74	(2.5)	80	(2.0)
Grades 9–12				
Do hands-on/laboratory science activities	67	(2.6)	71	(2.5)
Listen and take notes during presentation by teacher	93	(1.0)	86*	(1.4)
Prepare written science reports	25	(2.1)	24	(2.1)
Read from a science textbook in class	39	(2.2)	28*	(2.2)
Use computers as a tool[28]	4	(0.7)	16*	(2.2)
Watch a science demonstration[28]	53	(2.1)	43*	(2.0)
Work in groups[28]	74	(3.1)	80	(2.0)

* $p < 0.05$

Table 4.2
Science Classes Participating in Various Activities in Most Recent Lesson, by Grade Range: 1993 and 2000

	Percent of Classes			
	1993		2000	
Grades 1–4				
Students completing textbook/workbook problems	58	(3.1)	47*	(2.7)
Students doing hands-on/laboratory activities	60	(2.7)[29]	59	(2.9)
Students reading about science	62	(2.6)	45*	(2.8)
Students using calculators	2	(0.8)	1	(0.6)
Student using computers	3	(0.6)	4	(0.9)
Students using other technologies	15	(2.2)	5*	(1.0)
Test or quiz	12	(1.7)	8	(1.6)
Grades 5–8				
Students completing textbook/workbook problems	59	(2.8)	50*	(3.0)
Students doing hands-on/laboratory activities	51	(3.5)[29]	50	(3.2)
Students reading about science	51	(3.4)	41*	(2.6)
Students using calculators	6	(1.5)	8	(1.4)
Student using computers	4	(0.9)	10*	(1.6)
Students using other technologies	19	(2.1)	9*	(1.4)
Test or quiz	13	(1.8)	11	(1.6)
Grades 9–12				
Students completing textbook/workbook problems	62	(2.3)	52*	(2.3)
Students doing hands-on/laboratory activities	44	(2.9)[29]	42	(2.2)
Students reading about science	39	(2.3)	26*	(2.2)
Students using calculators	28	(1.7)	27	(1.9)
Student using computers	4	(1.1)	7*	(1.0)
Students using other technologies	19	(2.2)	9*	(1.2)
Test or quiz	20	(1.9)	12*	(1.2)

* $p < 0.05$

Table 4.3
Average Percentage of Science Class Time Spent on Different Types of Activities, by Grade Range: 1993 and 2000

	Percent of Time			
	1993		2000	
Grades 1–4				
Daily routines, interruptions, and other non-instructional activities	8	(0.5)	10*	(0.6)
Whole class lecture/discussion	36	(1.2)	34	(1.1)
Individual students reading textbooks, completing worksheets, etc.	21	(0.8)	18*	(1.0)
Working with hands-on, manipulative, or laboratory materials	26	(1.5)	30*	(1.8)
Non-laboratory small group work	9	(0.7)	8	(0.9)
Grades 5–8				
Daily routines, interruptions, and other non-instructional activities	11	(0.5)	13	(1.2)
Whole class lecture/discussion	36	(1.1)	31*	(1.2)
Individual students reading textbooks, completing worksheets, etc.	18	(1.2)	19	(1.0)
Working with hands-on, manipulative, or laboratory materials	23	(1.2)	25	(1.6)
Non-laboratory small group work	12	(1.0)	11	(1.2)
Grades 9–12				
Daily routines, interruptions, and other non-instructional activities	11	(0.3)	13*	(0.4)
Whole class lecture/discussion	42	(1.3)	40	(1.2)
Individual students reading textbooks, completing worksheets, etc.	17	(0.7)	15	(1.0)
Working with hands-on, manipulative, or laboratory materials	21	(1.2)	22	(1.3)
Non-laboratory small group work	10	(1.2)	10	(0.8)

* $p < 0.05$

Table 4.4
Science Classes Including Whole Class Lecture/Discussion in Most Recent Lesson, by Grade Range: 1993 and 2000

	Percent of Classes			
	1993[30]		2000	
Grades 1–4	93	(1.2)	93	(1.6)
Grades 5–8	92	(2.1)	90	(2.5)
Grades 9–12	93	(1.3)	91	(1.3)

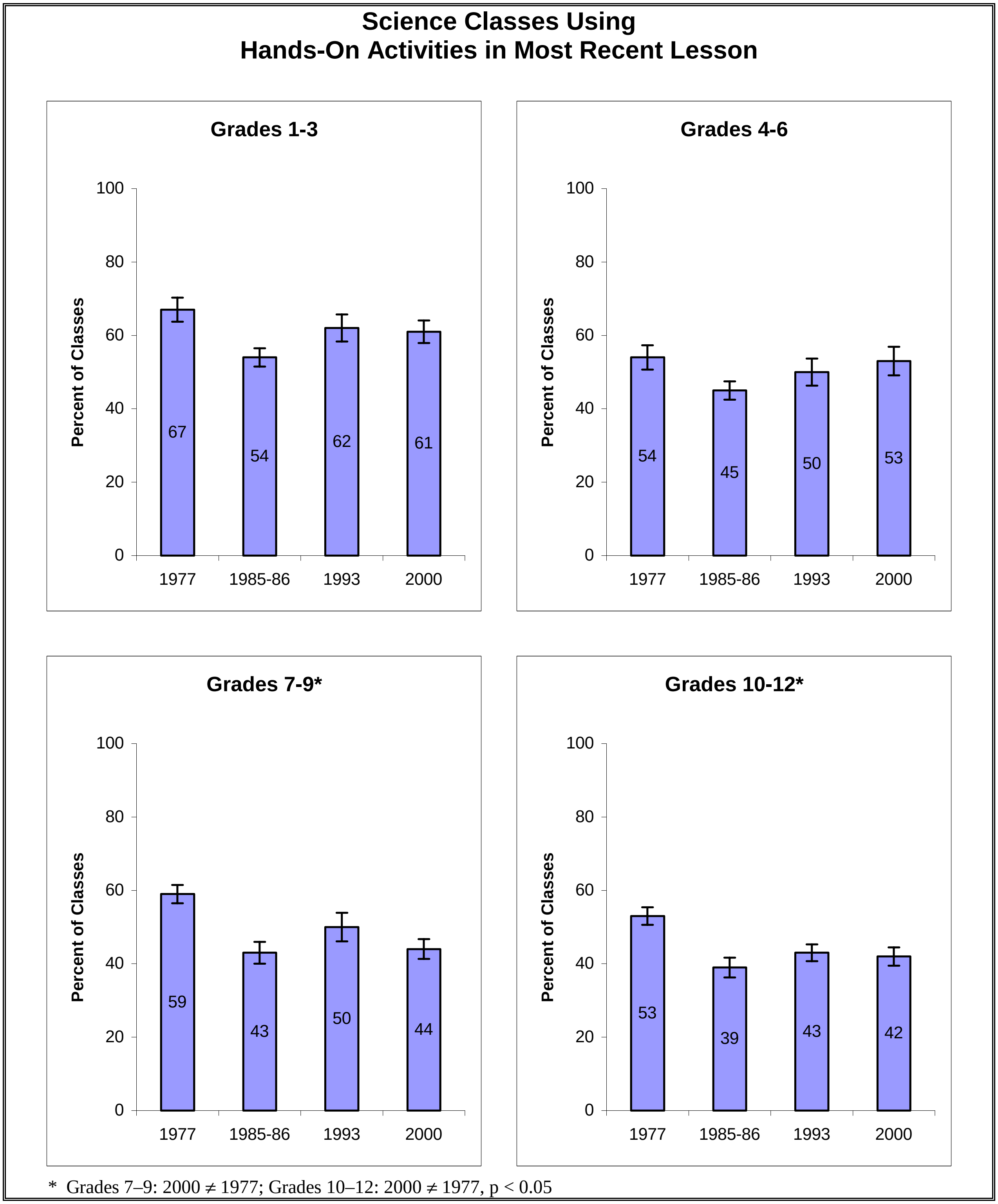

Science Classes Using
Hands-On Activities in Most Recent Lesson
Grades 1-3
Percent of Classes
100
80
60
40
20
0
67
54
62
61
1977
1985-86
1993
2000
Grades 4-6
Percent of Classes
54
45
50
53
1977
1985-86
1993
2000
Grades 7-9*
Percent of Classes
59
43
50
44
1977
1985-86
1993
2000
Grades 10-12*
Percent of Classes
53
39
43
42
1977
1985-86
1993
2000
* Grades 7–9: 2000 ≠ 1977; Grades 10–12: 2000 ≠ 1977, p < 0.05

Figure 4.1

Data for mathematics instruction (Tables 4.5–4.7; Figure 4.2) indicate only a couple of substantial changes. Teachers in each grade range were less likely in 2000 to report that their students read about mathematics in the most recent lesson, a change most noticeable in grades 5–8, where the percentage decreased from 47 percent in 1993 to 26 percent in 2000 (Table 4.6).

