DOCUMENT RESUME

ED 415 494 CS 013 026

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TITLE Long-Term Trends in Student Reading Performance.
INSTITUTION National Center for Education Statistics (ED), Washington, DC.
REPORT NO NCES-98-464
PUB DATE 1998-01-00
NOTE 6p.
PUB TYPE Collected Works - Serials (022)
JOURNAL CIT NAEP Facts; v3 n1 Jan 1998
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Comparative Analysis; Educational Trends; Elementary Secondary Education; Longitudinal Studies; *Racial Differences; *Reading Achievement; Reading Research; *Sex Differences; *Student Evaluation; Trend Analysis
IDENTIFIERS *Long Term Reading Assessment (NAEP); National Assessment of Educational Progress

ABSTRACT

Data from the National Assessment of Educational Progress (NAEP) 1996 Long-Term Reading Assessment show that overall student reading performance, as tested at age levels 9, 13, and 17, has increased for both 9- and 13-year-olds since the first assessment in 1971. Scores for 9- and 13-year-olds in most racial/ethnic and gender subgroups reflected the overall increase. Black 17-year-olds were the only members of that age group to achieve an increase, and they did so while black dropout rates were declining. (Contains four notes, one figure, and two tables of data.) (RS)

NATIONAL CENTER FOR EDUCATION STATISTICS

THE NATION'S REPORT CARD

NAEP FACTS

Vol. 3 No. 1

January 1998

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U.S. Department of Education
Office of Educational Research and Improvement

NCES 98–464

NATIONAL CENTER FOR EDUCATION STATISTICS

THE NATION'S REPORT CARD

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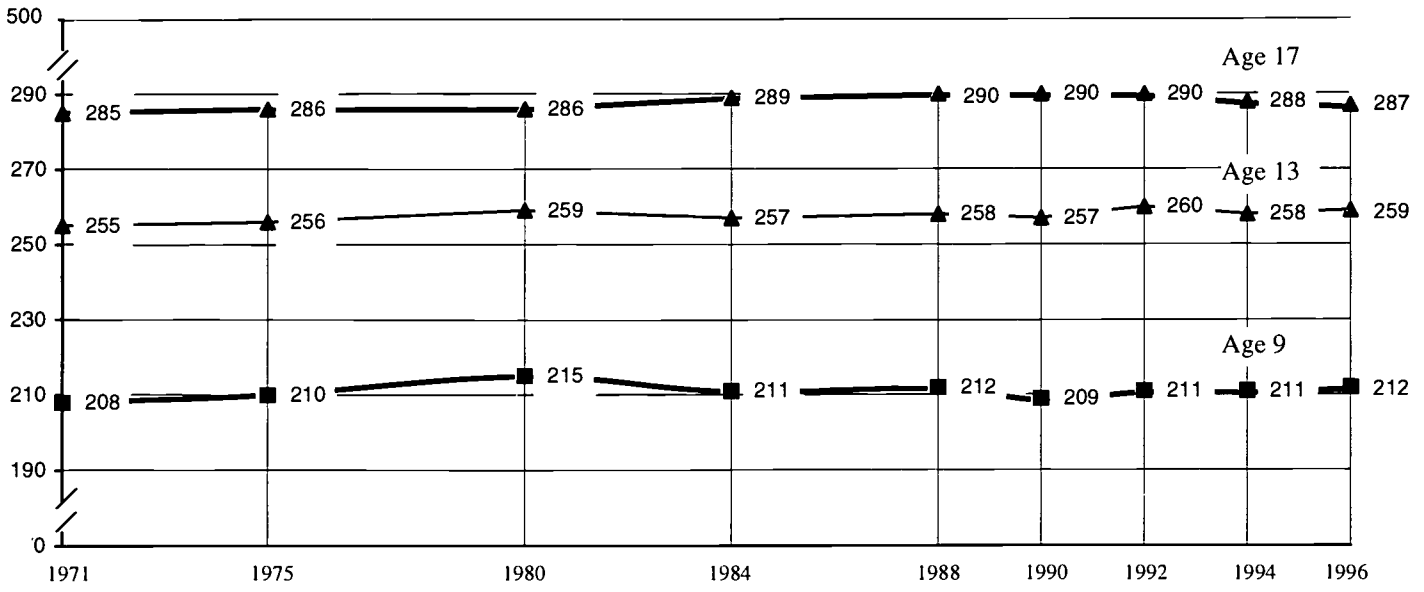
Long-Term Trends in Student Reading Performance

