

Appendix A. Sample Selection

The WOL study design called for a nationally representative sample of 1,400 eighth-graders to take the computer test. These students were selected from among those taking certain booklets administered as part of the main NAEP 2002 writing or reading assessments. The selection procedures for WOL involved multi-stage, multi-phase sampling of schools and students.

Sample Selection for Main NAEP 2002 Assessment

The grade 8 main NAEP 2002 assessment tested public and private school students. Samples were selected based on a two-stage design: (1) selection of schools and (2) selection of students within schools. The first-stage sample of schools was selected with probability proportional to a measure of size based on estimated enrollment at grade 8. Each participating school provided a list of eighth-graders from which a systematic sample of students was drawn. Depending on the school's size, one or more sessions of 60 students were sampled. Half of the selected students were assigned a reading assessment booklet and the remainder were assigned a writing booklet.

The public and private school sample designs differed with respect to sample size requirements and stratification. For public schools, representative samples were drawn within each state and the District of Columbia, as well as from separate lists of Bureau of Indian Affairs (BIA) schools and Department of Defense Domestic Dependent Elementary and Secondary Schools (DDESS). Each sample was designed to produce aggregate estimates with approximately equal precision. The target sample in each state was 6,300 grade 8 students. With a general target of 60 sampled students per school, roughly 100 participating schools were needed per state. Special procedures to reduce overall burden were used for states with many small schools, and for states having small numbers of grade-eligible schools.

Prior to sample selection, public schools were hierarchically stratified by district status,¹ urbanization, and race/ethnicity. Within the race/ethnicity strata, schools were sorted by state achievement data for states where it was available. Where state achievement data were not available, schools were sorted by median household income of the zip code area where the school was located. Achievement data were supplied by the states themselves. Median income data were obtained from the 1990 Census. Other stratification

variables were obtained from the National Center for Education Statistics' Common Core of Data (CCD).

For private schools, target student sample sizes were set for four separate reporting groups: Roman Catholic (6,000 students), Lutheran (1,500 students), Conservative Christian (1,500 students), and Other Private (3,000 students). Within these reporting groups, the private schools were implicitly stratified by census division, urbanization, and percent Black/Hispanic/American Indian. Implicit strata were collapsed extensively to ensure that the expected number of schools within each implicit stratum was reasonably large.²

Participation in state NAEP was not mandatory in 2002. Since the aggregate of the individual state samples was planned to be used as the public school sample for the national study, some provision needed to be made to ensure representation from a state even if that state declined to participate in state NAEP. Subsamples of schools were drawn from the state samples to use for the national sample under these circumstances. These subsamples were drawn for each and every state to cover all contingencies. As such, they provided a suitable starting point for selecting the public school portion of the WOL sample.

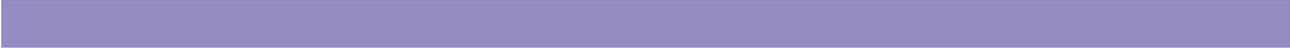
The process for drawing a national subsample for use in NAEP involved computing appropriate school probabilities of selection using a national target sample size assigned proportionally to each jurisdiction (as if no state NAEP samples had been drawn) and then dividing these probabilities by the full-sample or private-school NAEP probabilities to obtain conditional probabilities of selection for subsampling. School samples were drawn using the conditional probabilities. The resultant unconditional probabilities of selection for the subsample of schools are equal to the appropriate values for a stand-alone national sample. The target sample size for the main NAEP 2000 assessments was 35,500 assessed students at grade 8.

Sample Selection for the Writing Online (WOL) Study

The target student sample size for WOL was 1,400 eighth-graders. Even though considerably fewer than 60 students were selected from each school for the WOL study, further school subsampling was required. To increase operational efficiency, nationally subsampled schools were grouped into 167 geographic clusters, each containing at least 5 eligible sampled

¹ Districts with more than 20 percent of their state's students were in a separate stratum.

² In *explicit* stratification, the population is divided into strata and a separate sample is chosen from each stratum. In *implicit* stratification, the population is first sorted by a chosen characteristic. Next, the sample is selected from this sorted list using a random starting point and a fixed sampling interval.



schools. (A cluster could be an individual county if it met the minimum size requirement, or two or more adjacent counties.) From the 626 counties with at least one eligible eighth-grade school, 167 geographic clusters were defined and 48 were selected with probability proportional to the number of eligible schools. One of the 48 was selected with certainty because of its large size. In each of the remaining 47 sampled clusters, 5 schools were selected with equal probability. In the one certainty cluster, schools were also subsampled with equal probability, at a rate equal to the product of the cluster probability and within-cluster probability for noncertainty clusters.

The WOL study design targeted students who had been assessed in NAEP using any one of 10 specific writing assessment booklets or 9 specific reading booklets, which together comprise slightly less than 23 percent of NAEP-assessed students. Since the booklets are assigned randomly, the set of students assessed using these booklets constitutes a valid random sample of students capable of taking the NAEP assessment. In most schools, all such students were recruited to participate in WOL. Usually, this produced a caseload of about 10 students per school. In a very small number of schools where the sample size was larger than was operationally practical, targeted students were subsampled with equal probability.