The data on use of technology in mathematics instruction are mixed. In grades 9–12, teachers were more likely to report calculator or computer use on at least a weekly basis than in 1993, while grade 1–4 teachers were *less* likely to report use of these technologies on a weekly basis. (See Table 4.5.) This same pattern (an increase among grade 9–12 classes; a decrease among grade 1–4 classes) was also evident when teachers were asked if they used calculators in their most recent lesson. (See Table 4.6.) When asked about computer use, teachers reported that well under 10 percent of their most recent lessons in 2000 included computer use, unchanged from 1993. (See Table 4.6.)

There has been no change in the percentage of mathematics classes incorporating hands-on/ manipulative activities since 1993 (Figure 4.2), and with the exception of an increase in grades 1–3, no difference from 1977 levels.

Table 4.5
Mathematics Classes Where Teachers Report that Students Take Part in Various Instructional Activities at Least Once a Week, by Grade Range: 1993 and 2000

	Percent of Classes			
	1993		2000	
Grades 1–4				
Listen and take notes during presentation by teacher	18	(1.5)	23	(2.4)
Work in groups[31]	84	(2.5)	71*	(2.6)
Use calculators or computers to develop conceptual understanding[31]	37	(2.1)	21*	(2.2)
Grades 5–8				
Listen and take notes during presentation by teacher	66	(2.5)	69	(3.1)
Work in groups[31]	70	(2.8)	65	(2.4)
Use calculators or computers to develop conceptual understanding[31]	39	(2.9)	44	(2.3)
Grades 9–12				
Listen and take notes during presentation by teacher	94	(1.4)	93	(1.2)
Work in groups[31]	64	(2.3)	62	(2.1)
Use calculators or computers to develop conceptual understanding[31]	40	(3.0)	61*	(2.0)

* $p < 0.05$

Table 4.6
Mathematics Classes Participating in Various Activities in Most Recent Lesson, by Grade Range: 1993 and 2000

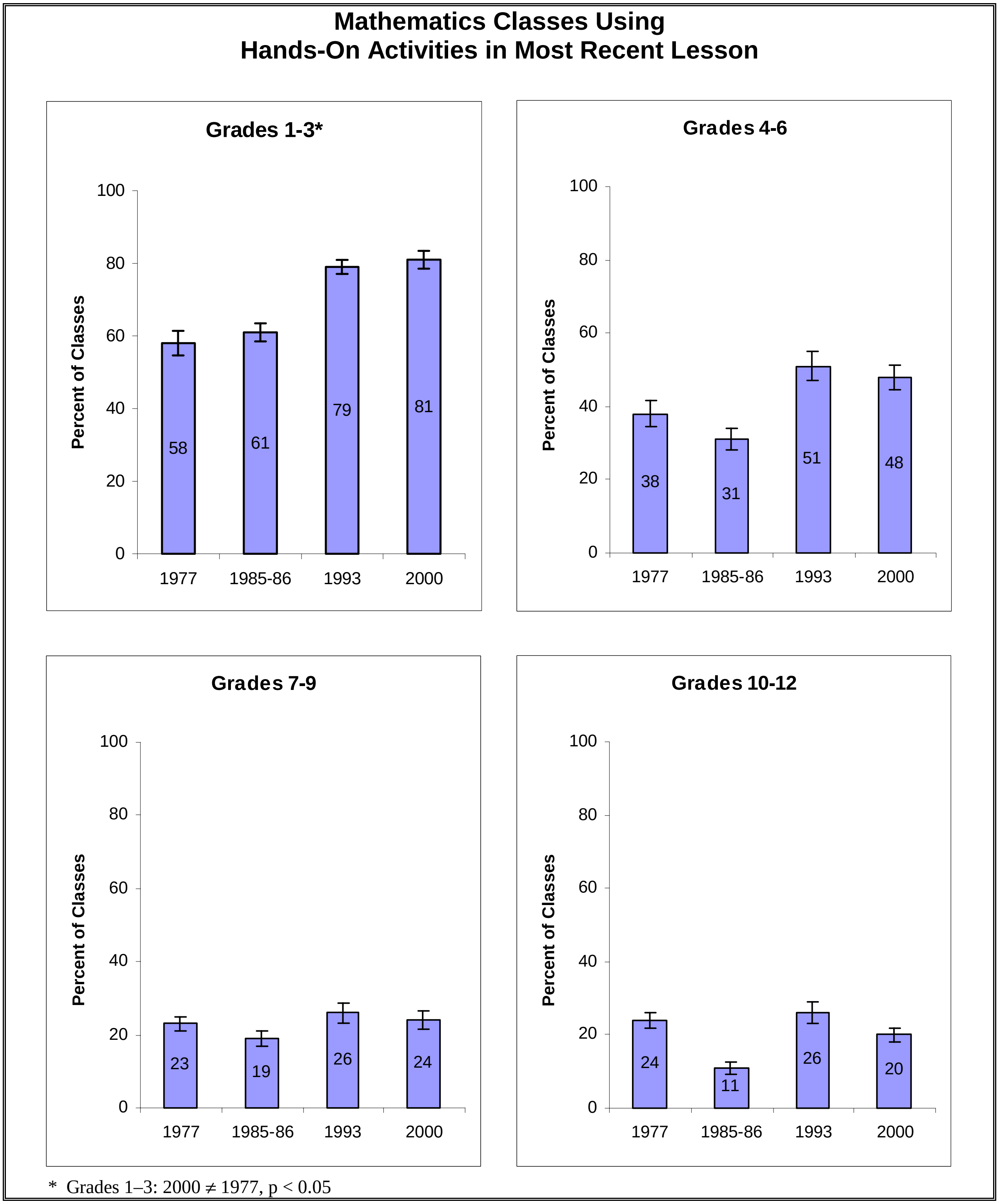
	Percent of Classes			
	1993		2000	
Grades 1–4				
Students completing textbook/worksheet problems	86	(1.9)	82	(2.3)
Students doing hands-on/ manipulative activities	73	(2.4)[32]	74	(2.2)
Student reading about mathematics	28	(2.9)	19*	(1.8)
Students using calculators	11	(1.5)	6*	(1.0)
Students using computers	9	(1.1)	7	(1.2)
Student using other technologies	16	(2.3)	3*	(0.6)
Test or quiz	12	(1.5)	14	(1.9)
Grades 5–8				
Students completing textbook/worksheet problems	87	(2.1)	80*	(1.8)
Students doing hands-on/ manipulative activities	38	(3.2)[31]	36	(2.9)
Student reading about mathematics	47	(3.6)	26*	(2.0)
Students using calculators	37	(3.4)	39	(2.1)
Students using computers	6	(1.5)	5	(1.0)
Student using other technologies	13	(1.5)	4*	(0.9)
Test or quiz	14	(1.8)	15	(1.8)
Grades 9–12				
Students completing textbook/worksheet problems	84	(1.5)	81	(1.6)
Students doing hands-on/ manipulative activities	24	(2.1)[31]	19	(1.5)
Student reading about mathematics	32	(2.3)	17*	(1.6)
Students using calculators	67	(1.6)	80*	(1.5)
Students using computers	2	(0.4)	3	(0.7)
Student using other technologies	7	(1.3)	1*	(0.2)
Test or quiz	17	(1.3)	15	(1.3)

* $p < 0.05$

Table 4.7
Average Percentage of Mathematics Class Time Spent on Different Types of Activities, by Grade Range: 1993 and 2000

	Percent of Time			
	1993		2000	
Grades 1–4				
Daily routines, interruptions, and other non-instructional activities	9	(0.6)	11*	(0.5)
Whole class lecture/discussion	26	(0.9)	29*	(0.8)
Individual students reading textbooks, completing worksheets, etc.	26	(0.6)	26	(1.0)
Working with hands-on or manipulative materials	29	(1.1)	26	(1.3)
Non-manipulative small group work	9	(0.7)	8	(0.9)
Grades 5–8				
Daily routines, interruptions, and other non-instructional activities	11	(0.5)	13*	(0.5)
Whole class lecture/discussion	37	(1.1)	38	(0.9)
Individual students reading textbooks, completing worksheets, etc.	26	(1.1)	26	(1.1)
Working with hands-on, manipulative, or laboratory materials	12	(0.9)	11	(1.0)
Non-laboratory small group work	15	(1.3)	11*	(0.9)
Grades 9–12				
Daily routines, interruptions, and other non-instructional activities	11	(0.3)	13*	(0.3)
Whole class lecture/discussion	48	(1.0)	45*	(0.9)
Individual students reading textbooks, completing worksheets, etc.	19	(0.8)	22*	(0.8)
Working with hands-on, manipulative, or laboratory materials	7	(0.9)	5*	(0.4)
Non-laboratory small group work	14	(0.6)	16*	(0.8)

