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ABSTRACT

This document focuses on trends in school and home frameworks for learning found in National Assessment of Educational Progress (NAEP) data from 1977 to 1990. Trends in classroom instruction, course taking, students' attitudes, homework versus television viewing, and reading habits and home support for literacy are considered. One table provides data on trends in attitudes toward mathematics at ages 13 and 17 years in 1978 to 1990; and another table provides data on trends in television watching at ages 9, 13, and 17 years from 1982 to 1990. Six questions for discussion are listed. Although classrooms should be student, rather than teacher, centered, NAEP trend data indicate that old habits are difficult to change. Results for science and mathematics show movement toward more advanced high school coursework. NAEP data show that students with more positive attitudes about the value of what they are learning generally have higher achievement levels; however, NAEP trend data also show that students' attitudes changed little either in liking particular subjects or in understanding their utility. NAEP trends for doing homework and watching television are either stable or moving in the wrong direction. Students appear to be infrequent readers, and the few changes that have occurred over time reflect decreases in students' propensity to read. (RLC)

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NAEPfacts

Trends in School and Home Contexts for Learning

NAEPfacts are brief reports that extract the results of data on a single topic from the National Assessment of Educational Progress (NAEP); they are intended for elementary and secondary school teachers and principals. NAEPfacts describe what educators, researchers, and policymakers have to say about effective practice; provide information from NAEP about what actually takes place in schools; and conclude with questions for discussion. They are not meant to promote or prove any educational theory; NAEP data simply tell us what is happening in the classroom. Furthermore, relationships between background factors and achievement are not causal.

This issue of NAEPfacts, written by Ina Mullis of Educational Testing Service, is concerned with trends in school and home frameworks for learning. We hope it will promote conversations among teachers, principals, parents, and other interested parties about improving learning. Readers' comments and suggestions are welcome.

D Elliott

Myriad factors lead to student learning. Instructional approaches, coursework, student attitudes, and home support for learning contribute heavily to student achievement. During the 1980s, leaders in the educational reform movement such as the National Council of Teachers of Mathematics, the American Association for the Advancement of Science, and the National Science Teachers Association recommended changing home and school learning environments and proposed many education policy initiatives. Were these recommendations implemented? Were they effective in improving student outcomes? Where do we go from here?

NAEP results reported in *Trends in Academic Progress: Achievement of U.S. Students in Science, 1969–70 to 1990; Mathematics, 1973 to 1990; Reading, 1971 to 1990; and Writing, 1984 to 1990* revealed some slight progress toward implementing recommendations for school reform. General improvements in achievement across the 1980s were accompanied by increases in the number of high school mathematics courses taken and by signs teachers were responding to suggested reforms in classroom practice. For example, 9-year-olds reported increased use of science equipment, and more 13- and 17-year-olds reported using computers in mathematics classes. Although lecture by the teacher still appears to dominate in high school mathematics classes, more students reported opportunities for discussion.

Classroom Instruction

Education reformers recommended that students be more active learners in class. Classrooms should be *student*, rather than teacher, centered. NAEP trend data, however, indicate old habits are difficult to change.

Students can learn to become better writers by understanding writing as a dynamic process of planning, drafting, and revising. Although they were given space and time to plan their writing in the assessment, less than one-fifth of 8th- or 11th-graders did—representing no change from 1984 to 1990. In 1990, 8th- and 11th-graders reported revising only about as frequently as their predecessors in 1984.

Students' reports about the kinds of school-related materials they read hardly changed between 1984 and 1990. Essentially the same percentages of students read plays, biographies, and science books, although more 13- and 17-year-olds recently reported reading poetry. Two-thirds or fewer students in all three grades reported ever reading biographies or plays.

Yet, there are signs that reformers' recommendations have affected school practice:

Discussion opportunities in mathematics classes were reported more frequently by 17-year-olds. In 1990, 63 percent reported "often" discussing mathematics in class compared with 51 percent in 1978.

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Nine-year-olds reported having more experience with hands-on science equipment; more elementary school students reported working with thermometers, microscopes, and calculators in 1990 than in 1977. For example, the percentage who used a microscope increased from 53 to 63 percent.

At ages 9 and 13, success on questions for which students were permitted to use a calculator increased significantly between 1978 and 1990; at age 17, performance improved significantly between 1982 and 1990 after a decline between 1978 and 1982.

Also, students reported more use of computers in mathematics classrooms.