Summary: *Data from the NAEP 1996 Long-Term Reading Assessment show that overall student reading performance, as tested at age levels 9,13, and 17, has increased for both 9- and 13-year-olds since the first assessment in 1971. Scores for 9- and 13-year-olds in most racial/ethnic and gender subgroups reflected the overall increase. Black 17-year-olds were the only members of that age group to achieve an increase, and they did so while black dropout rates were declining.*

The National Assessment of Educational Progress (NAEP) continuously monitors the knowledge, skills, and performance of the nation's children and youth in a variety of academic subjects. The data collected are available in major reports. The *NAEPfacts* series takes selected data from these reports and uses them to highlight specific issues of particular interest to teachers, researchers, policymakers, and other individuals with an interest in education.

The assessments used by NAEP to evaluate long-term trends in student performance began in the early 1970s. The first assessments were given in three subject areas—science, mathematics, and reading. Students were assessed at ages 9, 13, and 17. In 1984 a fourth subject, writing, was added. Long-term trend data can be analyzed in a number of ways. Student scores for given years can be compared for statistically significant differ-

Figure 1—NAEP Reading Average Scale Scores for the Nation



▲ Positive linear trend (scores have increased) ■ No linear trend

Red lines indicate negative quadratic trend (scores rose and then fell or flattened out).

Black lines indicate no quadratic trend.

Red numbers indicate 1996 scores were significantly higher than 1971 scores, at a 5 percent combined significance level per set of comparisons.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress, 1996 Long-Term Trend Assessments

ences. Often, scores for student groups or subgroups from the first assessment are compared with the results from the most recent assessment.

It is also possible to analyze a series of scores for overall trends, rather than simple year-to-year variations. Specifically, a series of scores can be analyzed for "linear" and "quadratic" trends. Linear trends can be represented as straight lines. A positive linear trend indicates that overall the average scores for a given student group form a gradually rising line, while a negative linear trend indicates a gradually declining one. A series of scores can show a linear trend despite wide variation among individual scores, as long as the overall pattern is either up or down.[1]

Table1.—Average Scale Scores in Reading by Race/Ethnicity and Gender

	Age 9			Age 13			Age 17		
	1971†	1996	Trend	1971†	1996	Trend	1971†	1996	Trend
Nation	208*	212	q	255*	259	L	285	287	Lq
White	214*	220	L	261*	267	L	291	294	L
Black	170*	190	Lq	222*	236	Lq	239*	265	Lq
Hispanic	183*	194		233	240		252	265	Lq
Male	201*	207	Lq	250	253		279	280	q
Female	214*	218		261*	265	L	291	294	L

† NOTE: For Hispanic students, the differences are calculated between 1975 and 1996.

*Statistically significant difference from 1996, at a 5 percent combined significance level per set of comparisons.

L=Positive Linear Trend l=Negative Linear Trend

Q=Positive Quadratic Trend q=Negative Quadratic Trend

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1996 Long-Term Trend Assessment.

Quadratic trends can be represented as simple curves, and can be represented mathematically by quadratic equations.[2] A positive quadratic trend indicates that scores form a simple curve with one or both ends higher than its center—scores sagged, and then either leveled off or rose, or were flat and then rose. A negative quadratic trend indicates a simple curve whose center is higher than one or both ends—scores rose, and then either leveled off or declined, or were flat and then declined.

It is possible for scores to display both a linear and a quadratic trend. For example, if scores rose sharply and then flattened out, this would constitute a negative quadratic trend. However, if the pattern of the scores still showed an increase for the entire time period, the scores would also display a positive linear trend.