* $p < 0.05$



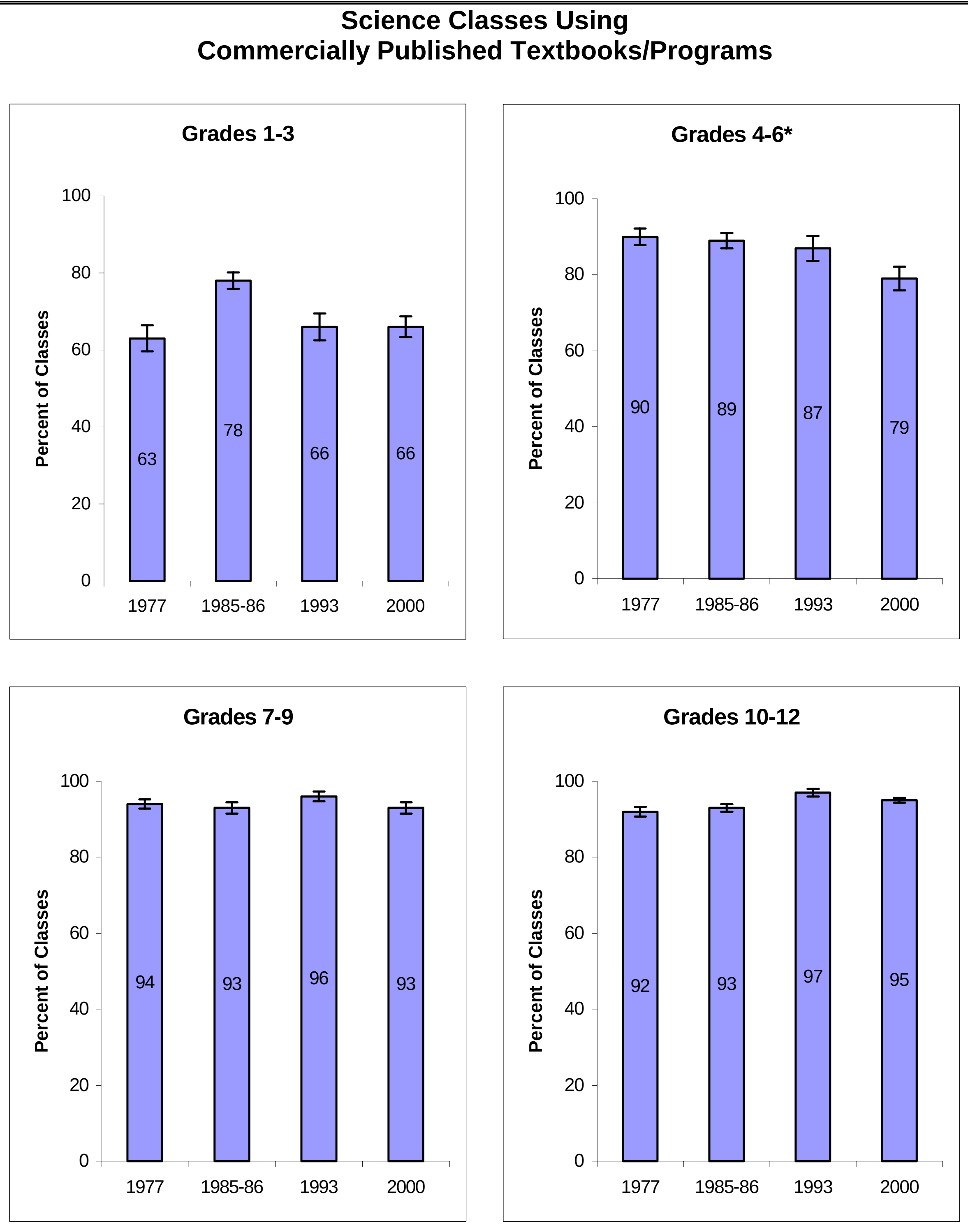
* Grades 1–3: 2000 ≠ 1977, $p < 0.05$

Figure 4.2

Section Five

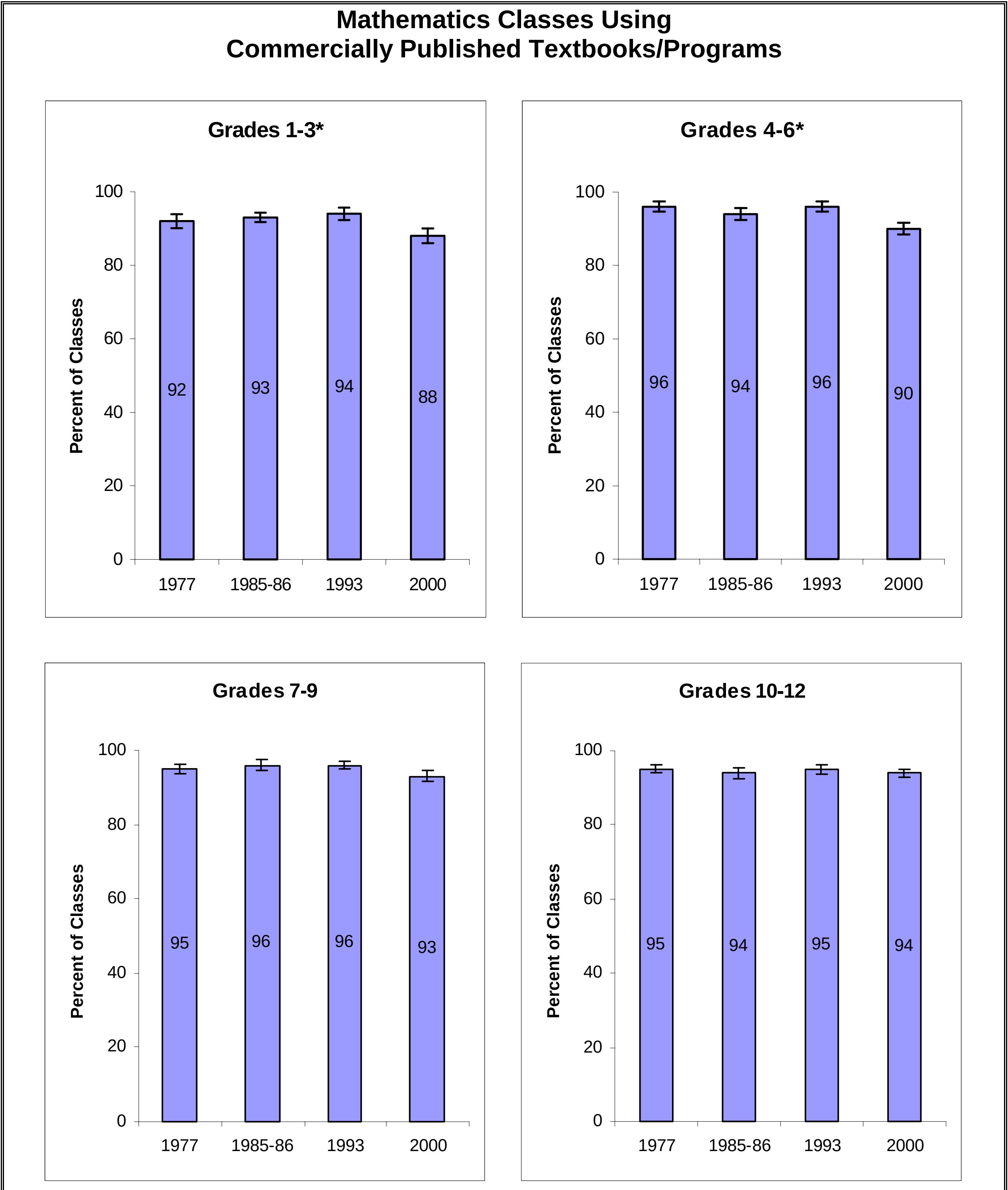
Instructional Resources

Figures 5.1 and 5.2 show the trend in textbook use from 1977 to 2000. These data indicate that textbook use in both science and mathematics classes has remained fairly stable since 1993. The only exceptions were decreases in textbook usage since 1993 in grade 1–3 and grade 4–6 mathematics. In all years, grade 1–3 science classes were least likely to report use of published textbooks.



