Science Proficiency

Headline

In 2005, students who were eligible for free- and reduced-price lunches (a proxy for low family income) had significantly lower science scores than students who were not eligible. For example, fourth grade students who were eligible for free- and reduced-price lunches scored 27 points lower than those who were not eligible (135 versus 162, respectively). (See Table 1)

Importance

Students who excel in the sciences, including earth and space science, natural science, life science, and physical science, may go on to become scientists, inventors, engineers, doctors and other highly skilled professionals. A solid foundation in science in elementary and secondary school can help to prepare students for entrance into these fields, for which workers are in great demand. [1]

Through a greater understanding of the earth and its surroundings, students can learn how to better protect the environment. It has been argued that the health and security of people throughout the world are dependent upon scientific and technological knowledge.[2] High levels of proficiency in science among students are crucial for the advancement of science, technology, and medicine.[3]

Trends

Trends in science proficiency differ across grade levels, with scores for older students declining and scores for younger students increasing between 1996 and 2005. Twelfth grade average science proficiency scores were slightly lower in 2005 than in 1996 (147 versus 150, respectively). However, scores for fourth grade students were slightly higher in 2005 than 1996 and 2000 (151 versus 147, respectively). Scores for grade eight were unchanged. (See Figure 1)

Note: Reported trends refer only to data where accommodations were permitted.

Differences by Percentile

A large range of performance exists among fourth, eighth, and twelfth graders, with students performing at the 90th percentile scoring between 80 to 91 points higher than those performing at the 10th percentile. Fourth grade students in the 90th percentile scored 80 points higher than those in the 10th percentile; eighth grade students in the 90th percentile scored 91 points higher than those in the 10th percentile; and twelfth grade

students in the 90th percentile scored 88 points higher than those in the 10th percentile. (See Figure 2)

Differences by Race and Ethnicity[4]

Whites had higher average science scale scores than blacks and Hispanics across all three grade levels in the 2005 assessment. Between whites and blacks, the performance gap averaged 35 points, and, between whites and Hispanics, the gap averaged 29 points. (See Figure 4)

Differences by Free/Reduced-Price School Lunch Program Eligibility

Lower income students, measured by eligibility for free- and reduced-price lunches, had significantly lower science scores than students who were not eligible. The pattern was consistent at all three grade levels in 2005. Fourth grade students who were eligible for free- and reduced-price lunches scored 27 points lower than those who were not eligible (135 versus 162, respectively); eighth grade students eligible for free- and reduced-price lunch scored 29 points lower than those who were not eligible; and twelfth grade students who were eligible for free- and reduced-price lunches scored 23 points lower than those who were not eligible. (See Table 1, Table 2, Table 3)

Differences by Gender

Science scores among males were slightly higher than females in 2005. The gap between males and females was four points in the fourth grade and twelfth grade and three points in the eighth grade. (See Table 1)

Differences by Parent Education Level

Science scores are higher among students with more educated parents. For example, among twelfth-grade students, those whose parents did not finish high school had an average scale score of 125, compared to 157 for those whose parents graduated from college.
(See Figure 3)

State and Local Estimates

2005 state estimates for 4th graders who scored below the basic science level are available at http://www.aecf.org/kidscount/sld/compare_results.jsp?i=570

2005 state estimates for 4th graders who scored at or above the proficient science level are available at http://www.aecf.org/kidscount/sld/compare_results.jsp?i=580

2005 state estimates for 8th graders who scored below the basic science level are available at http://www.aecf.org/kidscount/sld/compare_results.jsp?i=650

2005 state estimates for 8th graders who scored at or above the proficient science level are available at http://www.aecf.org/kidscount/sld/compare_results.jsp?i=660

2005 estimates for 4th and 8th graders for states who participate in the NAEP State are available at:
http://www.nces.ed.gov/nationsreportcard/science/stateassessment.asp

International Estimates

International assessments for eighth grade science from the *Trends in International Mathematics and Science Study (TIMSS) 2003* report are available at: http://nces.ed.gov/pubs2005/2005005.pdf

Fourth grade assessments from TIMSS are available at:
http://nces.ed.gov/pubs2005/2005005.pdf

Twelfth grade assessments from TIMSS are available at:
http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=98049