Overall Performance

Scores for 9- and 13-year-olds on the 1996 assessment are significantly higher than scores for the first assessment, given in 1971 (see figure 1). Scores for 9-year-olds showed a negative quadratic trend—rising and then falling—and no linear trend. Scores for 13-year-olds showed a positive linear trend and no quadratic trend, that is, a relatively straight-line increase. Scores for 17-year-olds showed a positive linear trend and a negative quadratic trend, because they rose and then fell, but with an overall upward trend.

Race/Ethnicity and Gender

Analysis of scores by race/ethnicity and gender shows higher scores in 1996 for most groups as compared to 1971. (Separate data for Hispanics only goes as far back as 1975.) Notably, scores for black students improved for all three age groups. (See table 1.) Whites and females recorded increases for both 9- and 13-year-olds, while Hispanics and males recorded increases for 9-year-olds only.

For the period 1971-1996 scores for white students in all three age groups showed a positive linear trend and no quadratic trend, a relatively straight-line increase. Scores for blacks in all three age groups showed both a positive linear trend and a negative quadratic trend, because scores increased overall between 1971 and 1996 but reached their high point prior to 1996 and then flattened out or declined. Scores for 17-year-old Hispanics showed the same trends. Scores for 13- and 9-year-old Hispanics showed no trends.

Scores for male 17-year-olds showed a negative quadratic trend, rising and then falling, while scores for male 9-year-olds showed a negative quadratic trend and a positive linear trend, rising and then falling, but showing an overall pattern of increase. Scores for female 17- and 13-year-olds showed a positive linear trend—a relatively straight-line increase.

The increase in reading scores for black 17-year-old students over the 1971–1996 period occurred despite the fact that dropout rates for this group fell significantly over the same period. Data from the Census Bureau's Current Population Survey indicate that in 1972 the overall dropout rate (known as the "status" dropout rate) for 16-to-24-year-olds was 14.6 percent, while the black dropout rate for this age group was 21.3 percent.[3] By

1995, the overall dropout rate had fallen to 12 percent, while the black dropout rate had fallen to 12.1 percent. (In 1995 the white dropout rate was 8.6 percent, while the Hispanic dropout rate was 30 percent.)

While the black dropout rate was dropping, the average scale scores for blacks were increasing. The reading score for black 17-year-old students was 265 in 1996, higher than the 1971 average of 239.

It is likely that a decreasing dropout rate increases the proportion of poorer-performing students in a school population.[4] Thus, it appears that the reading scores of black 17-year-old students increased even though the proportion of poorer-performing students in the overall population of black 17-year-old students was also increasing.

Performance Differences

As in the past, the 1996 Long-Term Trend Reading Assessment found significant differences in the performance of different racial/ethnic subgroups and between male and female students. Table 2 displays the differences in average reading scale scores and the trends in those differences since 1971 (in the case of Hispanics, since 1975).

White students in all three age groups outperformed their black and Hispanic peers. The difference between average scale scores for white and black students declined significantly from 1971 to 1996 for both 9- and 17-year-olds, but not for 13-year-olds. The differences in performance for all three age groups show a negative linear trend, that is, a relatively straight-line decline, due to improving scores for black students.

Differences for both the 13- and 17-year-old age groups show a positive quadratic trend as well, a decrease followed by an increase or a flattening out. In the late 1980s the differences between white and black scores for these two age groups were narrowing. For example, in 1988, scores for 17-year-old black students were 20 points lower than scores for their white peers. In 1971 the difference had been 53 points. However, the trend did not maintain itself. In 1996, the difference between scores for black and white 17-year-old students was 29 points.

Average scale score differences between white and Hispanic students did not change significantly over the years 1975–1996. Differences in scores for 17-year-old Hispanics did show a positive quadratic trend. Scores for 17-year-old Hispanics improved, narrowing the gap with whites, but then the gap widened somewhat.