Appendix B. Understanding NAEP Reporting Groups

NAEP results are provided for groups of students defined by shared characteristics—gender, race/ethnicity, parental education, region of the country, type of school, school’s type of location, and eligibility for free/reduced-price school lunch. Based on participation rate criteria, results are reported for subpopulations only when sufficient numbers of students and adequate school representation are present. The minimum requirement is at least 62 students in a particular subgroup from at least five primary sampling units (PSUs).¹ However, the data for all students, regardless of whether their subgroup was reported separately, were included in computing overall results. Definitions of the subpopulations are presented below.

Gender

Results are reported separately for male students and female students.

Race/Ethnicity

In all NAEP assessments, data about student race/ethnicity are collected from two sources: school records and student self-reports. Prior to 2002, NAEP used students’ self-reported race as the primary race/ethnicity reporting variable. As of 2002, the race/ethnicity variable presented in NAEP reports is based on the race reported by the school. When school-recorded information is missing, student-reported data are used to determine race/ethnicity. The mutually exclusive racial/ethnic categories are White, Black, Hispanic, Asian/Pacific Islander, American Indian (including Alaska Native), and Other. Information based on student self-reported race/ethnicity is available on the NAEP Data Tool (<http://nces.ed.gov/nationsreportcard/naepdata/>).

Parental Education

Eighth-graders were asked the following two questions, the responses to which were combined to derive the parental education variable.

How far in school did your mother go?

- She did not finish high school.
- She graduated from high school.
- She had some education after high school.
- She graduated from college.
- I don’t know.

How far in school did your father go?

- He did not finish high school.
- He graduated from high school.
- He had some education after high school.
- He graduated from college.
- I don’t know.

The information was combined into one parental education reporting variable in the following way: If a student indicated the extent of education for only one parent, that level was included in the data. If a student indicated the extent of education for both parents, the higher of the two levels was included in the data. If a student responded “I don’t know” for both parents, or responded “I don’t know” for one parent and did not respond for the other, the parental education level was classified as “I don’t know.” If the student did not respond for either parent, the student was recorded as having provided no response.

Region of the Country

Results by region were not included in the main NAEP 2002 writing assessment (except for the Southeast) because response adjustments for non-participating states cut across region. As a consequence, region was also not included among the examined population groups for the WOL study.

Type of School

Results are reported by the type of school that the student attends—public or nonpublic. Nonpublic schools include Catholic and other private schools.² Because they are funded by federal authorities (not state/local governments), Bureau of Indian Affairs (BIA) schools and Department of Defense Domestic Dependent Elementary and Secondary Schools (DDESS) are not included in either the public or nonpublic categories; they are included in the overall national results.

Type of Location

Results from the 2003 assessment are reported for students attending schools in three mutually exclusive location types: central city, urban fringe/large town, and rural/small town.

¹ For the NAEP national assessments prior to 2002, a PSU is a selected geographic region (a county, group of counties, or metropolitan statistical area). Since 2002, the first-stage sampling units are schools (public and nonpublic) in the selection of the combined sample. Further details about the procedure for determining minimum sample size will appear in the technical documentation section of the NAEP website (<http://nces.ed.gov/nationsreportcard/>).

² A more detailed breakdown of nonpublic school results is available on the NAEP website (<http://nces.ed.gov/nationsreportcard/naepdata/>).

Central city: Following standard definitions established by the Federal Office of Management and Budget, the U.S. Census Bureau (see <http://www.census.gov/>) defines “central city” as the largest city of a Metropolitan Statistical Area (MSA) or a Consolidated Metropolitan Statistical Area (CMSA). Typically, an MSA contains a city with a population of at least 50,000 and includes its adjacent areas. An MSA becomes a CMSA if it meets the requirements to qualify as a metropolitan statistical area, has a population of 1,000,000 or more, its component parts are recognized as primary metropolitan statistical areas, and local opinion favors the designation. In the NCES Common Core of Data (CCD) locale codes are assigned to schools. For the definition of central city used in this report, two locale codes of the survey are combined. The definition of each school’s type of location is determined by the size of the place where the school is located and whether or not it is in an MSA or CMSA. School locale codes are assigned by the U.S. Census Bureau. For the definition of central city, NAEP reporting uses data from two CCD locale codes: large city (a central city of an MSA or CMSA with the city having a population greater than or equal to 25,000) and midsize city (a central city of an MSA or CMSA having a population less than 25,000). Central city is a geographical term and is not synonymous with “inner city.”

Urban fringe/large town: The urban fringe category includes any incorporated place, census designated place, or nonplace territory within a CMSA or MSA of a large or mid-sized city and defined as urban by the U.S. Census Bureau, but which does not qualify as a central city. A large town is defined as a place outside a CMSA or MSA with a population greater than or equal to 25,000.