International comparisons of science literacy from the Organization for Economic Cooperation and Development's (OECD) Program for International Student Assessment (PISA) for 15 year olds in 2003 are available in the *International Outcomes of Learning in Mathematics Literacy and Problem Solving: PISA 2003 Results from the U.S. Perspective* report at: http://nces.ed.gov/pubs2005/2005003.pdf (Table B 17)

National Goals

The No Child Left Behind Act, signed into law in January 2002, requires states to set performance standards for several subjects. Beginning in 2007, states will be required to measure students' progress in science at least once each year during the following grade spans: 3-5, 6-9, and 10-12. The legislation also created Math and Science partnerships to encourage all sectors of society to help improve achievement and created rewards for states that increase the number of students in advanced math and science classes and the number of students passing the Advanced Placement exam in these subjects.

For more information visit: http://www.ed.gov/nclb/methods/science/science.html

Definition

Science proficiency is measured in this indicator as average scale scores for fourth, eighth, and twelfth graders on the Science National Assessment of Educational Progress. For trends over time, the long-term trend assessment of 9-, 13-, and 17-year-olds since 1969-70 is used which has a scale from 0-500. For subgroup differences in achievement,

the most recent main NAEP assessment of science achievement in 2005 is used, which has a scale of 0-300.

Data Source

The Nation's Report Card, 2005 Science Assessments National Trends. National Center for Education Statistics. National Assessment of Educational Progress (NAEP). Online. Available: http://nationsreportcard.gov/science_2005/s0102.asp?

Raw Data Source

National Assessment of Educational Progress Science Assessments
http://nces.ed.gov/nationsreportcard/

Approximate Date of Next Update

The next national and state assessments of science proficiency are currently scheduled to be in 2010.

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[1] National Commission on Mathematics and Science Teaching for the 21st Century. (2000). *Before It's Too Late*. Report prepared for the U.S. Department of Education. Washington, DC: Author. http://www.ed.gov/americacounts/glenn/report.pdf

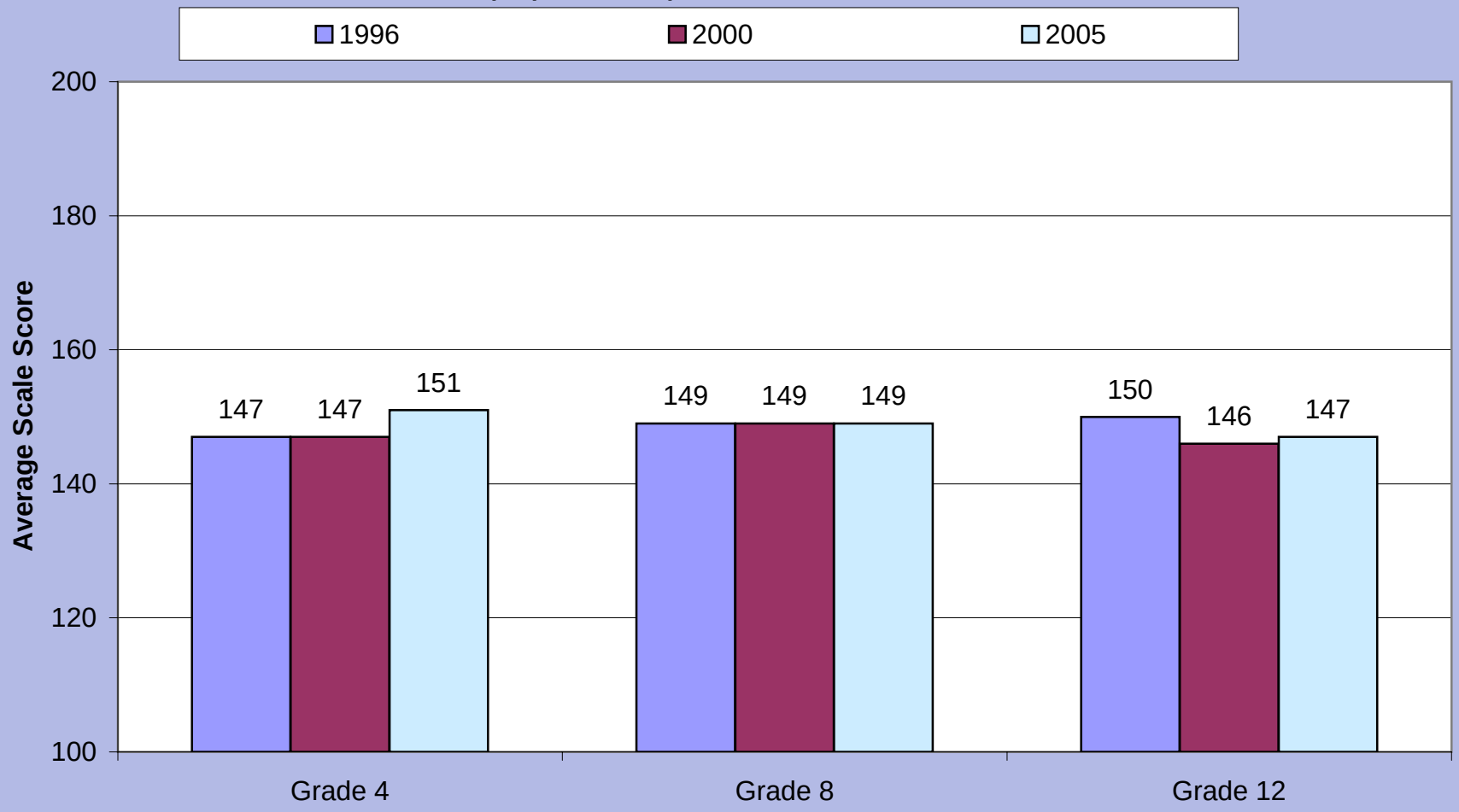
[2] Nelson, G.D. (2001). *Remarks on the Release of the NAEP 2000 Science Assessment Results*. Press release. Washington, DC: American Association for the Advancement of Science; National Commission on Mathematics and Science Teaching for the 21st Century, 2000.