* Grades 4–6: 2000 ≠ 1977, $p < 0.05$

Figure 5.1



* Grades 1–3: 2000 ≠ 1993; Grades 4–6: 2000 ≠ 1993, 2000 ≠ 1977, $p < 0.05$

Figure 5.2

As in 1993, two-thirds or more of the mathematics classes in 2000 reported covering a substantial portion (75 percent or more) of their textbook, compared to one-half or fewer of science classes. (See Tables 5.1 and 5.2.) A notable change since 1993 occurred in grade 1–4 mathematics, with 42 percent of the classrooms completing more than 90 percent of their text, a significant increase over the 30 percent of the classrooms doing so in 1993.

Table 5.1
Percentage of Science Textbooks/Programs Covered During the Course,§ by Grade Range: 1993 and 2000

	Percent of Classes			
	1993		2000	
Grades 1–4				
Less than 25 percent	10	(2.6)	4*	(1.2)
25–49 percent	17	(3.7)	17	(2.4)
50–74 percent	20	(2.8)	30*	(3.3)
75–90 percent	30	(2.4)	23*	(2.4)
More than 90 percent	22	(3.3)	26	(2.9)
Grades 5–8				
Less than 25 percent	9	(1.7)	8	(1.5)
25–49 percent	19	(2.0)	19	(2.2)
50–74 percent	30	(3.3)	33	(2.7)
75–90 percent	33	(3.7)	28	(2.5)
More than 90 percent	10	(1.5)	11	(1.7)
Grades 9–12				
Less than 25 percent	3	(0.8)	3	(0.6)
25–49 percent	16	(2.3)	13	(1.4)
50–74 percent	36	(1.8)	38	(2.3)
75–90 percent	37	(2.7)	37	(2.2)
More than 90 percent	8	(1.1)	9	(1.1)

* $p < 0.05$

§ Only classes using published textbooks/programs were included in these analyses.

Table 5.2
Percentage of Mathematics Textbooks/Programs Covered During the Course,§ by Grade Range: 1993 and 2000

	Percent of Classes			
	1993		2000	
Grades 1–4				
Less than 25 percent	1	(0.5)	1	(0.4)
25–49 percent	4	(0.8)	3	(0.9)
50–74 percent	21	(1.9)	17	(2.3)
75–90 percent	44	(2.2)	38	(2.7)
More than 90 percent	30	(2.1)	42*	(3.3)
Grades 5–8				
Less than 25 percent	1	(0.2)	1	(0.5)
25–49 percent	4	(0.9)	5	(1.1)
50–74 percent	23	(2.6)	27	(2.5)
75–90 percent	50	(2.7)	46	(3.3)
More than 90 percent	22	(2.1)	21	(2.2)
Grades 9–12				
Less than 25 percent	0	(0.2)	1*	(0.2)
25–49 percent	7	(0.7)	6	(0.8)
50–74 percent	23	(2.1)	28	(2.0)
75–90 percent	48	(2.3)	47	(2.4)
More than 90 percent	21	(1.3)	19	(1.5)

* $p < 0.05$

§ Only classes using published textbooks/programs were included in these analyses.

Teacher ratings of the quality of their textbooks/programs in 2000 were quite similar to those in 1993, with most teachers ratings their textbooks good or very good. (See Tables 5.3 and 5.4.)

Table 5.3
Teachers' Perceptions of Quality of Textbooks/Programs Used in Science Classes,§ by Grade Range: 1993 and 2000

	Percent of Classes			
	1993		2000	
Grades 1–4				
Very poor	3	(0.8)	4	(1.3)
Poor	8	(1.4)	8	(1.7)
Fair	27	(2.5)	34	(3.2)
Good	38	(3.4)	32	(3.2)
Very good	18	(1.8)	19	(2.7)
Excellent	7	(1.4)	3*	(1.1)
Grades 5–8				
Very poor	3	(0.5)	3	(0.9)
Poor	5	(1.1)	8	(2.6)
Fair	23	(2.3)	28	(2.6)
Good	30	(1.8)	32	(2.7)
Very good	29	(2.6)	22	(2.6)
Excellent	10	(3.5)	6	(1.5)
Grades 9–12				
Very poor	2	(0.5)	1	(0.3)
Poor	4	(0.4)	4	(0.8)
Fair	14	(2.0)	18	(1.8)
Good	36	(2.0)	39	(2.2)
Very good	33	(2.5)	31	(2.1)
Excellent	11	(1.1)	8	(1.1)

* $p < 0.05$

§ Only classes using published textbooks/programs were included in these analyses.

Table 5.4
Teachers' Perceptions of Quality of Textbooks/Programs Used in Mathematics Classes,§ by Grade Range: 1993 and 2000

	Percent of Classes			
	1993		2000	
Grades 1–4				
Very poor	3	(1.4)	1	(0.5)
Poor	4	(0.6)	3	(1.0)
Fair	21	(1.9)	17	(2.3)
Good	32	(2.4)	34	(2.8)
Very good	30	(3.5)	38	(2.9)
Excellent	10	(1.5)	7	(1.3)
Grades 5–8				
Very poor	0	(0.7)	2*	(0.7)
Poor	5	(0.7)	5	(1.3)
Fair	20	(3.2)	16	(1.7)
Good	32	(2.7)	33	(2.4)
Very good	31	(2.7)	33	(2.6)
Excellent	14	(1.8)	10	(1.9)
Grades 9–12				
Very poor	1	(0.3)	1	(0.2)
Poor	3	(0.7)	3	(0.6)
Fair	11	(1.1)	19*	(1.7)
Good	30	(2.7)	34	(2.1)
Very good	38	(1.8)	34	(2.1)
Excellent	16	(1.7)	9*	(1.2)

* $p < 0.05$

§ Only classes using published textbooks/programs were included in these analyses.

As noted earlier, the percentage of lessons incorporating student use of computers has not changed since 1993. However, the percentage of classrooms using computers at some point during the course has risen, both in mathematics (ranging from 44 percent to 77 percent in 1993, and from 60 percent to 88 percent in 2000), and more dramatically in science (ranging from 40 percent to 52 percent in 1993, and from 71 percent to 91 percent in 2000). (See Tables 5.5 and 5.6.) This increase is complemented by the sharp decrease in teachers reporting that computers are needed but not available. Only 3–6 percent of science and 2–5 percent of mathematics teachers now express a lack of this equipment, compared to 18–36 percent and 12–29 percent in 1993. It is interesting to note that more mathematics teachers in grades 5–8 and 9–12 indicated in 2000 that computers were not necessary for their instruction (18–35 percent) than did so in 1993 (12–29 percent), perhaps because of greater use of calculators for data manipulation, graphing, and analysis.

There have been similar increases in use of other instructional equipment and technologies. The most dramatic change occurs in the rise of CD-ROM use across all levels in both science and mathematics. In 1993, use of this medium ranged from 7 to 10 percent of science classes and from 1 to 3 percent of mathematics classes. (See Tables 5.5 and 5.6.) By the 2000 survey, use had grown to 52–59 percent of science classes and 22–53 percent of mathematics classes. This jump is also interesting considering the percentage of teachers in 1993 who said this equipment was not needed for instruction (60–65 percent in science, 81–88 percent in mathematics) as well as the percent who indicated CD-ROM players were needed, but not available that year (25–33 percent in science, 12–16 percent in mathematics). By the 2000 survey, teachers indicating that this equipment is not needed for instruction decreased to 34–43 percent in science and 42–75 percent in mathematics. Likewise, availability had increased a great deal, with only 5–8 percent of science and 3–6 percent of mathematics teachers reporting the equipment was needed, but unavailable. Evidently, not only are more teachers interested in using this technology in their instruction, but also more of such equipment is available for their use.

In nearly every instance, the percentages of both science and mathematics teachers reporting equipment unavailability has declined notably since 1993.