Rural/small town: Rural includes all places and areas with populations of less than 2,500 that are classified as rural by the U.S. Census Bureau. A small town is defined as a place outside a CMSA or MSA with a population of less than 25,000, but greater than or equal to 2,500. Results for each type of location are only compared across years 2000 and after. This is due to new methods used by NCES to identify the type of location assigned to each school in the CCD. The new methods were put into place by NCES in order to improve the quality of the assignments, and they take into account more information about the exact physical location of the school. The variable was revised in NAEP beginning with the 2000 assessments.

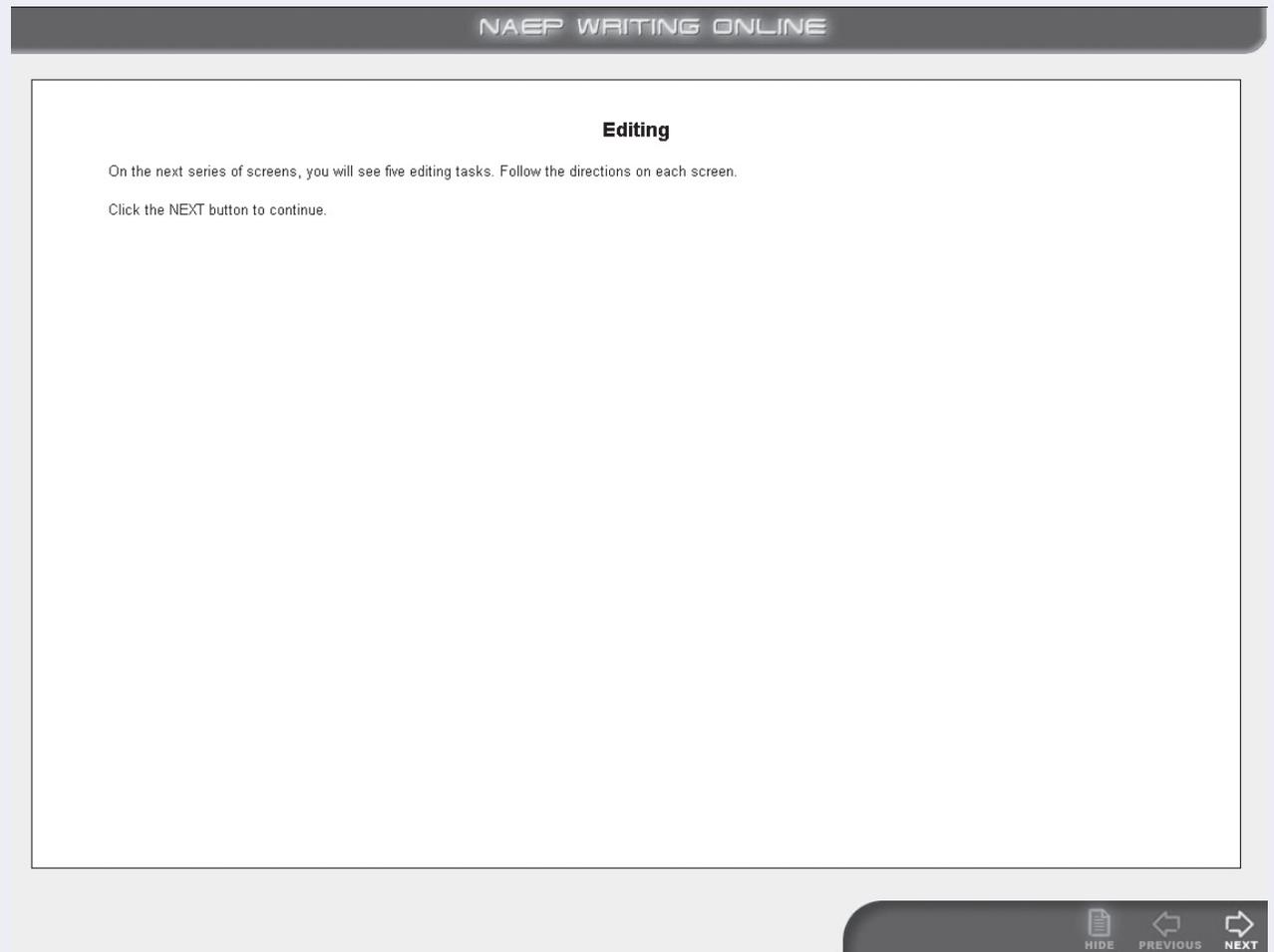
Eligibility for Free/Reduced-Price School Lunch

As part of the Department of Agriculture’s National School Lunch Program, schools can receive cash subsidies and donated commodities in turn for offering free or reduced-price lunches to eligible children. Based on available school records, students were classified as either currently eligible for free/reduced-price school lunch or not eligible. Eligibility for the program is determined by students’ family income in relation to the federally established poverty level. Free lunch qualification is set at 130 percent of the poverty level, and reduced-price lunch qualification is set between 130 and 185 percent of the poverty level. Additional information on eligibility may be found at the Department of Agriculture website (<http://www.fns.usda.gov/cnd/lunch/>). The classification applies only to the school year when the assessment was administered (i.e., the 2002–2003 school year) and is not based on eligibility in previous years. If school records were not available, the student’s information was recorded as “Unavailable.” If the school did not participate in the program, all students in that school were classified as “Unavailable.”