[3] National Commission on Mathematics and Science Teaching for the 21st Century. (2000). *Before It's Too Late*. Report prepared for the U.S. Department of Education. Washington, DC: Author. http://www.ed.gov/americacounts/glenn/report.pdf

[4] Note that none of the race groups include Hispanics of those races.

Figure 1

Trends in National Assessment Scores in Science, Grades 4, 8, and 12, Selected Years 1996-2005*



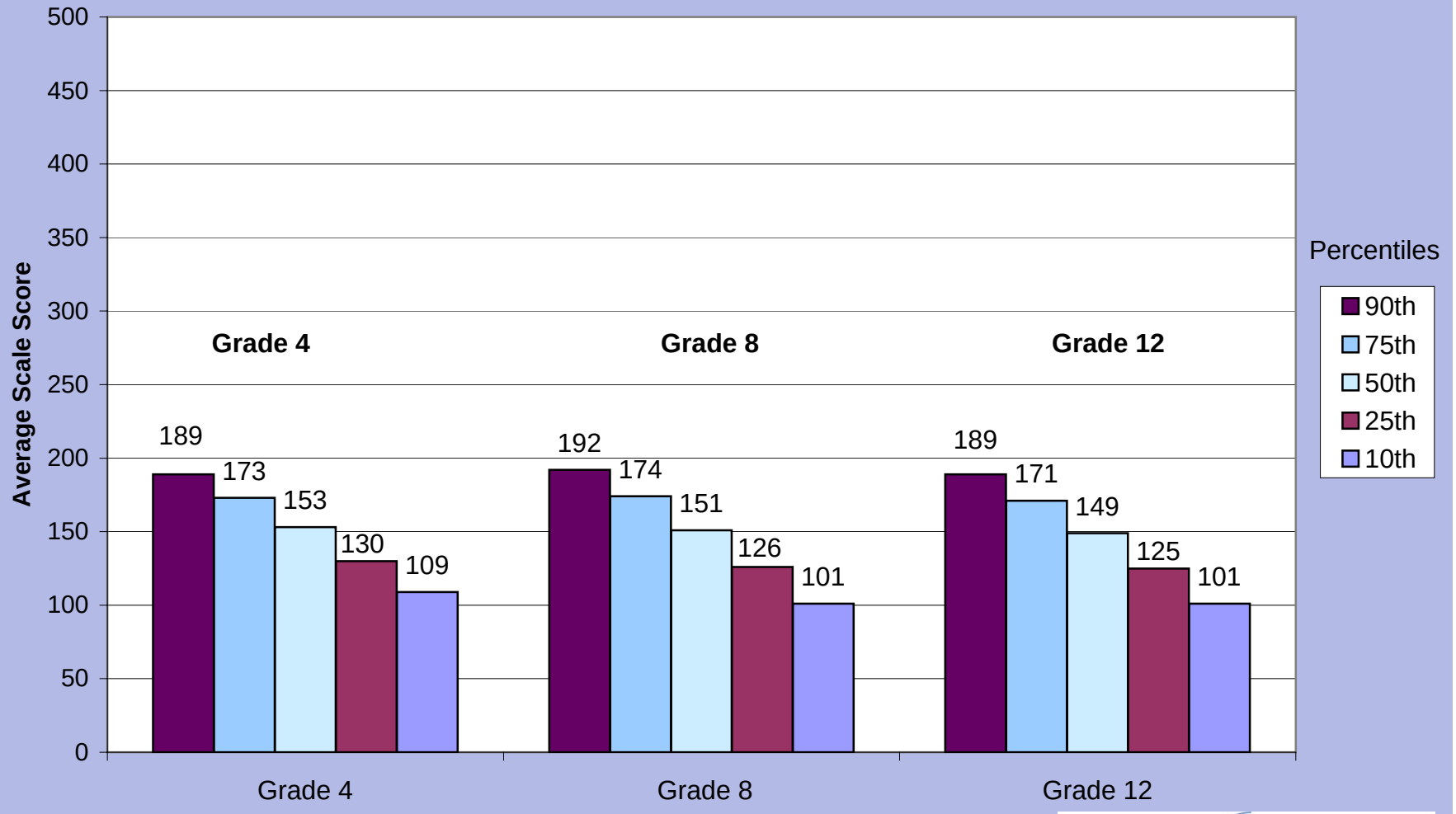
*Accomodations permitted for all years.

