

What We Know About What Students Don't Know

To improve student performance, districts should help teachers examine their instruction from the view of what students actually experience, promote higher-order thinking skills, engage students in active learning, and encourage more parent involvement.

The Nation's Report Card, the National Assessment of Educational Progress (NAEP), is funded by the U.S. Department of Education under a grant to Educational Testing Service. The National Assessment is mandated by Congress to collect and report data over time on the performance of young Americans in various school subjects. It also makes information on assessment procedures available to state and local education agencies.

According to data from NAEP:

- Black and Hispanic 9- and 12-year-olds have made dramatic progress in the basic skills of reading and mathematics during the past 20 years.
- Minority students know more scientific *facts* than they did 15 years ago.
- All students, on average, can spell better and write a grammatically correct sentence more readily than they could 15 years ago.

The schools have done a remarkable job in responding to the country's clear insistence on "back to basics" and minimum competencies. "Johnnie" *can* read. Furthermore, NAEP data give clear

Photograph by Dennis Johnson



indication that trend lines in most curriculums are heading upward:

- More writing is systematically taught and assigned.
- More mathematics and science courses are required, and are taken by more students.
- More homework is assigned and completed.

In addition to these results, there is reason for optimism as we listen to the committees of teachers and test experts who are meeting now to plan the assessments of 1990 and 1992. They share pervading interest in measuring the higher-order skills in all subjects and excited curiosity about the possible effects of new instructional practices: "whole language" and its effect on better reading skills, the use of calculators in mathematics classes, and the impact of "the writing process" on students' compositions.

NAEP results demonstrate conclusively that when goals are clear and the environment is supportive, our schools can deliver—and they do. However, the task of setting goals for the future might be helped by examining more closely results that reveal what students *don't know*. NAEP also collects information from students concerning their attitudes about school and curriculum subjects, and these data are revealing. Finally, the Nation's Report Card has compiled answers from 9-, 13-, and 17-year-olds,

and from their teachers, about how young people perceive they are being helped to learn and how their teachers think they are teaching. Some of those data can be useful in analyzing relationships between achievement and school practice.

A word of caution. NAEP is a survey project, not a rigorously controlled research study. Therefore, it is not possible to draw cause-and-effect conclusions from these data. Our hope is that the statistics will corroborate or challenge the assumptions and beliefs of experienced educators and policymakers.

In Reading

Last June, three and a half million 9-year-olds completed 3rd or 4th grade in the United States. Ninety-four percent were reading at what might be called "grade level," but 210,000 9-year-olds couldn't read and understand their textbooks.

The situation for 9-year-olds and reading, however, is better than it was 10 and 15 years ago. It reflects real—that is, dramatic—improvement over the period and includes remarkable improvement in performance for black and Hispanic children. It also describes a national achievement level that is better than that of most of the countries in the world. Nevertheless, each year more than 200,000 American boys and girls complete their 3rd or 4th year of schooling unable to read their texts.

While we can be reasonably satisfied with the 9-year-old performance, we must note that most of the improvement took place before 1980. The trend line stopped moving up in

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1980 and has remained virtually at the same level for the past eight years. The growth from 1971 through 1980 also occurred in the so-called basic skills and mostly among minority populations. There was little, if any, improvement in the higher-order skills.

Thirteen-year-olds have all kinds of problems just being new teenagers—physical growth spurts, social adjustments, dangerous temptations—but they also have serious reading problems. Each year, 40 percent of them—about 1,450,000 7th and 8th graders—have trouble reading and understanding their textbooks. This is a dramatically different situation from when they were four years younger at age 9. Somewhere between the 4th and 8th grades, many of them are "lost" to satisfying reading experiences. These statistics for this most basic of skills have serious implications for students' success and satisfaction in secondary schools.

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What Do Americans Study?