Appendix C. Writing Online Hands-On Editing Tasks

This appendix presents screen shots of the tasks used to measure students' online editing skills.

Figure C-1. Writing Online hands-on editing tasks, screen 1, grade 8: 2002



SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2002 Writing Online Study.

Figure C-2. Writing Online hands-on editing tasks, screen 2, grade 8: 2002

MINUTE NAEP WRITING ONLINE

Editing

Next, make the following change to the bolded words and phrases in the paragraph on the right according to the directions below. You will have 1 minute.

- Delete the word "major".

When planning a vacation, people should consider going to a **major** city, like New York. Cities like New York have something for everyone. For those who prefer crowds, museums, and shopping, a trip into the center of town can be entertaining. For those who prefer something greener, a trip to Central Park is the thing to do. On a sunny day, people enjoy picnic lunches and long walks along the many trails through the Park. Central Park is very large, and features wide lawns, gardens, and a small zoo.

HIDE PREVIOUS NEXT

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2002 Writing Online Study.

Figure C-3. Writing Online hands-on editing tasks, screen 3, grade 8: 2002

MINUTE **NAEP WRITING ONLINE**

Editing

Next, make the following change to the bolded words and phrases in the paragraph on the right according to the directions below. You will have 1 minute.

- Insert the word "very" before "entertaining".

When planning a vacation, people should consider going to a major city, like New York. Cities like New York have something for everyone. For those who prefer crowds, museums, and shopping, a trip into the center of town can be **entertaining**. For those who prefer something greener, a trip to Central Park is the thing to do. On a sunny day, people enjoy picnic lunches and long walks along the many trails through the Park. Central Park is very large, and features wide lawns, gardens, and a small zoo. |

HIDE **PREVIOUS** **NEXT**

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2002 Writing Online Study.

Figure C-4. Writing Online hands-on editing tasks, screen 4, grade 8: 2002

MINUTE

NAEP WRITING ONLINE

Editing

Next, make the following change to the bolded words and phrases in the paragraph on the right according to the directions below. You will have 1 minute.

- Change the word "entertaining" to the word "enjoyable".

When planning a vacation, people should consider going to a major city, like New York. Cities like New York have something for everyone. For those who prefer crowds, museums, and shopping, a trip into the center of town can be **entertaining**. For those who prefer something greener, a trip to Central Park is the thing to do. On a sunny day, people enjoy picnic lunches and long walks along the many trails through the Park. Central Park is very large, and features wide lawns, gardens, and a small zoo.

HIDE PREVIOUS NEXT

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2002 Writing Online Study.

Figure C-5. Writing Online hands-on editing tasks, screen 5, grade 8: 2002

MINUTE NAEP WRITING ONLINE

Editing

Next, make the following change to the bolded words and phrases in the paragraph on the right according to the directions below. You will have 1 minute.

- Move the last sentence so that it comes right after sentence 4 (marked with an *).

When planning a vacation, people should consider going to a major city, like New York. Cities like New York have something for everyone. For those who prefer crowds, museums, and shopping, a trip into the center of town can be entertaining. For those who prefer something greener, a trip to Central Park is the thing to do.* On a sunny day, people enjoy picnic lunches and long walks along the many trails through the Park. **Central Park is very large, and features wide lawns, gardens, and a small zoo.**

HIDE PREVIOUS NEXT

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2002 Writing Online Study.

Figure C-6. Writing Online hands-on editing tasks, screen 6, grade 8: 2002

MINUTE

NAEP WRITING ONLINE

Editing

Next, make the following change to the bolded words and phrases in the paragraph on the right according to the directions below. You will have 1 minute.

- Correct the spelling for "vacasion".

When planning a **vacasion**, people should consider going to a major city, like New York. Cities like New York have something for everyone. For those who prefer crowds, museums, and shopping, a trip into the center of town can be entertaining. For those who prefer something greener, a trip to Central Park is the thing to do. On a sunny day, people enjoy picnic lunches and long walks along the many trails through the Park. Central Park is very large, and features wide lawns, gardens, and a small zoo.]