Table 5.5
Equipment Usage in Science Classes, by Grade Range: 1993 and 2000

	Percent of Classes											
	Used				Not Needed				Needed, But Not Available			
	1993		2000		1993		2000		1993		2000	
Grades 1–4												
Videotape player	88	(2.0)	90	(1.7)	9	(1.3)	8	(1.3)	2	(0.7)	2	(1.1)
Overhead projector	74	(2.8)	89*	(2.2)	21	(2.9)	11*	(2.2)	6	(1.3)	0*	(0.2)
Videodisc player	18	(1.6)	26*	(3.1)	59	(1.9)	67*	(3.1)	23	(2.5)	7*	(1.6)
CD-ROM player	10	(1.5)	52*	(3.7)	65	(2.4)	43*	(3.5)	25	(2.7)	5*	(1.2)
Four function calculators	31	(2.8)	33	(3.1)	57	(1.7)	64	(3.2)	12	(2.0)	3*	(1.1)
Fraction calculators	2	(0.6)	2	(0.8)	88	(1.5)	94*	(1.3)	10	(1.5)	4*	(1.1)
Graphing calculators	0	(0.2)	1*	(0.4)	89	(1.9)	96*	(1.1)	11	(1.6)	3*	(1.1)
Scientific calculators	0	(2.6)	2	(0.7)	88	(2.4)	96*	(1.3)	12	(1.6)	3*	(1.1)
Electric outlets in labs/classrooms	51	(2.6)	88*	(2.2)	32	(2.2)	11*	(2.1)	17	(2.3)	1*	(0.5)
Running water in labs/classrooms	49	(2.7)	79*	(2.5)	28	(2.2)	14*	(2.2)	24	(1.9)	7*	(1.2)
Gas for burners in labs/classrooms	7	(2.1)	7	(1.4)	73	(3.0)	85*	(2.3)	20	(2.1)	8*	(1.8)
Hoods or air hoses in labs/classrooms	3	(1.6)	3	(0.9)	79	(2.5)	92*	(1.7)	18	(1.6)	6*	(1.3)
Computers	52	(2.4)	71*	(3.0)	30	(1.8)	26	(3.2)	18	(2.2)	3*	(1.4)
Calculator/computer lab interfacing devices	13	(1.8)	7*	(1.5)	64	(1.9)	87*	(2.0)	23	(1.9)	6*	(1.1)
Grades 5–8												
Videotape player	94	(1.1)	94	(1.6)	6	(1.0)	6	(1.6)	1	(0.3)	0*	(0.4)
Overhead projector	88	(1.5)	92	(2.0)	10	(1.2)	8	(1.8)	2	(0.6)	0*	(0.3)
Videodisc player	27	(2.5)	47*	(3.4)	49	(3.3)	42	(3.2)	24	(2.1)	11*	(1.9)
CD-ROM player	10	(2.0)	59*	(3.0)	60	(2.9)	34*	(3.2)	30	(2.4)	7*	(1.5)
Four function calculators	34	(3.0)	62*	(3.0)	60	(3.3)	34*	(2.9)	7	(1.0)	3*	(1.1)
Fraction calculators	8	(1.5)	17*	(2.8)	81	(2.2)	79	(3.1)	11	(1.3)	4*	(1.3)
Graphing calculators	2	(1.0)	12*	(1.7)	86	(1.8)	80*	(2.0)	13	(1.3)	8*	(1.7)
Scientific calculators	6	(1.3)	29*	(2.7)	81	(2.1)	67*	(2.6)	13	(1.4)	4*	(1.0)
Electric outlets in labs/classrooms	75	(2.3)	96*	(1.0)	10	(1.5)	4*	(1.0)	15	(1.8)	0*	(0.2)
Running water in labs/classrooms	70	(2.7)	91*	(1.9)	7	(1.3)	3*	(0.7)	23	(2.6)	7*	(1.8)
Gas for burners in labs/classrooms	28	(3.1)	36	(2.9)	42	(3.0)	53*	(3.0)	30	(2.7)	11*	(2.0)
Hoods or air hoses in labs/classrooms	13	(3.3)	22*	(2.7)	52	(3.0)	64*	(2.9)	35	(2.5)	15*	(1.8)
Computers	50	(3.0)	91*	(1.5)	21	(2.5)	6*	(1.4)	29	(2.4)	3*	(0.8)
Calculator/computer lab interfacing devices	18	(3.2)	28*	(2.8)	41	(2.8)	56*	(3.2)	41	(3.0)	16*	(2.0)
Grades 9–12												
Videotape player	90	(1.8)	95*	(0.9)	8	(1.4)	5	(0.9)	2	(0.3)	0*	(0.1)
Overhead projector	83	(2.6)	88	(2.7)	14	(2.8)	12	(2.7)	3	(0.9)	0*	(0.1)
Videodisc player	29	(2.1)	55*	(2.4)	47	(3.1)	39*	(2.1)	24	(2.0)	7*	(1.2)
CD-ROM player	7	(1.4)	57*	(2.5)	60	(3.2)	36*	(2.3)	33	(3.3)	8*	(1.2)
Four function calculators	38	(2.2)	59*	(2.3)	54	(2.6)	37*	(2.3)	8	(2.1)	5	(0.9)
Fraction calculators	11	(1.1)	27*	(2.7)	83	(1.9)	70*	(2.8)	6	(1.3)	4	(1.1)
Graphing calculators	7	(1.4)	35*	(2.6)	82	(1.6)	60*	(2.7)	11	(2.1)	5*	(0.9)
Scientific calculators	38	(2.1)	58*	(2.6)	53	(2.9)	38*	(2.6)	9	(1.8)	4*	(0.9)
Electric outlets in labs/classrooms	94	(0.9)	97*	(0.9)	4	(0.9)	2	(0.7)	2	(0.8)	1	(0.7)
Running water in labs/classrooms	90	(2.7)	96*	(0.9)	3	(0.8)	2	(0.7)	7	(2.5)	2*	(0.4)
Gas for burners in labs/classrooms	67	(2.7)	72	(2.1)	24	(3.1)	22	(2.0)	9	(1.0)	5*	(1.0)
Hoods or air hoses in labs/classrooms	36	(2.1)	56*	(2.4)	38	(2.3)	33	(2.0)	26	(2.3)	11*	(1.4)
Computers	40	(2.5)	85*	(1.7)	24	(2.2)	9*	(1.3)	36	(2.1)	6*	(1.0)
Calculator/computer lab interfacing devices	18	(1.2)	42*	(2.5)	37	(1.6)	40	(2.7)	46	(1.9)	18*	(2.1)

* $p < 0.05$

Table 5.6
Equipment Usage in Mathematics Classes, by Grade Range: 1993 and 2000

	Percent of Classes											
	Used				Not Needed				Needed, But Not Available			
	1993		2000		1993		2000		1993		2000	
Grades 1–4												
Videotape player	42	(2.8)	45	(3.3)	54	(2.7)	54	(3.3)	4	(1.0)	1*	(0.3)
Overhead projector	78	(3.2)	92*	(1.7)	15	(2.1)	7*	(1.6)	8	(1.7)	1*	(0.4)
Videodisc player	8	(1.0)	10	(1.8)	80	(2.2)	87*	(2.0)	12	(1.8)	3*	(0.9)
CD-ROM player	3	(0.8)	53*	(2.9)	81	(1.9)	42*	(2.8)	16	(2.1)	6*	(1.6)
Four function calculators	50	(2.5)	70*	(2.6)	34	(2.2)	28	(2.4)	16	(1.1)	2*	(1.1)
Fraction calculators	3	(0.7)	4	(1.1)	85	(1.6)	89	(1.8)	13	(1.6)	7*	(1.5)
Graphing calculators	1	(0.3)	2	(0.8)	88	(1.4)	93*	(1.3)	12	(1.8)	5*	(1.1)
Scientific calculators	1	(0.4)	4*	(1.1)	90	(1.2)	92	(1.6)	9	(1.7)	4*	(1.2)
Computers	77	(2.1)	88*	(2.0)	11	(1.4)	10	(1.9)	12	(1.8)	2*	(0.7)
Calculator/computer lab interfacing devices	33	(2.4)	23*	(2.5)	46	(3.0)	69*	(2.8)	21	(2.3)	9*	(1.7)
Grades 5–8												
Videotape player	44	(2.8)	48	(2.3)	51	(2.7)	51	(2.2)	5	(2.4)	1	(0.4)
Overhead projector	79	(3.7)	91*	(2.2)	16	(2.3)	9*	(2.2)	5	(2.5)	0*	(0.2)
Videodisc player	5	(1.0)	10*	(1.9)	80	(2.9)	84	(2.3)	15	(2.4)	6*	(1.3)
CD-ROM player	3	(0.9)	39*	(3.3)	84	(1.8)	57*	(3.2)	13	(1.8)	4*	(0.8)
Four function calculators	72	(3.0)	82*	(1.8)	17	(2.2)	16	(1.8)	11	(2.9)	1*	(0.5)
Fraction calculators	26	(2.3)	54*	(2.8)	35	(2.2)	39	(3.0)	39	(2.9)	7*	(1.1)
Graphing calculators	5	(1.0)	26*	(2.2)	66	(3.0)	66	(2.7)	30	(2.7)	9*	(1.6)
Scientific calculators	22	(3.0)	49*	(3.1)	61	(3.4)	46*	(3.1)	17	(2.0)	6*	(1.4)
Computers	60	(3.1)	78*	(2.6)	12	(1.3)	18*	(2.4)	29	(3.1)	4*	(0.9)
Calculator/computer lab interfacing devices	26	(2.0)	29	(2.4)	35	(2.4)	56*	(2.8)	39	(3.1)	14*	(2.0)
Grades 9–12												
Videotape player	38	(2.1)	42	(2.2)	57	(1.7)	57	(2.2)	5	(1.2)	0*	(0.1)
Overhead projector	76	(2.9)	88*	(1.5)	20	(2.3)	12*	(1.5)	5	(1.2)	0*	(0.3)
Videodisc player	2	(0.7)	4	(1.0)	88	(1.6)	94*	(1.2)	10	(1.4)	3*	(0.7)
CD-ROM player	1	(0.3)	22*	(2.2)	88	(1.4)	75*	(2.2)	12	(1.3)	3*	(0.8)
Four function calculators	65	(2.3)	65	(1.9)	30	(2.2)	34	(1.9)	5	(1.3)	1*	(0.3)
Fraction calculators	28	(2.3)	61*	(2.1)	53	(1.7)	38*	(2.1)	19	(2.2)	1*	(0.4)
Graphing calculators	40	(2.3)	77*	(2.0)	40	(1.6)	20*	(1.9)	20	(1.9)	2*	(0.9)
Scientific calculators	67	(2.0)	78*	(1.6)	27	(2.1)	21*	(1.6)	6	(1.2)	1*	(0.3)
Computers	44	(2.4)	60*	(2.3)	29	(1.8)	35*	(2.2)	28	(2.4)	5*	(0.9)
Calculator/computer lab interfacing devices	21	(2.1)	32*	(2.2)	43	(2.0)	58*	(2.5)	36	(2.7)	10*	(1.1)