What Americans Study, the first in a series of *Policy Information Reports* from the ETS Policy Information Center, examines course-taking trends of high school graduates from 1982 to 1987, self-reported course selections of SAT-takers from 1975 to 1988, and course-taking patterns of 11th, 8th, and 4th graders. Contains numerous graphs and charts. Of interest to educational policymakers and practitioners. 1989. 28 pp. Large paperback. Available for \$3.50 (prepaid) from Educational Testing Service, Publications Order Service, P.O. Box 6736, Princeton, NJ 08541-6736.

Reading and understanding an 8th grade textbook requires the same skill level as reading most local newspapers—not a terribly sophisticated achievement, but one that's essential if our teenagers are to become knowledgeable citizens within their communities. Seventeen-year-olds across the nation are *one* year away from voting on issues that range from the need for a new fire truck in town and the local school budget, to funding "star wars" and electing a new President. Each year 60 percent of those who are still in school (NAEP cannot reach the dropouts estimated at about 15 percent of this age group), more than 1,600,000 young men and women, leave their secondary school experience unable to "locate, understand, summarize, and explain relatively complicated information." This means it is difficult for them to read and decipher most editorials, many important instructional manuals, or newspapers like *The New York Times* and *The Wall Street Journal*. There are many who wonder if this performance level is adequate for success in the third millennium.

In Mathematics

During the 1989-90 academic year, over three million 17-year-olds are high school juniors and seniors. When they have finished, 1,500,000 of them—almost half—will still not have mastered 8th grade mathematics. As a matter of fact, only 6 percent, about 180,000 young Americans, complete their secondary school programs each year proficient in what was considered high school mathematics (algebra, geometry, multi-step problem solving) a generation ago. This 6 percent constitutes the country's pool of college entrants able to qualify for scientific, technical, and engineering programs.

Mathematics achievement is better than it was five years ago but not as good as it was 15 years ago. At age 9, both male and female students do equally well in mathematics in our 3rd and 4th grades: 74 percent of them can add and subtract two-digit numbers and can recognize relationships among coins. This means essentially

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that three-fourths of the cohort each year are performing at "grade level." Whether or not "grade level," as exemplified by textbook content, is considered appropriate in today's world is a separate matter.

By the time these students reach the 7th or 8th grades at age 13, only 16 percent of them have mastered the content of a typical 8th grade mathematics textbook; that is, they can (65 to 80 percent of the time) "compute with decimals, fractions, and percents; recognize geometric figures; and solve simple equations." The vast majority of them, more than 2,800,000 out of 3,500,000, cannot do these kinds of tasks successfully at least 50 percent of the time.

If this is the case, it seems reasonable to ask whether this "goal" is realistic for 13-year-olds, even though it was set by America's teachers and mathematicians. A partial answer to this query may be provided by an international study (ETS 1989) that presented some of these same questions to comparable samples of 13-year-olds from five other countries (see *A World of Differences*, p. 9).

- While 40 percent of American 13-year-olds could regularly solve two-

step problems, close to 70 percent of their Canadian counterparts could do so.

- While only 9 percent of American 13-year-olds could understand certain mathematical concepts, 40 percent of their peers in Korea could do so most of the time.

As mentioned earlier, the decline in mathematics achievement continues through high school, and by age 17, far fewer than 10 percent each year have mastered algebra, geometry, and the ability to solve multi-step problems.

In Science

Next June, three and a half million 13-year-olds will finish the 7th or 8th grade in the United States. One and a half million of them—almost half—will still not understand basic information from the life and physical sciences—things like the effect of different soils on plants or the concept of buoyancy. This situation is better than it was 10 years ago but not as good as it was 20 years ago, according to statistics from NAEP. This means that each year, unless things change, one and a half million young Americans will leave their middle school experiences unprepared for secondary school science courses.

Fewer than 10 percent of our 17-year-olds leave school with an understanding of biology, chemistry, and physics; that is, equipped to pursue engineering and scientific programs in college. Indeed, while over 90 percent of them will have studied the life sciences in the 9th grade, only one-half will sign up for chemistry and only 10 percent will tackle physics. This course-taking pattern, though, does seem to be improving.