Cut Copy Paste Undo Spelling

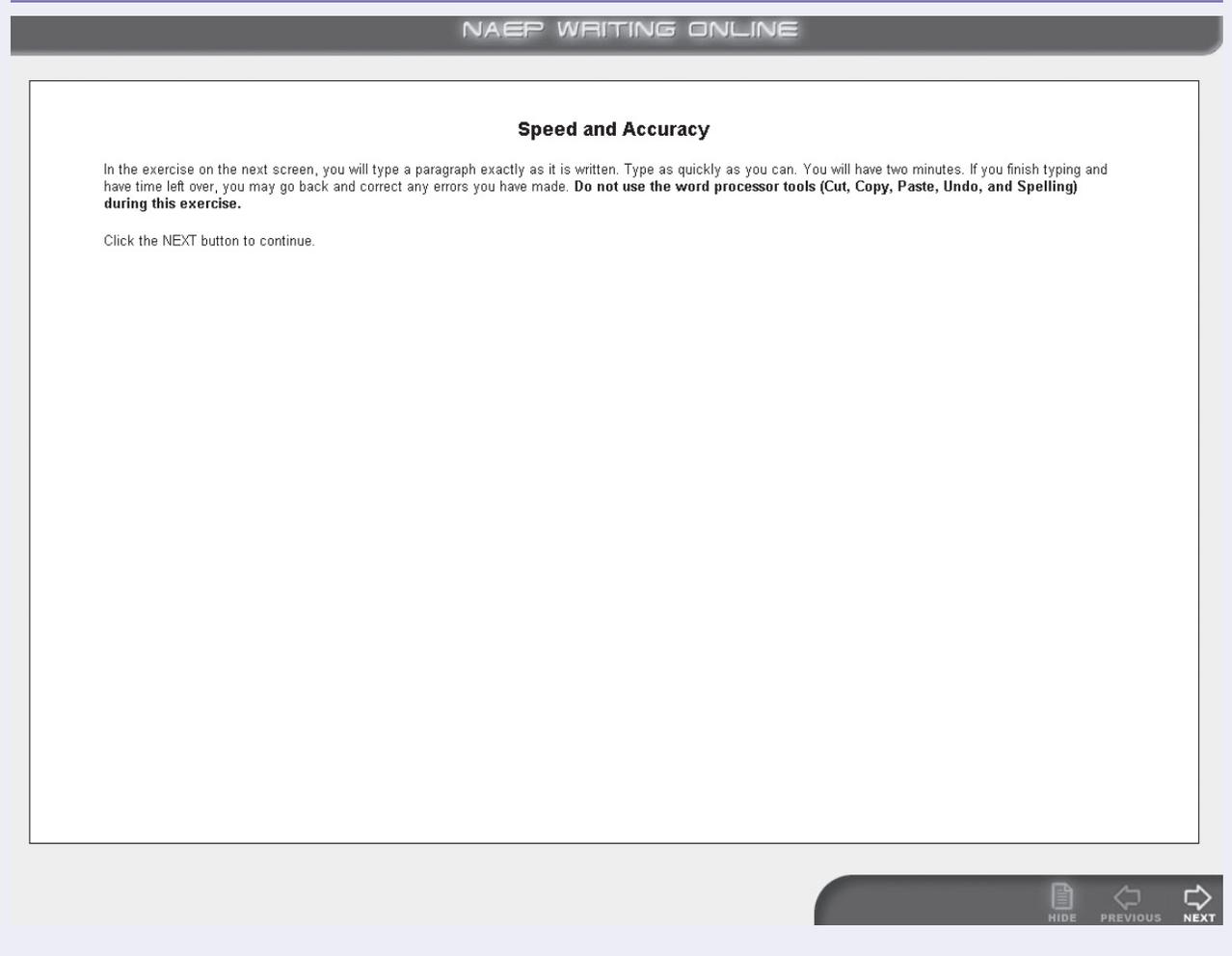
HIDE PREVIOUS NEXT

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2002 Writing Online Study.

Appendix D. Writing Online Speed and Accuracy Tasks

This appendix presents screen shots of the tasks used to measure students' online typing speed and accuracy.

Figure D-1. Writing Online speed and accuracy tasks, screen 1, grade 8: 2002



SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2002 Writing Online Study.

Figure D-2. Writing Online speed and accuracy tasks, screen 2, grade 8: 2002

The screenshot shows the NAEP Writing Online interface for a speed and accuracy task. At the top, there is a header with 'MINUTES' on the left and 'NAEP WRITING ONLINE' in the center. Below the header, the interface is divided into two main sections. On the left, there is a panel titled 'Speed and Accuracy' with the instruction 'Begin typing now.' and a text box containing the following text: 'I don't know about you, but I really like new movies (the ones they make now) better than the old movies that are my parents' favorites. I think the most important difference for me is that the older movies don't seem as real. First of all, the older movies are in black and white. Color makes a big difference in a movie; it's a lot more interesting to watch things happen in color than in black and white.' On the right, there is a large writing area with a vertical scrollbar on the right side. Above the writing area is a toolbar with icons for 'Cut', 'Copy', 'Paste', 'Undo', and 'Spelling'. At the bottom of the interface, there is a navigation bar with icons for 'HIDE', 'PREVIOUS', and 'NEXT'.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2002 Writing Online Study.