Source: Reproduced from Figure 1.1: U.S. Department of Education. Office of Educational Research and Improvement. National Center for Education Statistics. *NAEP 1999 Trends in Academic Progress: Three Decades of Student Performance* , NCES 2000–469, by J.R. Campbell, C.M. Hombo, and J. Mazzeo. Washington, DC: 2000: Table B.1.

Child TRENDS DATABANK

Figure 2

National NAEP Science Scale Score Among Students in Grades 4, 8, 12, by Percentile, 2005

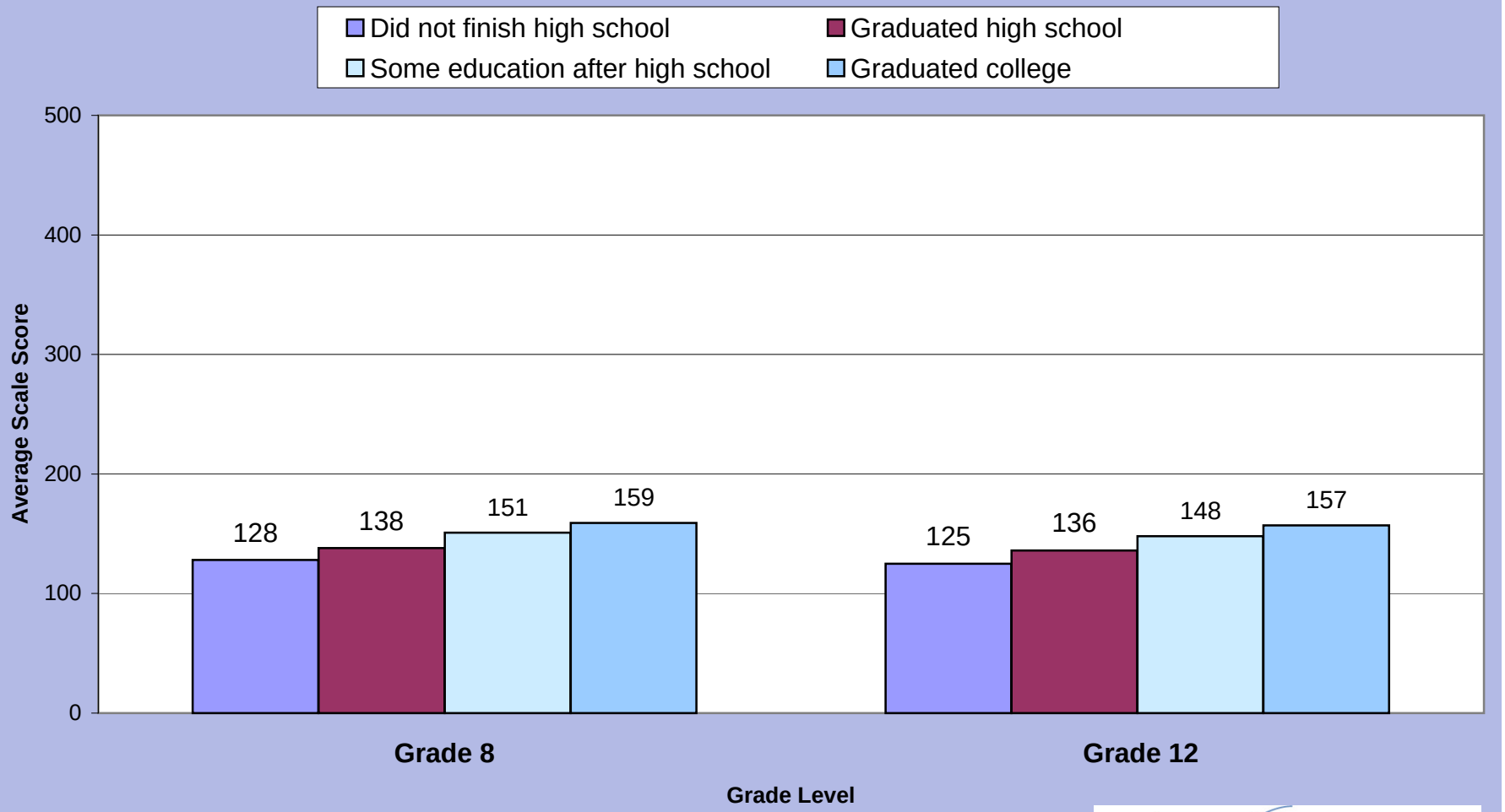


Source: The Nation's Report Card, 2005 Science Assessments. National Center for Education Statistics. National Assessment of Educational Progress (NAEP)Online. Available: http://www.nces.ed.gov/nationsreportcard/science/results/

Child TRENDS DATABANK

Figure 3

National Science Scores Among Students in Grades 8 and 12, by Parent's Education, 2005