In Writing

In writing, as well as in other subjects, performance on the basics has improved. Students can now spell better than they could, more of them can write grammatically correct sentences, and much larger percentages of our minority students share in these accomplishments.

However, there is little solace in the writing achievement of our students.

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The Nation's Report Card assesses three kinds of student writing at age 17:

Informative: Only 25 percent of 17-year-olds can write an adequate analytic paper from given information.

Persuasive: Only 20 percent of them can write a persuasive letter to the principal.

Imaginative: Only 28 percent of them can write an adequate essay in this area.

As increasing stress is placed on writing instruction, we may have reason to hope for improvement. More states are testing the subject, and students are asked to do more and more writing in school.

In Literature and U.S. History

NAEP's report in 1987 (Applebee et al.) drew a range of commentary as educators and experts viewed the performance statistics for our 17-year-olds in literature and U.S. history [see book review of *What Our 17-Year-Olds Know* by Ravitch and Finn, p. 91]. Some observers were satisfied and others appalled when they learned that 80 percent of students recognized:

- Thomas Edison, Alexander Graham Bell, and Harriet Tubman
 - Italy and the Soviet Union on a map
 - the Underground Railroad and the Bill of Rights
 - characters from *Alice in Wonderland*
 - Dr. King's "I have a dream . . ." speech
 - *Huckleberry Finn*
- but that 30 percent or fewer could identify:
- Betty Friedan and Gloria Steinem
 - the Seneca Falls Declaration
 - Reconstruction or the Progressive movement
 - Tennessee Williams as the author of *A Streetcar Named Desire*
 - the plot of *The Catcher in the Rye*
 - Dostoyevsky as the author of *Crime and Punishment*.

The range of reactions to the findings probably reflects the diversity of the content of these curriculums and differences in emphasis in districts across the country. Those concerned about what has been labeled "cultural literacy," however, were disappointed about the paucity of factual knowledge and common experiences shared by citizens in our pluralistic society.

In Computer Competence

In 1986 (Martinez and Mead), the Nation's Report Card assessed the computer competence of 9-, 13-, and 17-year-old students. While we recognized that the curriculum for this rapidly evolving subject/learning tool was in a state of flux, we felt it imperative to

What Schools Can Do

Most school districts periodically review their curriculums but rarely review instructional practice. In addition to examining what the curriculum *intends* for students to experience, districts should also determine what they *are actually experiencing* in the classroom. NAEP findings indicate the following:

1. The role of students is largely passive. High school students report that the most common instruction they experience, in all subjects assessed, is teacher lecture or teacher presentation of problems.

2. Students receive teacher feedback on spelling, punctuation, and grammar on written assignments but little feedback on their ideas. Planning, drafting, feedback, redrafting, and editing are important in the development of writing skills (the "Writing Process").

3. Question/answer teaching, workbooks, rote-learning, and textbook-based teaching may raise minimum performance, but they do not improve skills in higher-order thinking. Higher-order skill development requires higher-order work.

4. During science classes:

- Only about one-third of the 7th graders and slightly more than half of the 11th graders reported that they were asked to hypothesize or interpret data at least weekly.
- Only 35 percent of the 7th graders and 53 percent of 11th graders reported working with other students on science experiments at least on a weekly basis.
- Over half of the 3rd graders and more than 80 percent of the 7th and 11th graders reported never going on field trips.
- Sixty percent of the 7th graders and 41 percent of the 11th graders said they never had to write up the results of science experiments.
- Only about 46 percent of the teachers of 7th or 11th grade reported access to a general-purpose laboratory, and only 64 percent of the 11th grade teachers reported access to a specialized laboratory for teaching science.

5. Quantity of time-on-task, homework, and attention helps improve achievement up to a point, but quality of instructional interaction is what achieves higher levels of performance.