Appendix E. Background Questions Administered in Writing Online

Questions 1–8. To what extent do you do the following on a computer? Include things you do in school and things you do outside of school. (Choices: Not at all, Small extent, Moderate extent, Large extent)

1. Play computer games
 2. Write using a word processing program
 3. Make drawings or art projects on the computer
 4. Make tables, charts, or graphs on the computer
 5. Look up information on a CD
 6. Find information on the Internet for a project or report for school
 7. Use email to communicate with others
 8. Talk in chat groups or with other people who are logged on at the same time you are
9. Who taught you the most about how to use a computer?
- I learned the most on my own.
 - I learned the most from my friends.
 - I learned the most from my teachers.
 - I learned the most from my family.
 - I don't really know how to use a computer.
10. How often do you use a computer at school? Include use anywhere in the school and at any time of day.
- Every day
 - Two or three times a week
 - About once a week
 - Once every few weeks
 - Never or hardly ever
11. How often do you use a computer outside of school?
- Every day
 - Two or three times a week
 - About once a week
 - Once every few weeks
 - Never or hardly ever
12. Is there a computer at home that you use?
- Yes
 - No

Questions 13–15. Please indicate the extent to which you AGREE or DISAGREE with the following statements. (Choices: Strongly agree, Agree, Disagree, Strongly disagree, I never use a computer)

13. I am more motivated to get started doing my schoolwork when I use a computer.
 14. I have more fun learning when I use a computer.
 15. I get more done when I use a computer for schoolwork.
16. Which best describes you?
- White
 - Black
 - Hispanic
 - Asian
 - Pacific Islander
 - Other

17. If you are Hispanic, what is your Hispanic background?

- I am not Hispanic
- Mexican, Mexican American, or Chicano
- Puerto Rican
- Cuban
- Other Spanish or Hispanic background

18. How far in school did your mother go?

- She did not finish high school.
- She graduated from high school.
- She had some education after high school.
- She went to college.
- I don't know.

19. How far in school did your father go?

- He did not finish high school.
- He graduated from high school.
- He had some education after high school.
- He went to college.
- I don't know.

20. About how many books are there in your home?

- Few (0-10)
- Enough to fill one shelf (11-25)
- Enough to fill one bookcase (26-100)
- Enough to fill several bookcases (more than 100)

21. Does your family get a newspaper at least four times a week?

- Yes
- No
- I don't know.

22. Does your family get any magazines regularly?

- Yes
- No
- I don't know.

23. Is there an encyclopedia in your home? It could be a set of books, or it could be on the computer.

- Yes
- No
- I don't know.

24. On a school day, about how many hours do you usually watch TV or videotapes outside of school?

- None
- 1 hour or less
- 2 or 3 hours
- 4 or 5 hours
- 6 hours or more

Questions 25–28. When you write a paper or report for school this year, how often do you do each of the following?
(Choices: Almost always, Sometimes, Never or hardly ever)

- 25. Brainstorm with other students to decide what to write about
- 26. Organize your paper before you write (for example, make an outline, draw a chart)
- 27. Make changes to your paper to fix mistakes and improve your paper
- 28. Work with other students in pairs or small groups to discuss and improve your paper

Questions 29–34. When you write a paper or report for school this year, how often do you do each of the following?
(Choices: Almost always, Sometimes, Never or hardly ever)

- 29. Use a computer to plan your writing (for example, by making an outline, list, chart, or other kind of plan)
- 30. Use a computer from the beginning to write the paper or report (for example, use a computer to write the first draft)
- 31. Use a computer to make changes to the paper or report (for example, spell-check, cut and paste)
- 32. Use a computer to type up the final copy of the paper or report that you wrote by hand
- 33. Look for information on the Internet to include in the paper or report
- 34. Use a computer to include pictures or graphs in the paper or report

35. How often do people in your home talk to each other in a language other than English?

- Never
- Once in a while
- About half of the time
- All or most of the time

36. When you write, how often does your teacher talk to you about what you are writing?

- Never
- Sometimes
- Always

37. When you write, how often does your teacher ask you to write more than one draft of a paper?

- Never
- Sometimes
- Always

Appendix F. NAEP Grade 8 Writing Scoring Guides

Informative Scoring Guide

6 Excellent Response

- Develops and shapes information with well-chosen details across the response.
- Is well organized with strong transitions.
- Sustains variety in sentence structure and exhibits good word choice.
- Errors in grammar, spelling, and punctuation are few and do not interfere with understanding.

5 Skillful Response

- Develops and shapes information with details in parts of the response.
- Is clearly organized, but may lack some transitions and/or have occasional lapses in continuity.
- Exhibits some variety in sentence structure and some good word choices.
- Errors in grammar, spelling, and punctuation do not interfere with understanding.

4 Sufficient Response

- Develops information with some details.
- Organized with ideas that are generally related, but has few or no transitions.
- Exhibits control over sentence boundaries and sentence structure, but sentences and word choice may be simple and unvaried.
- Errors in grammar, spelling, and punctuation do not interfere with understanding.