* $p < 0.05$

Tables 5.7 and 5.8 compare the amount of money per student schools indicated spending on instructional materials in 1993 and 2000. The actual dollar amounts reported in 1993 are given along with those numbers adjusted for inflation into 2000 dollars.‡ Based on these adjusted figures, per pupil spending for equipment has decreased from 1993 to 2000 in middle and high school science and in elementary school mathematics.

The amount of money spent in science programs on consumable supplies in middle and high schools has increased. This increase may be due to the influence of the NRC *Standards*, with more schools purchasing instructional programs emphasizing hands-on activities. However, as mentioned earlier in this report, teachers are not reporting an increase in the use of such activities in their science classes. Additionally, the amount of money schools spent on software for their science programs has dropped in all three school levels.

Table 5.7
Median Amount Schools Spent Per Pupil on Science Equipment, Consumable Supplies, and Software, by School Type: 1993 and 2000

	Median Amount		
	1993	**1993 Adjusted**	**2000**
Elementary Schools			
Equipment	\$ 1.06	\$ 1.26	\$ 1.10
Consumable Supplies	\$ 0.51	\$ 0.61	\$ 0.79
Software	\$ 0.09	\$ 0.11	\$ 0.00*
Middle Schools			
Equipment	\$ 1.78	\$ 2.12	\$ 1.10*
Consumable Supplies	\$ 0.88	\$ 1.05	\$ 1.33*
Software	\$ 0.16	\$ 0.19	\$ 0.00*
High Schools			
Equipment	\$ 2.11	\$ 2.51	\$ 2.05*
Consumable Supplies	\$ 2.22	\$ 2.65	\$ 3.12*
Software	\$ 0.25	\$ 0.30	\$ 0.19*

* $p < 0.05$

‡ CJR Dollar Conversion Calculator (www.cjr.org/resources/inflater.asp).

Table 5.8
Median Amount Schools Spent Per Pupil on Mathematics Equipment, Consumable Supplies, and Software, by School Type: 1993 and 2000

	Median Amount		
	1993	1993 Adjusted	2000
Elementary Schools			
Equipment	$ 1.40	$ 1.67	$ 0.99*
Consumable Supplies	$ 1.00	$ 1.19	$ 1.58
Software	$ 0.46	$ 0.55	$ 0.66*
Middle Schools			
Equipment	$ 1.00	$ 1.19	$ 1.16
Consumable Supplies	$ 0.40	$ 0.48	$ 0.94
Software	$ 0.49	$ 0.58	$ 0.14
High Schools			
Equipment	$ 0.87	$ 1.04	$ 1.32
Consumable Supplies	$ 0.38	$ 0.45	$ 0.61*
Software	$ 0.22	$ 0.26	$ 0.18

* $p < 0.05$

Tables 5.9 and 5.10 report the percentage of schools that made some purchase of instructional materials in the previous year. In light of the data presented earlier in this chapter that showed an increase in the availability and use of computers, the lack of significant increase in the amount of money spent on software, in general, and the decrease in middle schools, seem odd. The inclusion of suites of software with computer purchases as well as the proliferation of educational sites on the Internet and free program downloads may account for these seemingly contradictory observations.

Table 5.9
Schools Purchasing Science Equipment, Consumable Supplies, Software, or Any Purchase in Previous Year, by School Type: 1993 and 2000

	Percent of Schools			
	1993		2000	
Elementary Schools				
Equipment	83	(4.9)	75	(3.5)
Consumable Supplies	85	(5.9)	83	(2.7)
Software	53	(5.0)	48	(4.0)
Any purchase	92	(4.5)	89	(2.2)
Middle Schools				
Equipment	84	(5.7)	70*	(4.0)
Consumable Supplies	88	(6.0)	84	(3.3)
Software	56	(5.1)	43*	(3.6)
Any purchase	89	(5.8)	87	(2.9)
High Schools				
Equipment	94	(2.2)	83*	(3.4)
Consumable Supplies	98	(1.8)	96	(1.7)
Software	64	(2.9)	58	(4.1)
Any purchase	100	(1.5)	97	(1.6)

* $p < 0.05$

Table 5.10
Schools Purchasing Mathematics Equipment, Consumable Supplies, Software, or Any Purchase in Previous Year, by School Type: 1993 and 2000

	Percent of Schools			
	1993		**2000**	
Elementary Schools				
Equipment	85	(4.7)	78	(3.8)
Consumable Supplies	85	(3.7)	90	(2.4)
Software	74	(3.5)	65	(4.3)
Any purchase	94	(3.3)	94	(1.9)
Middle Schools				
Equipment	85	(5.1)	84	(3.0)
Consumable Supplies	79	(5.9)	89	(2.4)
Software	69	(4.3)	52*	(4.3)
Any purchase	91	(3.7)	96	(1.7)
High Schools				
Equipment	87	(3.2)	85	(3.1)
Consumable Supplies	79	(3.4)	86	(2.3)
Software	63	(3.0)	56	(3.7)
Any purchase	93	(2.8)	98	(0.6)

* $p < 0.05$

Given the picture of school-wide expenditure painted by the previous tables, it is not surprising that teachers are still spending a good deal of their own money to augment their classroom instruction. (See Table 5.11.)

Table 5.11
Amount of Own Money Science and Mathematics Teachers Spent on Supplies Per Class, by Grade Range: 1993 and 2000

	Median Amount		
	1993	**1993 Adjusted**	**2000**
Science			
Grades 1–4	$ 30	$ 36	$ 35
Grades 5–8	$ 50	$ 60	$ 50*
Grades 9–12	$ 50	$ 60	$ 55
Mathematics			
Grades 1–4	$ 50	$ 60	$ 46*
Grades 5–8	$ 50	$ 60	$ 50*
Grades 9–12	$ 25	$ 30	$ 50*

* $p < 0.05$

Section Six

Factors Affecting Instruction

NCTM's *Curriculum and Evaluation Standards* and *Professional Standards for Teaching Mathematics* were published in 1989 and 1991, respectively. In both 1993 and 2000, program questionnaire respondents were asked a series of questions about how broadly the NCTM *Standards* had been disseminated in their school and district. (The NRC *National Science Education Standards* were published in 1996; thus trend data are not available.) Given how long the NCTM *Standards* have been in the field, it is somewhat surprising that elementary and middle school program respondents in 2000 were less likely than in 1993 to perceive their school and district administrators as being well-informed about the documents. (See Table 6.1.) In both 1993 and 2000, roughly half of all schools in the nation reported school-wide efforts to implement the NCTM *Standards.*