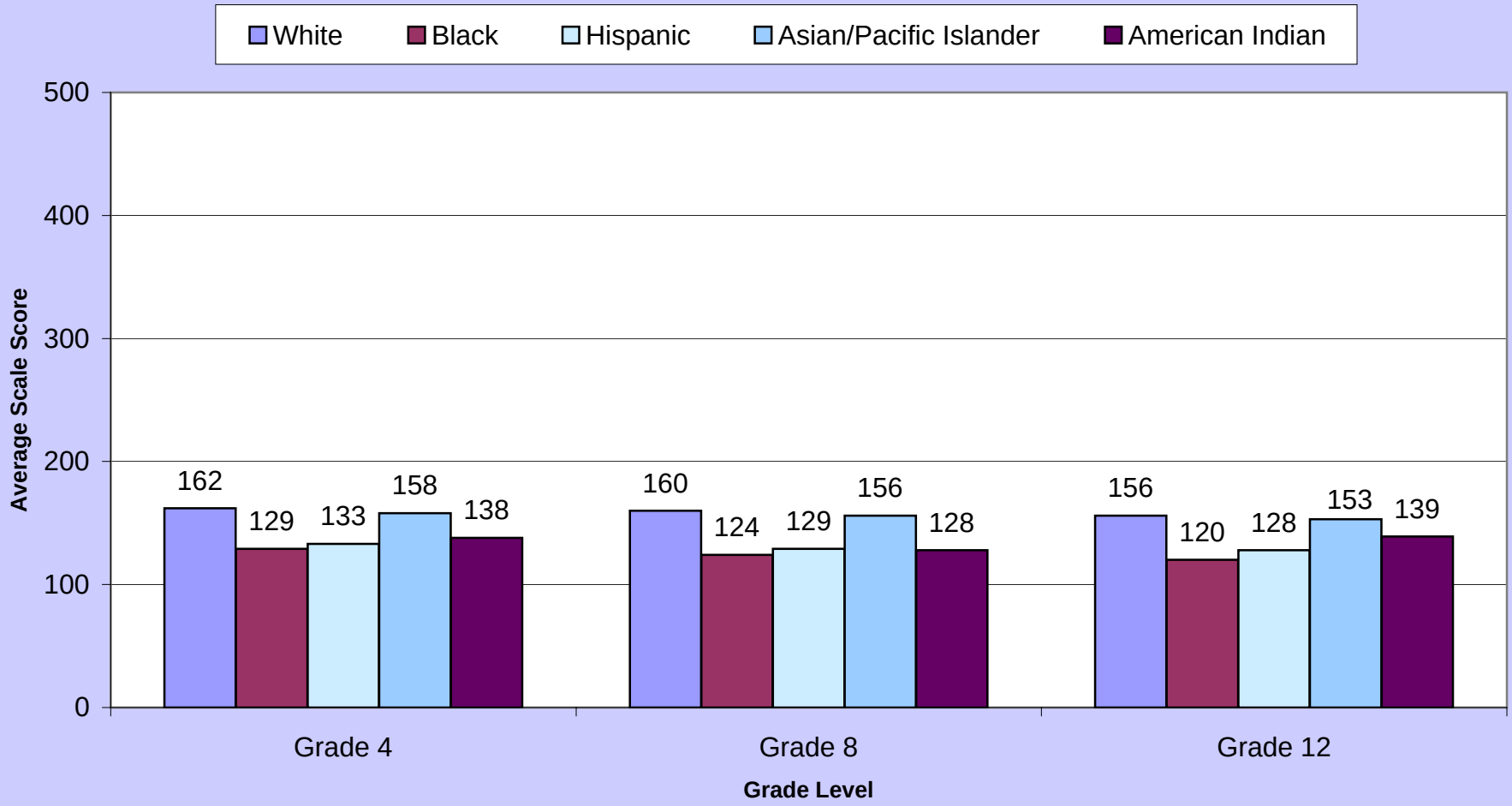


Data not available for Grade 4.

Source: The Nation's Report Card, 2005 Science Assessments. National Center for Education Statistics. National Assessment of Educational Progress (NAEP). Online. Available: http://www.nces.ed.gov/nationsreportcard/science/results/

Figure 4

National Science Scores Among Students in Grades 4, 8, and 12 by Race/Ethnicity, 2005



Source: The Nation's Report Card, 2005 Science Assessments. National Center for Education Statistics. National Assessment of Educational Progress (NAEP). Online. Available: http://www.nces.ed.gov/nationsreportcard/science/results/

Table 1

Trends in Average Scale Scores for the Nation in Science, Grade 4

	1996	2000	1996	2000	2005
	No Accomodations Permitted[2]		Accomodations Permitted[2]		
Total	150	150	147	147	151
Gender					
Male	151	153	148	149	153
Female	149	147	146	145	149
Race/Ethnicity[1]					
White	159	160	158	159	162
Black	122	123	120	122	129
Hispanic	127	126	124	122	133
Asian/Pacific Islander	147	-	144	-	158
American Indian	-	147	129	135	138
Parent's Education					
Less than high school	-	-	-	-	-
Graduated high school	-	-	-	-	-
Some education after high school	-	-	-	-	-
Graduated College	-	-	-	-	-
Unknown	-	-	-	-	-
School Lunch Eligibility					
Eligible	133	130	129	127	135
Not Eligible	159	159	159	158	162
Info Not Available	161	161	151	160	160
Type of School					
Public	148	148	145	145	149
Nonpublic	163	164	160	163	-
School Location					
Central City	-	-	-	-	143
Urban Fringe	-	-	-	-	154
Rural	-	-	-	-	154
Region					
Northeast	-	-	-	-	154
Midwest	-	-	-	-	155
South	-	-	-	-	151
West	-	-	-	-	144
Percentile					
10th	105	105	99	99	109
25th	130	129	125	125	130
50th	153	153	150	150	153
75th	173	174	172	172	173
90th	190	191	190	190	189

"-" Indicates no data available

[1] Note that none of the race groups include Hispanics of those races.

[2] In 1996, 2000 and 2005 NAEP allowed testing accommodations for students with disabilities and for limited English proficient students. Accommodations may include extra time, one-on-one administration, use of magnifying equipment, translation of assessments, or the use of bilingual dictionaries and are determined by state and district policies. Data for 2005 unaccomodated testing are not available.