3 Uneven Response (may be characterized by one or more of the following)

- Presents some clear information, but is list-like, undeveloped, or repetitive OR offers no more than a well-written beginning.
- Is unevenly organized; the response may be disjointed.
- Exhibits uneven control over sentence boundaries and sentence structure; may have some inaccurate word choices.
- Errors in grammar, spelling, and punctuation sometimes interfere with understanding.

2 Insufficient Response (may be characterized by one or more of the following)

- Presents fragmented information OR may be very repetitive OR may be very undeveloped.
- Is very disorganized; thoughts are tenuously connected OR the response is too brief to detect organization.
- Minimal control over sentence boundaries and sentence structure; word choice may often be inaccurate.
- Errors in grammar or usage (such as missing words or incorrect word use or word order), spelling, and punctuation interfere with understanding in much of the response.

1 Unsatisfactory Response (may be characterized by one or more of the following)

- Attempts to respond to task, but provides little or no coherent information; may only paraphrase the task.
- Has no apparent organization OR consists of a single statement.
- Minimal or no control over sentence boundaries and sentence structure; word choice may be inaccurate in much or all of the response.
- A multiplicity of errors in grammar or usage (such as missing words or incorrect word use or word order), spelling, and punctuation severely impedes understanding across the response.

Persuasive Scoring Guide

6 Excellent Response

- Takes a clear position and develops it consistently with well-chosen reasons and/or examples across the response.
- Is well organized with strong transitions.
- Sustains variety in sentence structure and exhibits good word choice.
- Errors in grammar, spelling, and punctuation are few and do not interfere with understanding.

5 Skillful Response

- Takes a clear position and develops it with reasons and/or examples in parts of the response.
- Is clearly organized, but may lack some transitions and/or have occasional lapses in continuity.
- Exhibits some variety in sentence structure and some good word choices.
- Errors in grammar, spelling, and punctuation do not interfere with understanding.

4 Sufficient Response

- Takes a clear position and supports it with some reasons and/or examples.
- Is organized with ideas that are generally related, but there are few or no transitions.
- Exhibits control over sentence boundaries and sentence structure, but sentences and word choice may be simple and unvaried.
- Errors in grammar, spelling, and punctuation do not interfere with understanding.

3 Uneven Response (may be characterized by one or more of the following)

- Takes a position and offers support, but may be unclear, repetitive, list-like, or undeveloped.
- Is unevenly organized; the response may be disjointed.
- Exhibits uneven control over sentence boundaries and sentence structure; may have some inaccurate word choices.
- Errors in grammar, spelling, and punctuation sometimes interfere with understanding.

2 Insufficient Response (may be characterized by one or more of the following)

- Takes a position, but response may be very unclear, very undeveloped, or very repetitive.
- Is very disorganized; thoughts are tenuously connected OR the response is too brief to detect organization.
- Minimal control over sentence boundaries and sentence structure; word choice may often be inaccurate.
- Errors in grammar or usage (such as missing words or incorrect word use or word order), spelling, and punctuation interfere with understanding in much of the response.

1 Unsatisfactory Response (may be characterized by one or more of the following)

- Attempts to take a position (addresses topic) but response is incoherent OR takes a position but provides no support; may only paraphrase the task.
- Has no apparent organization OR consists of a single statement.
- Minimal or no control over sentence boundaries and sentence structure; word choice may be inaccurate in much or all of the response.
- A multiplicity of errors in grammar or usage (such as missing words or incorrect word use or word order), spelling, and punctuation severely impedes understanding across the response.

Appendix G. Statistical Procedures

Procedure for ANOVA Using WESVAR

Many of the research questions for the Writing On-line (WOL) study required repeated-measures analysis of variance (ANOVA). These analyses were complicated by the necessity of using student sampling weights with the WOL data. WESVAR, proprietary software of Westat, was used so that student sampling weights would be applied appropriately. Because WESVAR does not currently have an ANOVA option, the regression option was used to calculate ANOVA tables and tests. Contrasts, coded as categorical variables in WESVAR, were used to define the groups specified by the variables in the model. To create the contrast defining gender, for instance, male students were coded as 1 and female students were coded as 0.

Contrasts were needed for most of the independent variables to allow the WESVAR regression routines to calculate the statistics required for repeated-measures ANOVA. Any covariates included as independent variables were coded as ordinal, or continuous, variables.

Contrast coding of the type described above is necessary for any ANOVA analysis. For repeated-measures ANOVA in a regression setting, appropriate tests can be performed by creating additional variables to reflect the within- and between-group sources of variance. To do this, in a setting where scores on the two WOL essays were the outcome variables, two dependent variables were created. The between-groups variable, B , is defined as

$$B = \frac{(x_1 + x_2)}{\sqrt{2}},$$

where x_i is the score on the i^{th} essay.

The within-groups variable, W , is defined as

$$W = \frac{(x_1 - x_2)}{\sqrt{2}},$$

where x_i is the score on the i^{th} essay.

After these two dependent variables were formed, two separate regressions were run with the independent variables—one regression to estimate the between-group effects and one to estimate the within-group effects.

