

the condition of education 2004



INDICATOR 23

Instructional Approaches to 8th-Grade Science

The indicator and corresponding tables are taken directly from *The Condition of Education 2004*. Therefore, the page numbers may not be sequential.

Additional information about the survey data and supplementary notes can be found in the full report. For a copy of *The Condition of Education 2004* visit the NCES web site (<http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2004077>) or contact ED PUBs at 1-877-4ED-PUBS.

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Learning Opportunities

Instructional Approaches to 8th-Grade Science

In 46 percent of U.S. science lessons, 8th-graders conducted experiments or other practical activities. In 31 percent, 8th-graders collected and recorded data from those activities.

The 1999 Third International Mathematics and Science Study included a Videotape Study of 8th-grade science classes in Australia, the Czech Republic, Japan, the Netherlands, and the United States. The study used nationally representative class samples to examine the differences and similarities in how science is taught. This indicator examines aspects of how teachers organize lessons to support science learning.

Some teachers organize science content to encourage students to make connections among experiences, ideas, and explanations; others present content as facts, definitions, or problem-solving algorithms to be learned. Japanese science lessons were more likely to provide opportunities for 8th-graders to make connections than to focus on facts; Czech, Dutch, and U.S. lessons were more likely to focus on facts than on making connections. No difference was detected in focus among Australian lessons.

One way teachers help students make connections is through hands-on, practical activities.¹ Engaging students this way is strongly emphasized in Japanese and U.S. curriculum and standards documents, moderately emphasized

in those of Australia and the Netherlands, and minimally emphasized in those of the Czech Republic.² To some degree the observations of students engaged in practical work in the videotaped lessons appear to correspond with these different curricular emphases.

The percentage of science lessons in which 8th-graders conducted practical activities ranged widely, from 23 percent in the Czech Republic to 74 percent in Australia (see supplemental table 23-1). In 46 percent of U.S. science lessons, students conducted experiments, a greater proportion than in the Czech Republic but a smaller one than in Australia. Lessons also varied in the extent students were engaged in the process of scientific inquiry, from developing a hypothesis, through recording observations, to interpreting data. In 31 percent of U.S. science lessons, 8th-graders were asked to collect and record their observations as data, a greater proportion than in the Czech Republic (8 percent), but a smaller one than in Australia and Japan (62 and 59 percent, respectively). Likewise, students were asked to interpret their data in 31 percent of U.S. science lessons, within the range of 20 to 56 percent in the other countries.

#Reporting standards not met (too few cases).

¹Practical activities include both traditional laboratory experiments and other hands-on interactions with objects, such as building models, classifying materials, drawing observations of objects, producing and observing phenomena, or designing and testing technological solutions to problems.

²American Association for the Advancement of Science 1990, 1993; Australian Education Council 1994; Dutch Ministry of Education 1998; Goto 2001; National Research Council 1996; and Nelesovska and Spalcilova 1998.

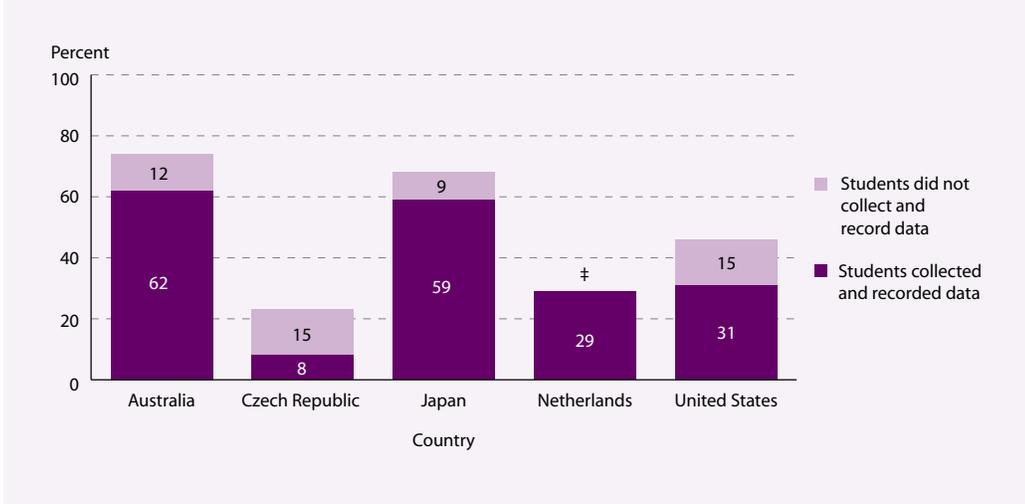
NOTE: Totals represent the percentage of lessons that included at least one segment of students doing practical activities independently.