Table 6.1
Respondents Agreeing[§] with Various Statements Regarding the NCTM *Standards* for Mathematics Curriculum, Instruction, and Evaluation, by School Type: 1993 and 2000

	Percent of Schools			
	1993		2000	
Elementary Schools				
The principal of this school is well-informed about the *Standards*	59	(2.8)	50*	(3.6)
There is a school-wide effort to make changes inspired by the *Standards*	48	(2.8)	55	(3.8)
Our district is organizing staff development based on the *Standards*	50	(4.3)	46	(3.9)
The superintendent of this district is well-informed about the *Standards*	55	(3.4)	34*	(3.4)
The *Standards* have been thoroughly discussed by teachers in this school	21	(2.6)	33*	(3.7)
The School Board is well-informed about the *Standards*	28	(2.7)	22	(2.9)
Our district has changed how it evaluates teachers based on the *Standards*	19	(2.8)	16	(2.5)
Parents of students in this school are well-informed about the *Standards*	8	(2.2)	14	(2.5)
Middle Schools				
The principal of this school is well-informed about the *Standards*	55	(3.9)	35*	(3.4)
There is a school-wide effort to make changes inspired by the *Standards*	53	(4.1)	54	(4.2)
Our district is organizing staff development based on the *Standards*	41	(3.9)	39	(3.6)
The superintendent of this district is well-informed about the *Standards*	49	(4.1)	30*	(3.3)
The *Standards* have been thoroughly discussed by teachers in this school	30	(4.0)	30	(3.0)
The School Board is well-informed about the *Standards*	23	(3.4)	20	(2.2)
Our district has changed how it evaluates teachers based on the *Standards*	17	(3.8)	14	(2.3)
Parents of students in this school are well-informed about the *Standards*	10	(3.0)	8	(1.9)
High Schools				
The principal of this school is well-informed about the *Standards*	35	(3.3)	32	(2.8)
There is a school-wide effort to make changes inspired by the *Standards*	45	(2.4)	49	(3.5)
Our district is organizing staff development based on the *Standards*	34	(2.4)	38	(2.7)
The superintendent of this district is well-informed about the *Standards*	33	(2.6)	26	(2.6)
The *Standards* have been thoroughly discussed by teachers in this school	39	(3.5)	32	(2.7)
The School Board is well-informed about the *Standards*	14	(1.7)	14	(2.6)
Our district has changed how it evaluates teachers based on the *Standards*	6	(1.4)	12*	(1.9)
Parents of students in this school are well-informed about the *Standards*	6	(1.3)	6	(1.1)

* $p < 0.05$

§ Includes teachers responding "strongly agree" or "agree" to each statement.

Program respondents were also given a list of potential problems and asked to rate how serious each was for science and mathematics instruction in their school. The percentages rating each as a "serious problem" are shown in Tables 6.2 and 6.3. The most consistent change concerned access to computers, with significantly fewer schools in 5 of the 6 subject/grade range groups rating this factor as a serious problem.

Table 6.2
Science Program Representatives Viewing Each of a Number of Factors as a Serious Problem for Science Instruction in Their School, by School Type: 1993 and 2000

	Percent of Schools											
	Elementary Schools				Middle Schools				High Schools			
	1993		2000		1993		2000		1993		2000	
Facilities	26	(3.4)	20	(3.0)	23	(5.2)	28	(4.0)	18	(1.9)	21	(3.3)
Funds for purchasing equipment	47	(5.3)	35	(3.6)	40	(5.9)	33	(4.0)	30	(3.7)	25	(3.4)
Materials for individualized instruction	36	(4.3)	27	(3.2)	36	(5.9)	25	(3.8)	30	(2.4)	16*	(2.1)
Access to computers	23	(3.8)	17	(2.9)	35	(4.3)	18*	(3.0)	39	(4.3)	22*	(2.7)
Appropriate computer software	40	(4.7)	33	(3.5)	43	(5.8)	40	(3.9)	40	(3.9)	32	(3.0)
Student interest in science	3	(0.9)	4	(1.8)	8	(1.8)	4	(1.0)	17	(1.3)	8*	(1.8)
Student reading abilities	14	(3.2)	11	(2.2)	21	(5.7)	18	(2.4)	20	(2.2)	22	(2.4)
Student absences	1	(0.7)	4	(1.4)	4	(0.7)	9*	(2.0)	12	(1.3)	20*	(2.6)
Teacher interest in science	3	(1.4)	8*	(2.0)	1	(0.6)	3	(1.2)	1	(0.9)	2	(1.4)
Teacher preparation to teach science	12	(1.7)	14	(2.7)	4	(1.5)	5	(2.1)	3	(1.1)	5	(2.5)
Time to teach science	19	(3.7)	20	(2.9)	5	(1.7)	12	(3.2)	9	(2.0)	4*	(0.9)
Opportunities for teachers to share ideas	29	(3.5)	24	(3.2)	14	(2.5)	21	(2.9)	21	(2.5)	21	(2.8)
In-service education opportunities	18	(3.4)	14	(2.6)	10	(2.3)	13	(2.8)	17	(2.7)	9*	(1.4)
Interruptions for announcements, assemblies, other school activities	7	(1.8)	10	(2.3)	8	(1.9)	12	(2.7)	19	(3.5)	13	(1.9)
Large classes	12	(1.6)	7*	(1.9)	15	(2.2)	12	(1.7)	20	(2.6)	14	(2.0)
Maintaining discipline	6	(1.6)	6	(1.8)	6	(1.3)	6	(1.1)	10	(1.5)	5*	(0.9)
Parental support for education	7	(1.6)	12	(2.4)	8	(1.6)	11	(2.1)	16	(2.1)	13	(2.2)
State and/or district testing policies	11	(2.4)	11	(2.1)	5	(1.5)	9	(1.4)	9	(2.1)	13	(1.9)

* $p < 0.05$

Table 6.3
Mathematics Program Representatives Viewing Each of a Number of Factors as a Serious Problem for Mathematics Instruction in Their School, by School Type: 1993 and 2000

	Percent of Schools											
	Elementary Schools				Middle Schools				High Schools			
	1993		2000		1993		2000		1993		2000	
Facilities	6	(2.3)	4	(1.5)	8	(4.2)	4	(1.6)	4	(0.6)	5	(1.1)
Funds for purchasing equipment	33	(6.3)	23	(4.1)	31	(5.9)	19	(4.0)	26	(2.6)	18*	(3.1)
Materials for individualized instruction	26	(5.0)	14*	(2.5)	24	(6.0)	13	(2.9)	20	(2.0)	11*	(1.6)
Access to computers	27	(5.0)	14*	(2.5)	37	(5.8)	17*	(2.7)	41	(3.3)	19*	(3.0)
Appropriate computer software	27	(3.6)	20	(2.9)	35	(4.3)	29	(3.7)	41	(3.5)	27*	(3.1)
Student interest in mathematics	4	(1.5)	5	(1.3)	9	(2.2)	10	(1.7)	13	(2.3)	20*	(2.5)
Student reading abilities	12	(2.9)	15	(2.5)	16	(4.9)	15	(2.2)	16	(2.1)	20	(2.5)
Student absences	1	(0.5)	4*	(1.3)	5	(0.9)	7	(1.6)	12	(1.5)	17*	(2.0)
Teacher interest in mathematics	1	(0.8)	1	(0.4)	1	(0.2)	0*	(0.2)	0	(0.3)	0	(0.3)
Teacher preparation to teach mathematics	4	(1.2)	7	(2.0)	1	(0.2)	5	(2.2)	1	(0.4)	2	(1.0)
Time to teach mathematics	3	(0.8)	2	(0.9)	2	(0.8)	3	(0.9)	3	(0.5)	5	(1.2)
Opportunities for teachers to share ideas	20	(2.9)	15	(2.9)	15	(2.9)	14	(2.9)	20	(2.8)	14	(2.2)
In-service education opportunities	11	(4.0)	10	(2.3)	5	(1.3)	9	(2.8)	11	(2.8)	10	(2.6)
Interruptions for announcements, assemblies, other school activities	4	(1.1)	4	(1.1)	7	(1.6)	9	(1.6)	13	(2.3)	11	(1.7)
Large classes	12	(1.8)	8	(2.0)	11	(1.8)	6*	(1.2)	11	(1.3)	10	(1.3)
Maintaining discipline	5	(1.7)	7	(1.9)	5	(0.8)	4	(0.9)	3	(0.6)	5	(1.1)
Parental support for education	10	(2.3)	11	(2.0)	11	(1.7)	11	(2.0)	15	(1.2)	15	(2.2)
State and/or district testing policies	12	(2.3)	15	(2.8)	9	(1.7)	10	(1.8)	10	(2.1)	17*	(1.9)

* $p < 0.05$

Conclusion

Based on teacher responses to the national survey questionnaires, grade K–12 science and mathematics education was for the most part stable in the period from 1993 to 2000. Analysis of data from several items that were administered in the 1977 and/or 1985–86 national surveys reinforces the picture of overall stability in teaching practices.