Female students continued to outperform male students by a significant margin, at all three age levels. Differences in performance did not change significantly for any of the three age groups. Scores for 17- and 13-year-olds showed a negative quadratic trend, indicating that tendencies toward reduced differences in performance failed to maintain themselves. For example, in 1988, 17-year-old males scored 7 points lower than 17-year-old females, compared to 12 points lower on the first assessment in 1971. However, in 1996 the difference stood at 15 points. For the most part, minor gains in male students' performance were offset by improved scores by female students.

Table 2.—Trends in Differences in Average Reading Scale Scores by Race/Ethnicity and Gender

	1971†	1996	Trends
White vs. Black Students (white minus black)			
Age 17	53*	29	lQ
Age 13	39	31	lQ
Age 9	44*	30	l
White vs. Hispanic Students (white minus Hispanic)			
Age 17	41	30	Q
Age 13	30	27	
Age 9	34	26	
Male vs. Female Students (male minus female)			
Age 17	-12	-15	q
Age 13	-11	-13	q
Age 9	-13	-11	

† NOTE: For Hispanic students, the differences are calculated between 1975 and 1996.

*Significantly higher than 1996, at a 5 percent combined significance level per set of comparisons.

L=Positive Linear Trend l=Negative Linear Trend
Q=Positive Quadratic Trend q=Negative Quadratic Trend

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1996 Long-Term Trend Assessment.

Conclusion

Average reading scale scores for 9- and 13-year-old students were higher in 1996 than in 1971. Scores for both 13- and 17-year-old students showed a positive linear trend, indicating a gradual rise in scores for the period 1971–1996. Scores for both 9- and 17-year-old students showed a negative quadratic trend, indicating that scores had increased, but then either declined or flattened out.

Reading scores for most but not all student subgroups were higher in 1996 than in 1971, particularly in the 13-

and 9-year-old age groups. Black students recorded increases at all three age levels. However, scores for many subgroups showed a pattern of increase in the 1980s, followed by a decline or a flattening out in the 1990s. Reading scores for 17-year-old black students have increased even as dropout rates have been falling.

Notes

[1]A series of scores may show a linear trend, either positive or negative, even though a comparison of the first and last scores does not show a statistically significant difference. The reverse is true as well.

[2]Quadratic equations, familiar from elementary algebra, involve variables with a power no greater than 2. For example, the equation $y^2=R^2- x^2$ (or $y = \sqrt{R^2 - x^2}$) is a quadratic equation, in particular, the equation used for graphing a circle. For purposes of trend analysis, this equation could be used to represent either a positive quadratic trend in which scores first fell and then rose to their original starting point, or a negative quadratic trend in which scores first rose and then fell to their original starting point.

[3]See McMillen, M. & Kaufman, P., *Dropout Rates in the United States: 1995,* Chapter 1 (National Center for Education Statistics, U.S. Department of Education, U.S. Printing Office) ***http://nces.ed.gov/pubs/dp95/index.html***.

[4]The dropout population is likely to contain a larger percentage of poorer-performing students than the student population as a whole. See Natriello, G., ed., *School Dropouts: Patterns and Policies*, 1987, Teachers College Press, New York, NY and Schwartz, W., "School Dropouts: New Information About an Old Problem," ERIC Clearinghouse on Urban Education Digest, No. 109, Aug. 1995.

For Further Information

NAEP 1996 Trends in Academic Progress, the complete report. Single copies are available free from the National Center for Education Statistics, U.S. Department of Education, Washington, DC 20208-5653. Copies may also be obtained over the World Wide Web at ***http://nces.ed.gov/NAEP/96report/97986.shtml***.

NAEPfacts briefly summarize findings from the National Assessment of Educational Progress (NAEP). The series is a product of the National Center for Education Statistics, Pascal D. Forgione, Jr., Commissioner, and Gary W. Phillips, Associate Commissioner for Education Assessment. This issue of *NAEPfacts* was written by Alan Vanneman, of the Education Statistics Services Institute, in support of the National Center for Education Statistics, and Sheida White of NCES. To order other NAEP publications, call Bob Clemons at 202-219-1690, or e-mail bob_clemons@ed.gov.

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