SOURCE: U.S. Department of Education, NCES. (forthcoming). *Teaching Science in Five Countries: Results From the TIMSS 1999 Video Study* (NCES 2004–015). Data from U.S. Department of Education, NCES, Third International Mathematics and Science Study (TIMSS) Video Study, 1999.

FOR MORE INFORMATION:
Supplemental Note 5
Supplemental Table 23-1



PRACTICAL SCIENTIFIC WORK: Percentage of 8th-grade science lessons with student-conducted experiments or other practical activities, by the percentage of lessons in which students collected and recorded data as part of those activities, by country: 1999



Instructional Approaches to 8th-Grade Science

Table 23-1. Percentage of 8th-grade science lessons with student-conducted experiments or other independent practical activities, by types of student work and country: 1999

Country	Total	Lessons with student-conducted experiments or other practical activities in which			
		Students collected and recorded data		Students interpreted data ¹	
		Yes	No	Yes	No
Australia	74	62	12	56	19
Czech Republic	23	8	15	20	4
Japan	67	59	9	40	28
Netherlands	30	29	‡	24	6
United States	46	31	15	31	15

‡Reporting standards not met (too few cases).

¹"Interpreting data" is defined as using data generated from a student-conducted experiment or other practical activity as evidence to explain patterns, draw conclusions, or make generalizations.

NOTE: Practical activities include both traditional laboratory experiments and other hands-on interactions with objects, such as building models, classifying materials, drawing observations of objects, producing and observing phenomena, or designing and testing technological solutions to problems. See *supplemental note 5* for information about the TIMSS Videotape Study. Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, NCES. (forthcoming). *Teaching Science in Five Countries: Results from the TIMSS 1999 Video Study* (NCES 2004-015), figure 6.20. Data from U.S. Department of Education, NCES, Third International Mathematics and Science Study (TIMSS) Video Study, 1999.

Instructional Approaches to 8th-Grade Science

Table S23. Standard errors for the percentage of 8th-grade science lessons with student-conducted experiments or other practical activities, by the percentage of lessons in which students collected and recorded data as part of those activities, by country: 1999

Country	Lessons with student-conducted experiments or other practical activities in which	
	Students collected and recorded data	Students did not collect and record data
Australia	5.5	4.4
Czech Republic	3.2	3.7
Japan	5.7	3.1
Netherlands	5.6	‡
United States	5.1	4.3

‡Reporting standards not met (too few cases).

SOURCE: U.S. Department of Education, NCES. (forthcoming). *Teaching Science in Five Countries: Results From the TIMSS 1999 Video Study* (NCES 2004–015), figure 6.20. Data from U.S. Department of Education, NCES, Third International Mathematics and Science Study (TIMSS) Video Study, 1999.

Instructional Approaches to 8th-Grade Science

Table S23-1. Standard errors for the percentage of 8th-grade science lessons with student-conducted experiments or other independent practical activities, by types of student work and country: 1999

Country	Total	Lessons with student-conducted experiments or other practical activities in which			
		Students collected and recorded data		Students interpreted data	
		Yes	No	Yes	No
Australia	6.1	5.5	4.4	6.1	5.1
Czech Republic	4.6	3.2	3.7	4.5	1.2
Japan	5.5	5.7	3.1	5.6	5.6
Netherlands	5.8	5.6	‡	5.1	2.8
United States	6.4	5.1	4.3	6.2	4.3

‡Reporting standards not met (too few cases).

SOURCE: U.S. Department of Education, NCES. (forthcoming). *Teaching Science in Five Countries: Results from the TIMSS 1999 Video Study* (NCES 2004–015), standard errors for figure 6.20. Data from U.S. Department of Education, NCES, Third International Mathematics and Science Study (TIMSS) Video Study, 1999.