Between 1984 and 1990, more 8th- and 11th-graders reported that teachers commented about ideas in their papers; still, in 1990 fewer than half said teachers provided feedback on this aspect of their papers.

Course Taking

Particularly in science and mathematics, much concern has been expressed about the low numbers of students who pursue challenging coursework. A recent College Board study showed geometry is the "gatekeeper" for college enrollment; 93 percent of all college-bound high school seniors had taken geometry. However, NAEP showed that in 1990, only 67 percent of 17-year-olds nationally and as few as 52 percent of Hispanics reported studying mathematics through geometry or beyond.

NAEP trend results for both science and mathematics show movement toward more advanced high school coursework.

Biology and chemistry enrollments increased about 10 percent since 1982; eighty-five percent of 17-year-olds in 1990 reported studying biology at least one year, and 42 percent reported taking chemistry at least one year. However, only about 10 percent of 17-year-olds in either assessment reported taking physics one year. The patterns were the same across gender and racial-ethnic groups.

Mathematics coursework showed similar patterns, with students moving further through the course sequence, but relatively few reaching the end; fewer 17-year-olds reported ending mathematics coursework with general mathematics or pre-algebra, and more reported pursuing studies through Algebra I and geometry to enroll in Algebra II classes. Forty-four percent in 1990 reported taking Algebra II, compared with 37 percent in 1978; however, fewer than 10 percent in either assessment reported having taken pre-calculus or calculus.

Students' Attitudes

Students who understand the *value* of knowledge and skills across subject areas, it is generally agreed, are more motivated to learn. NAEP data support this view because they show that students with more positive attitudes about the value of what they are learning generally have higher achievement levels. NAEP trend data, however, show students' attitudes changed little either in liking particular subjects or in understanding their utility.

Specifically, students' opinions about how useful what they learned in science would be in the future changed little between 1977 and 1990. Also, in both years, fewer 17-year-olds than 13-year-olds thought such learning would be useful (two-thirds compared to about three-fourths, respectively). Between 1977 and 1990, increased percentages of 17-year-olds agreed science should be required in school (75 compared with 62 percent). Also, 1990 students more often than 1977 students felt science applications could affect world problems.

Asked whether they liked mathematics, were good at it, and to assess its value, students at ages 13 and 17 replied similarly between 1978 and 1990. For example, more than one-fourth in both student groups reported they were only taking mathematics because it was required. In 1990, fewer than half of 13- and 17-year- olds reported they would like to take more mathematics (see table 1).

In 1984 and 1990, nearly 60 percent of 4th-graders reported they liked to write, had confidence in their writing ability, and felt others liked what they wrote; in grades 8 and 11, fewer students—about 40 percent—responded positively.

Homework versus Television

Researchers say, together with encouraging students to read, parents can also call attention to homework and monitor the amount of television viewing. Unfortunately, trends for both activities—doing homework and watching television—are either stable or moving in the wrong direction.

Students' homework habits changed little across the 1980s. In 1990, at age 9, most students reported doing less than one hour of homework each night; at ages 13 and 17, only about one-third of students spent as much as one hour or more per night on homework. Conversely, students at all three ages reported watching television more often. The percentage of students watching up to 2 hours per night dropped, and the percentage watching 3 to 5 hours rose (see table 2).

Reading Habits and Home Support for Literacy

NAEP assessed students' attitudes about reading through questions about their reading habits. Much research, including NAEP findings, indicates positive relationships between reading activities and academic achievement. However, students appear to be infrequent readers, and the few changes that have occurred over time reflect decreases in their propensity to read.