Correlations Used in This Report

Two types of correlations are used throughout this report. For reader reliability statistics the intraclass correlation coefficient is used. It is defined as

$$r(ICC) = \frac{MSS - MSR}{MSS + (k - 1) * MSR},$$

where MSS is the mean sum of the squares within subjects and MSR is the mean sum of the squares between subjects (i.e., within readers) obtained from a one-way ANOVA, and k is the number of readers.

For other types of correlations a standard Pearson correlation was used,

$$r(Pearson) = \frac{\text{covariance}(X, Y)}{\sqrt{\text{Var}(X) * \text{Var}(y)}}.$$

t-tests Used in This Report

The following section explains the calculation of t -tests:

Let A_i be the statistic in question (e.g., a mean for group i) and let S_{A_i} be the standard error of the statistic. The text in the reports identifies the means or proportions for groups i and j as being different if

$$\frac{|A_i - A_j|}{\sqrt{S_{A_i}^2 + S_{A_j}^2}} \geq T_{\frac{.05}{2c}}$$

where T_a is the $(1 - a)$ percentile of the t distribution with degrees of freedom, df , set to the number of replicates involved in the comparison.

Appendix H. Percentage of Writing Online Students Who Report Using a Computer for Different Specific Writing Purposes

Table H-1. Percentage of Writing Online students who report using a computer for different specific writing purposes, grade 8: 2002

Item	Always	Sometimes	Never
29. Use a computer to plan your writing (for example, by making an outline, list, chart, or other kind of plan)	15 (1.2)	48 (1.4)	37 (1.5)
30. Use a computer from the beginning to write the paper or report (for example, use a computer to write the first draft)	32 (1.7)	42 (1.6)	25 (1.4)
31. Use a computer to make changes to the paper or report (for example, spell-check, cut and paste)	57 (1.6)	32 (1.4)	10 (0.9)
32. Use a computer to type up the final copy of the paper or report that you wrote by hand	69 (1.6)	24 (1.5)	6 (0.7)
33. Look for information on the Internet to include in the paper or report	60 (1.8)	35 (1.7)	5 (0.7)
34. Use a computer to include pictures or graphs in the paper or report	37 (1.9)	48 (1.9)	14 (1.0)

NOTE: The number of students responding ranged from 1,300 to 1,304. Standard errors are in parentheses. Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2002 Writing Online Study.

Appendix I. Summary Statistics for Computer Familiarity Measures

Table I-1. Summary statistics for components of the hands-on computer skills measure, grade 8: 2002

Component	<i>n</i>	Scale range	Mean	Standard deviation
Typing speed	686	0–78	36.3	19.5
Typing accuracy	686	0–maximum number of errors made	3.1	3.8
Editing	672	0–5	3.1	1.3

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2002 Writing Online Study.

Table I-2. Summary statistics for computer familiarity measures, grade 8: 2002

Measure	<i>n</i>	Scale range	Mean	Standard deviation
Extent of computer use	681	0–8.0	4.5	1.8
Computer use for writing	685	0–6.0	5.0	1.2
Hands-on computer skill	672	0–4.3	2.1	0.9

NOTE: The values for hands-on computer skill were real numbers created from a regression equation relating Writing Online (WOL) score to measures of typing speed, typing accuracy, and editing skill. The largest observed value for hands-on computer skill was just under 4.3.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2002 Writing Online Study.

Appendix J. Analysis of Variance Results Relating Computer Familiarity and Gender to Writing Online Performance

Table J-1. Results of repeated-measures analysis of variance testing the effects of gender and of self-reported and hands-on computer familiarity variables on Writing Online performance, controlling for main NAEP writing performance, grade 8: 2002

Variable	F-value	Numerator df	Denominator df	p-value
Between-subjects effects				
Main NAEP writing skill	86.34	1	62	.00*
Extent of computer use	3.30	1	62	.07
Computer use for writing	1.54	1	62	.22
Hands-on computer skill	98.11	1	62	.00*
Gender	4.31	1	62	.04*
Extent of computer use x gender	0.57	1	62	.45
Computer use for writing x gender	2.96	1	62	.09
Hands-on computer skill x gender	0.22	1	62	.64
Within-subjects effects				
Main NAEP writing performance x essay	0.09	1	62	.77
Extent of computer use x essay	0.14	1	62	.71
Computer use for writing x essay	1.92	1	62	.17
Hands-on computer skill x essay	5.01	1	62	.03*
Gender x essay	0.34	1	62	.56
Extent of computer use x gender x essay	0.07	1	62	.80
Computer use for writing x gender x essay	0.23	1	62	.63
Hands-on computer skill x gender x essay	0.01	1	62	.91

* $p < .05$ for the difference of the regression coefficient from zero as calculated using an F -test.

NOTE: WOL=Writing Online. Students taking the WOL computer test were drawn from the main NAEP writing sample. The number of students responding to both essays was 660.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2002 Writing Online Study.