Source: U.S. Department of Education. Office of Educational Research and Improvement. National Center for Education Statistics. NAEP Data Explorer. Available at: http://nces.ed.gov/nationsreportcard/nde/viewresults.asp.

Table 2

Trends in Average Scale Scores for the Nation in Science, Grade 8

	1996	2000	1996	2000	2005
	No Accomodations Permitted[2]		Accomodations Permitted[2]		
Total	150	151	149	149	149
Gender					
Male	151	154	150	153	150
Female	149	147	148	146	147
Race/Ethnicity[1]					
White	159	161	159	161	160
Black	120	121	121	121	124
Hispanic	129	126	128	127	129
Asian/Pacific Islander	150	152	151	153	156
American Indian	146	140	148	147	128
Parent's Education					
Less than high school	131	126	130	126	128
Graduated high school	140	138	140	137	138
Some education after high school	155	155	154	154	151
Graduated College	159	162	158	161	159
Unknown	134	130	129	129	130
School Lunch Eligibility					
Eligible	133	128	129	127	130
Not Eligible	156	160	156	159	159
Info Not Available	156	156	157	155	160
Type of School					
Public	148	149	148	148	147
Nonpublic	161	167	165	167	-
School Location					
Central City	-	-	-	-	141
Urban Fringe	-	-	-	-	152
Rural	-	-	-	-	152
Region					
Northeast	-	-	-	-	153
Midwest	-	-	-	-	155
South	-	-	-	-	145
West	-	-	-	-	144
Percentile					
10th	104	103	103	101	101
25th	128	128	127	126	126
50th	153	154	152	152	151
75th	174	177	174	175	174
90th	192	195	192	194	192

"-" Indicates no data available

[1] Note that none of the race groups include Hispanics of those races.

[2] In 1996, 2000 and 2005 NAEP allowed testing accommodations for students with disabilities and for limited English proficient students. Accommodations may include extra time, one-on-one administration, use of magnifying equipment, translation of assessments, or the use of bilingual dictionaries and are determined by state and district policies. Data for 2005 unaccomodated testing are not available.

Source: U.S. Department of Education. Office of Educational Research and Improvement.National Center for Education Statistics.NAEP Data Explorer. Available at: http://nces.ed.gov/nationsreportcard/nde/viewresults.asp.

Table 3

Trends in Average Scale Scores for the Nation in Science, Grade 12

	1996	2000	1996	2000	2005
	No Accomodations Permitted[2]		Accomodations Permitted[2]		
Total	150	147	150	146	147
Gender					
Male	152	148	154	148	149
Female	148	145	147	145	145
Race/Ethnicity[1]					
White	158	153	159	153	156
Black	123	123	123	122	120
Hispanic	129	128	131	128	128
Asian/Pacific Islander	145	151	147	149	153
American Indian	-	147	144	151	139
Parent's Education					
Less than high school	123	126	125	125	125
Graduated high school	140	135	139	135	136
Some education after high school	151	146	151	146	148
Graduated College	160	157	160	156	157
Unknown	116	114	121	114	119
School Lunch Eligibility					
Eligible	125	126	127	124	129
Not Eligible	154	150	154	149	152
Info Not Available	150	150	152	150	158
Type of School					
Public	149	145	150	145	146
Nonpublic	155	160	156	160	-
School Location					
Central City	-	-	-	-	142
Urban Fringe	-	-	-	-	150
Rural	-	-	-	-	148
Region					
Northeast	-	-	-	-	149
Midwest	-	-	-	-	154
South	-	-	-	-	143
West	-	-	-	-	145
Percentile					
10th	104	102	105	101	101
25th	128	125	128	124	125
50th	152	148	152	148	149
75th	174	171	174	170	171
90th	192	190	192	189	189

"-" Indicates no data available

[1] Note that none of the race groups include Hispanics of those races.

[2] In 1996, 2000 and 2005 NAEP allowed testing accommodations for students with disabilities and for limited English proficient students. Accommodations may include extra time, one-on-one administration, use of magnifying equipment, translation of assessments, or the use of bilingual dictionaries and are determined by state and district policies. Data for 2005 unaccomodated testing are not available.

Source: U.S. Department of Education. Office of Educational Research and Improvement. National Center for Education Statistics. NAEP Data Explorer. Available at: http://nces.ed.gov/nationsreportcard/nde/viewresults.asp.