Table 1.—Trends in attitudes toward mathematics at ages 13 and 17 1978 to 1990

		Strongly agree or agree		Undecided, strongly disagree or disagree	
		Percent of students	Average proficiency	Percent of students	Average proficiency
I would like to take more mathematics.					
Age 13	1990	43 (1.3)	273 (1.6)	57 (1.3)	269 (1.4)
	1978	50 (1.5)*	263 (2.6)*	51 (1.5)*	268 (1.4)
Age 17	1990	37 (1.3)	312 (1.9)	63 (1.3)	299 (1.4)
	1978	39 (1.7)	304 (2.0)	61 (1.7)	295 (1.7)
I am taking mathematics only because I have to.					
Age 13	1990	28 (1.0)	263 (1.8)	72 (1.0)	272 (1.4)
	1978	29 (1.4)	256 (2.4)	71 (1.4)	270 (1.9)
Age 17	1990	27 (1.1)	294 (1.9)	73 (1.1)	307 (1.5)
	1978	27 (1.5)	287 (2.5)	73 (1.5)	302 (1.8)
I am good at mathematics.					
Age 13	1990	71 (1.0)	274 (1.6)	29 (1.0)	263 (1.7)
	1978	65 (1.3)*	270 (2.0)	35 (1.3)*	258 (1.9)
Age 17	1990	58 (1.7)	311 (1.6)	42 (1.7)	294 (1.8)
	1978	54 (1.5)	307 (2.0)	46 (1.5)	289 (1.5)

*Statistically significant difference from 1990, as determined by an application of the Bonferroni procedure, where alpha equals .05 per set of comparisons between previous mathematics assessments and 1990.

NOTE: The standard errors of the estimated percentages and proficiencies appear in parentheses. It can be said with 95 percent certainty that for each population of interest, the value for the whole population is within plus or minus two standard errors of the estimate for the sample. Percentages of students may not total 100 percent due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Trends in Academic Progress*. Prepared by the Educational Testing Service. Washington, DC: 1991, p. 95.

Table 2.—Trends in television watching at ages 9, 13, and 17

	Number of hours watched per day					
	0–2 Hours		3–5 Hours		6 or more hours	
	Percent of students	Average proficiency	Percent of students	Average proficiency	Percent of students	Average proficiency
Age 9						
1990	37 (0.9)	231 (1.2)	39 (0.7)	234 (0.9)	23 (0.8)	221 (1.4)
1982	44 (1.1)*	218 (1.4)*	29 (0.6)*	227 (1.1)*	26 (1.0)	215 (1.2)*
Age 13						
1990	31 (0.9)	277 (1.2)	53 (0.7)	271 (0.9)	17 (0.7)	258 (1.4)
1982	45 (0.8)*	273 (1.2)	39 (0.4)*	269 (1.1)	16 (0.8)	256 (1.8)
Age 17						
1990	51 (1.2)	312 (1.1)	41 (1.1)	300 (1.2)	9 (0.5)	287 (1.8)
1982	69 (0.7)*	305 (1.0)*	26 (0.6)*	296 (1.1)*	5 (0.2)*	279 (2.1)*

*Statistically significant difference from 1990, as determined by an application of the Bonferroni procedure, where alpha equals .05 per set of comparisons between previous mathematics assessments and 1990.

NOTE: The standard errors of the estimated percentages and proficiencies appear in parentheses. It can be said with 95 percent certainty that for each population of interest, the value for the whole population is within plus or minus two standard errors of the estimate for the sample. Percentages of students may not total 100 percent due to rounding. Data from 1978 are not available at ages 9 and 13.

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Trends in Academic Progress*. Prepared by the Educational Testing Service. Washington, DC: 1991, p. 100.

At ages 13 and 17, about 60 percent of students in 1990 as in 1984 reported reading only weekly or less often. About one-third of 13-year-olds and one-fourth of 17-year-olds reported reading books, newspapers, and magazines only once a month or less. At all three ages, approximately one-fifth of students reported reading for fun only yearly or never. More 9-year-olds reported never reading for fun in 1990 than in 1984.

Students were also asked if they ever engaged in a variety of reading activities, including telling a friend about a good book, taking a book out of the library, spending their own money on books, or reading more than one book by a favorite author. In 1984 and 1990, at all three ages, fewer than half the students reported having engaged in all four activities; at age 13, the percentage having done none or only one of these activities increased from 12 percent in 1984 to 16 percent in 1990.

Students reported that fewer reading materials such as books, a daily newspaper, magazines, and an encyclopedia were in their homes. In 1990 compared with 1971, fewer students at all three ages reported all four types of materials were available. At age 9, the percentage of students reporting only two or fewer types of these materials in their homes increased from 28 to 36 percent.

Questions for Discussion

1. How can we encourage more students to take advanced mathematics and science courses?
2. What are some specific classroom projects that would increase the use of hands-on science experiences and allow students to use more science equipment?
3. How can teachers stimulate discussion and written communication in mathematics classes?
4. How can we make learning more fun?
5. How can we demonstrate more effectively the utility of the subject material being presented?
6. How can schools help parents find ways to encourage their children's reading activities and promote good study habits?

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