One notable trend is that there has been an influx of females into the science and mathematics teaching force since 1977; for example, in 1977 only 25 percent of science teachers and 32 percent of mathematics teachers in grades 10–12 were female, compared to 48 and 57 percent, respectively in 2000. There has also been a trend toward a slightly more diverse teaching force, although minority groups continue to be underrepresented, with only 9–14 percent of teachers, compared to more than 30 percent of students, classified as non-white.

The newest teachers in 2000, those with five or fewer years of experience, are more likely to have completed a graduate degree than their counterparts in 1993. The number of semesters of college coursework of mathematics has increased for teachers in all three grade ranges. In contrast, the average number of semesters of college coursework in science completed by teachers did not increase, and in grades 5–8 actually fell between 1993 and 2000.

There appears to be little, if any, change in participation in subject-specific professional development among science and mathematics teachers; the amount of professional development for the average teacher remains strikingly low. Only 9–15 percent of grade 1–4 teachers, 17–23 percent of grade 5–8 teachers, and 31–45 percent of grade 9–12 teachers report participating in more than 35 hours of professional development in the last three years.

Survey data indicate some gains and some losses in teacher pedagogical preparedness. One prominent change is an increase in the percentage of grade 5–12 science teachers and grade 9–12 mathematics teachers indicating they are well prepared to have students work in cooperative learning groups. In contrast, in some groups of teachers (elementary science teachers and high school mathematics teachers), there was a trend toward feeling less prepared to include parents in the science/mathematics education of their children.

One of the most obvious differences between 1993 and 2000 is the amount of control science and mathematics teachers perceive themselves having over decisions related to curriculum, with fewer teachers reporting that they have strong control over determining course goals and objectives and over selecting the content, topics, and skills to be taught. In addition, teachers in both subjects and all grade ranges are more likely to report that the testing program in their state/district dictates what they teach.

Mathematics continues to be taught virtually every day in grades 1–12; in contrast, while the percent has increased since 1993, only about 70 percent of elementary classrooms receive science instruction every day. The amount of class time spent on mathematics instruction in the elementary grades has increased, and while time spent on science has increased slightly in grades 1–3, science still receives much less attention than mathematics in the elementary grades.

In terms of course offerings, there has been a decrease since 1993 in the percentage of high schools offering review mathematics courses, and an increase in the percentage of schools offering courses in probability and statistics. There has also been an increase in the percent of high schools offering advanced science courses (such as 2nd Year and Advanced Placement Chemistry). In middle schools, there has been a trend toward increased offering of general/integrated science courses.

In both science and mathematics there has been an increase in the percentage of classes containing LEP students in grades 1–4, a trend especially evident in the South and West. While the percentage of females in all science courses has remained roughly the same from 1993 to 2000, ranging from 46 to 56 percent, there has been an increase in the percentage of non-Asian minority students in science courses for grades 9–12, particularly in chemistry and physics courses.

Changes in science instruction are slight, but include reductions in students reading about science during class and doing textbook/worksheet problems. For the most part, the frequency of students doing hands-on/laboratory activities has not changed. The use of computers in science instruction is striking in its lack of change; in both 1993 and 2000, 10 percent or fewer science lessons included students using computers.

Mathematics instruction appears to have changed even less than science. Similar to science instruction, computer use in mathematics instruction has remained quite low, with well under 10 percent of the lessons in both 1993 and 2000 including computer use.

Access to technology generally appears to have improved since 1993, when as many as 41 percent of the schools rated access to computers as a serious problem. By 2000, this figure decreased to about 20 percent; apparently, the continued low levels of computer use are due to factors other than lack of access. Use of some other instructional technology has risen since 1993. The most dramatic change occurs across all levels and subjects with the rise in the use of CD-ROM, an increase from practically non-existent in 1993 to as much as 59 percent of the grade 5–8 science classes reporting their use in 2000.

The attention to science and mathematics education reform over the last decade begs the question: Why is widespread change not more evident? At the time of the survey, national standards documents for science and mathematics had been in the field for five and ten years, respectively; yet evidence of their impact on a national scale is not strong. One potential explanation lies in other data from this study, which show that the amount of subject-specific professional development for the average science and mathematics teacher is quite small, typically less than a few days over a three-year period. Without professional development opportunities, and the time and incentives to participate in them, teachers are not very likely to change their practice in ways envisioned by the reforms.

A second potential explanation concerns the context within which teachers work, much of which they have little control over. The standards documents make it clear that in order for change to occur, there must be a supportive policy context. As noted in this report, teachers are more likely today than several years ago to perceive high-stakes tests as dictating what they teach; the fact that many of these tests are not well-aligned with the reform vision would act as a deterrent to teachers for changing their practice.

Without opportunities for teachers to reform their practice or a context that supports such reforms, perhaps the lack of change is not so surprising after all.

Endnotes

1 Concerning race/ethnicity categories, in the 1993 survey, teachers were instructed to “circle one”; in the 2000 survey, teachers were instructed to “darken all that apply.”

2 Concerning race/ethnicity categories, in the 1993 survey, teachers were instructed to “circle one”; in the 2000 survey, teachers were instructed to “darken all that apply.”

3 The highest number of courses a teacher could indicate for each of the four categories—life science, chemistry, physics/physical science, and earth/space science—was “>8,” and 9 was used as the number of courses in those cases. As a result, these figures underestimate the total for any teacher who completed more than nine courses in a particular category.

4 The highest number of courses a teacher could indicate for each of the four categories—calculus, statistics, advanced calculus, and “all other mathematics courses”—was “>8,” and 9 was used as the number of courses in those cases. As a result, these figures underestimate the total for any teacher who completed more than nine courses in a particular category.

5 The standard errors are estimated using the average design effect.

6 The 1977 survey included Kindergarten teachers; estimates are for teachers of grades K–6, rather than 1–6.

7 The standard error is estimated using the average design effect.

8 The 1993 survey categories were “Discrete mathematics,” “Number systems and number theory,” and “Conceptual underpinnings of calculus.”

9 The 2000 survey category was “Have students work in cooperative learning groups.”

10 The 2000 survey category was “Have students work in cooperative learning groups.”

11 The 1993 category was “Science teachers in this school regularly share ideas and materials.”

12 The 1993 category was “Mathematics teachers in this school regularly share ideas and materials.”

13 The 1993 category was “Selecting textbooks.”

14 The 1993 category was “Selecting textbooks.”

15 The standard errors are estimated using the average design effect.

16 To avoid overestimating the number of minutes typically spent on science instruction, if the most recent lesson did not take place on the last day school was in session, the number of minutes was treated as zero when the average was computed.

17 The 1993 survey did not include Kindergarten teachers; estimates are for teachers of grades 1–3, rather than K–3.

18 To avoid overestimating the number of minutes typically spent on mathematics instruction, if the most recent lesson did not take place on the last day school was in session, the number of minutes was treated as zero when the average was computed.

19 The 1993 survey did not include Kindergarten teachers; estimates are for teachers of grades 1–3, rather than K–3.

20 Only teachers who indicated they teach reading, mathematics, science, and social studies were included in these analyses.

[21] The 1977 survey included Kindergarten teachers; estimates are for teachers of grades K–3, rather than 1–3.

[22] Only teachers who indicated they teach reading, mathematics, science, and social studies were included in these analyses.

[23] The 1993 survey collected data for grades 7–8; the 2000 survey collected data for grades 6–8. To compensate, only schools containing grades 7 and/or 8 were included in these analyses.

[24] The 1993 data included coordinated science.

[25] The 1993 survey collected data for grades 7–8; the 2000 survey collected data for grades 6–8. To compensate, only classes with grade 7 and/or 8 students were used to calculate these numbers.

[26] The 1993 data included coordinated science.

[27] The standard error is estimated using the average design effect.

[28] The 1993 survey categories were "Use a computer," "Watch the teacher demonstrate a scientific principle," and "Work in small groups."

[29] The standard error is estimated using the average design effect.

[30] The standard error is estimated using the average design effect.

[31] The 1993 survey categories were "Work in small groups" and "Use computers/calculators to develop an understanding of mathematics concepts."

[32] The standard error is estimated using the average design effect.