

CHAPTER THREE

Characteristics of Mathematics and Science Lessons

Introduction

Inside the Classroom researchers documented the observed lessons along a number of dimensions, including how much of the lesson time was devoted to instruction as opposed to housekeeping and interruptions; and how much instructional time was spent in whole class, small group, and individual work. They also described in detail the content addressed in these lessons. These data are presented below, weighted to represent all K–12 mathematics and science lessons in the United States.

Content Areas Addressed

Narrative descriptions were used to categorize the mathematics/science content addressed in each lesson. In mathematics, topics from NCTM's *Principles and Standards for School Mathematics* (2000) were used to classify lessons. In science, lessons were grouped in terms of the major content areas included in the *National Science Education Standards* (NRC, 1996).

Table 12 shows the percentage of mathematics lessons in the nation focusing on particular content areas. Eight in ten lessons have a focus on a single one of these areas, ranging from 72 percent of middle school lessons to 93 percent of lessons in grades 9–12. Number and operations is by far the most common topic in the elementary and middle grades. At the high school level, Algebra is a focus of half of all mathematics lessons. The percentage of lessons categorized as having a focus on problem solving (in most cases in combination with another topic) varied from 3 percent of lessons in grades 9–12 to 15 percent of lessons in elementary schools.

Table 12
Content Focus of Observed Lessons: Mathematics

	Percent of Lessons			
	Overall	Grades K-5	Grades 6-8	Grades 9-12
Lessons with a single content focus	80	78	72	93
Lessons with more than one focus	20	22	28	7
Lessons including a focus on:				
Number and Operations	53	74	53	5
Algebra	20	4	21	55
Geometry	17	11	29	20
Problem Solving	11	15	11	3
Data Analysis and Probability	10	11	9	6
Communication	6	10	4	0
Measurement	5	7	6	0
Trigonometric Functions	3	0	2	13
Reasoning and Proofing	2	2	3	0
Calculus	1	0	0	5
Representations	0	0	0	1
Connections	0	0	0	0

As in mathematics, the vast majority of science lessons have a single content focus. (See Table 13.) The prevalence of life and physical science lessons at the high school level mirrors patterns of course offerings reported in the 2000 National Survey of Science and Mathematics Education, where three-quarters of courses are classified as either life or physical science. The percentage of lessons with a focus on science inquiry (typically in combination with another topic) varies from 2 percent of lessons in grades 9–12 to 15 percent of lessons in elementary schools.

Table 13
Content Focus of Observed Lessons: Science

	Percent of Lessons			
	Overall	Grades K-5	Grades 6-8	Grades 9-12
Lessons with a single content focus	86	87	84	88
Lessons with more than one focus	14	13	16	12
Lessons including a focus on:				
Life Science	41	41	37	45
Physical Science	34	29	37	44
Earth and Space Science	21	24	27	8
Science as Inquiry	11	15	9	2
Science in Personal and Social Perspectives	6	5	8	7
History and Nature of Science	2	2	0	4
Science and Technology	2	2	0	3

Percentage of Time Spent on Instruction

In addition to the content addressed, lesson descriptions included the amount of time spent on instructional and non-instructional activities. Non-instructional activities included such things as taking roll, distributing papers not related to the observed lesson, and interruptions (e.g., loudspeaker announcements).

As can be seen in Table 14, based on *Inside the Classroom* observations, across all mathematics and science lessons, 7 percent of class time is spent on non-instructional activities. Over a 180-day school year, this equates to approximately 2½ weeks of instruction, somewhat lower than the 3½ weeks estimated from teacher self-reports in the 2000 National Survey of Science and Mathematics Education.

The percentage of non-instructional time increases with grade range. In mathematics, 5 percent of class time is spent on non-instructional matters in the elementary grades, rising to 13 percent in grades 9–12, which equates to approximately 4½ lost weeks of instruction at the high school level. In science, the percentage of non-instructional time increases from 4 percent at the elementary level to 11 percent at the high school level.

Table 14
Class Time Spent on
Instructional and Non-Instructional Activities

	Mean Percent of Class Time	
	Instructional	Non-Instructional
All Mathematics and Science Lessons	93	7
All Mathematics Lessons	92	8
Grades K–5	95	5
Grades 6–8	93	7
Grades 9–12	87	13
All Science Lessons	94	6
Grades K–5	96	4
Grades 6–8	93	7
Grades 9–12	89	11

How Students Are Grouped for Instruction

Whole-class instruction accounts for almost two-thirds of instructional time in mathematics and science lessons, with the remaining one-third divided fairly evenly between students working individually and students working in small groups. (See Table 15.) In mathematics, students are likely to spend quite a bit more time working individually than in pairs or small groups, especially at the high school level. Overall, students also spend a greater proportion of class time working individually in mathematics lessons than they do in science lessons. Similar results were found when science and mathematics teachers described their lessons as part of the 2000 National Survey of Science and Mathematics Education.

Table 15
Class Arrangements

	Mean Percent of Instructional Time [†]		
	Whole Class	Pairs/ Small Groups	Individuals
All Mathematics and Science Lessons	62	17	21
All Mathematics Lessons	59	15	27
Grades K–5	57	16	27
Grades 6–8	60	15	25
Grades 9–12	61	12	27
All Science Lessons	65	20	15
Grades K–5	65	23	12
Grades 6–8	64	18	18
Grades 9–12	65	16	19

[†] Time spent on non-instructional activities is not included in these percentages.