If NAEP's findings are to change for the better, what students generally experience as learners in our schools must change first. We recommend that those who are committed to high-quality supervision and curriculum development help their school districts to:

- constructively help teachers look at instructional practice;
- examine this practice from the perspective of what an individual student experiences;
- look at what is assigned and taught with an eye toward creative and higher-order thinking and problem-solving;
- seek integration of instruction rather than so-called "layer cake" curriculum;
- work hard at home involvement (Parents want to help their children learn but need guidance from teachers. Where parents are involved, students do better, both in this country and in other countries);
- rededicate themselves to John Dewey's concept of "learning by doing." The active involvement of students improves their learning.

—Gregory R. Anrig and Archie E. Lapointe

A World of Differences

A World of Differences: An International Assessment of Mathematics and Science presents the results of achievement level comparisons of students from British Columbia, Ireland, Korea, New Brunswick, Ontario, Quebec, Spain, the United Kingdom, and the United States. The report affords policymakers, educators, and researchers a context for reviewing the outcomes and suggests questions for further consideration. Written by Archie E. Lapointe, Nancy A. Mead, and Gary W. Phillips and published by Educational Testing Service. Available from the Center for the Assessment of Educational Progress at ETS, Rosedale Rd., Princeton, NJ 08541-0001. 1989. 96 pp. Paperback. \$9.50.

collect what might be important baseline data from which to measure change at a later date.

Students at all three ages were presented paper-and-pencil tasks to determine what they knew about the computer; if they could use it for simple tasks such as word processing, preparing spreadsheets, or data base manipulation; and if they could write programs (LOGO, BASIC, or Pascal). Most American youngsters know how computers function and some of the things they can do. But fewer than one-half of the 13-year-olds can use them to perform simple operations, and a very small percentage of 17-year-olds (fewer than 33 percent) can actually write programs.

Of equal significance, we learned that:

- very few students have regular access to computers in school;
- very few use them as learning tools in various subject areas;
- a serious *equity* problem existed in 1985 for *disadvantaged* students as far as access was concerned;
- many teachers designated as "computer coordinators" did not feel adequately prepared for the assignment (This was especially true at the elementary and middle grades).

The Instructional Challenge

Before each assessment, NAEP assembles committees to set reasonable *objectives* to assess for 9-, 13-, and 17-year-olds in each subject it measures. The drafts of these documents are reviewed by over 100 teachers, experts, and laypersons from across the country. The tasks we place before

students every two years are designed to reflect these objectives.

It seems reasonable to most American educators, as reflected in the opinions of those hundreds who serve as NAEP's advisors, that 80 percent or more of our 13-year-olds should be able to:

- answer four factual questions about a simply written single-page description of the development of a game of basketball—*only 6 out of 10 can do so*;
- select, from 4 options, the correct answer to the question, "Which is true about 87 percent of 10?": "It's greater than, it's less than, it's equal to, or can't tell"—*only 2 out of 10 can do so*;
- recognize that different soils affect plant growth—*only 5 out of 10 can do so*;
- write an adequate informative report about a simple personal experience—*only 2 out of 10 can do so*;
- use a personal computer as a tool to learn a school subject—*only 2 out of 10 can do so*.

Increasingly, NAEP is being asked to focus on today's burning issue: higher-

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order skills. In the future, a greater percentage of the tasks in each assessment will attempt to measure these skills. They will be more difficult. As the Nation's Report Card responds to this demand, two concerns come to mind:

- Can we pull it off without abandoning the emphasis and the successes related to the basic skills—especially among disadvantaged populations? Even though great progress has been made, there is still a way to go to close the gaps.
- NAEP is designed to reflect what is happening in the schools, not what *should* be happening in the schools. This latter decision is one reserved to the 50 states and the 15,000 school districts. Their leadership is what NAEP must remain sensitive to, especially as state comparisons using the NAEP assessments become a reality in 1990 and 1992.

We are working very closely with representatives from all the states to ensure that our instruments reflect the content, the emphasis, and the objectives of all when we assess 8th grade mathematics in 1990 and 1992 and 4th grade reading in 1992. With the help of the Council of Chief State School Officers and other organizations, we have been able to involve more people than ever before in the design of and the decisions about these assessments. The results should prove even more helpful in determining what American students *know* and *can do* □

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