

## Data Collected Through the NAEP

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This module provides information about the data collected through the National Assessment of Educational Progress (NAEP). It describes the assessment design and administration procedures. It also describes the Long-Term Trend and Main NAEP assessments, as well as the background questionnaires for students, teachers, and schools.

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Since NAEP assessments are administered uniformly using the same sets of test booklets across the nation, NAEP results serve as a common metric for all states and selected urban districts. The assessment remains essentially the same from year to year, with only carefully documented changes. This permits NAEP to provide a clear picture of student academic progress over time.

As NAEP moves toward computer-based assessments, the assessment administration protocols will remain uniform recognizing the importance of continuing NAEP as a common metric.

However, new questions are added and some questions are retired over time.

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The National Assessment Governing Board (NAGB), appointed by the Secretary of Education but independent of the U.S. Department of Education, sets policy for NAEP and is responsible for developing the framework and test specifications that serve as the blueprint for the assessments. The framework specifies the assessment content, the numbers of content sub-scales and their weight toward the composite scale, and the formats and proportion of items. More information about the NAGB can be accessed by clicking the corresponding underlined screen text.

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NAEP field staff go into schools across the nation to administer assessment exercises to students who are part of the NAEP sample. The NAEP assessment includes two types of items, cognitive items and background questions. In addition, teachers and principals are asked to complete questionnaires. The background questionnaire items asked of students, teachers, and principals provide context for student results. More information about how NAEP is administered can be accessed by clicking the corresponding underlined screen text.

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NAEP uses two cognitive item formats. Multiple choice and constructed-response, or open-ended, questions. Multiple choice questions are scored as either correct or incorrect. Short constructed response and extended constructed response questions are scored using a rubric where partial credit is possible. More information about NAEP multiple-choice and constructed-response questions can be accessed by clicking the corresponding underlined screen text.

The number of cognitive items developed for each NAEP assessment varies by subject and grade. For example, the reading item pool consists of about 100 to 170 items per grade. For mathematics, the item pool consists of about 180 to 200 items per grade.

Since 2001, NAEP has been exploring new testing methods and item types that reflect the growing use of technology in education. Beginning in 2017, the NAEP mathematics, reading, and writing assessments will be administered to students throughout the nation on NAEP-provided tablets. Additional subjects will be administered on tablets in 2018 and 2019. More information about technology-based assessments can be accessed by clicking the corresponding underlined screen text.

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The NAEP assessments are designed such that no student responds to all of the items in the item pool. This method, known as multiple matrix sampling, is used with Item Response Theory (IRT) models to keep the testing burden to a minimum but ensure broad subject-matter coverage. More information regarding multiple matrix sampling can be accessed by clicking the corresponding underlined screen text.

In this approach, a participating student takes only a portion of the complete set of cognitive items developed for any assessment. The assessment design ensures that every item within the item pool is exposed to about one quarter of the sample.

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NAEP uses a Balanced Incomplete Block (BIB) design to distribute the assessment items among students, yet retain linkages necessary for scaling the achievement data with Item Response Theory (IRT) models. More information regarding IRT can be accessed by clicking the corresponding underlined screen text. In this approach, NAEP assessment items are clustered in blocks. The blocks, in turn are used to create test booklets containing interlocking blocks of items. In NAEP each block is paired with every other block once, and each block appears once in every position of the booklets.

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Here we see an example of the multiple matrix sampling technique with Balanced Incomplete Block design in action. Using a linear programming process, items are clustered into blocks. Items one and two appear in block one; items three and four appear in block two; and items five and six appear in block three. The blocks, in turn are used to create test booklets (in this case booklets A, B, and C). Block one is paired

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with every other block once (that is it is paired with block two in booklet A and with block three in booklet B).

Then booklets are assembled such that each block appears once in every position of the booklet. Here we see that booklet A contains block one and two. Block one appears in the first position (or as the first block) in booklet A, and then as the second block in booklet G. All seven blocks of items are combined into the seven booklets that each contain two blocks.

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Since 2002, the NAEP students are allotted 60 minutes to complete the assessment. Each student receives a booklet that contains two cognitive blocks and two sets of background questions, specific to the cognitive blocks taken. Past NAEP booklets have varied by subject.

Here we see the booklet design for all subjects since 2002, as well as the past booklet designs by subject for three assessments: writing, Reading, and mathematics.

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Let's consider a classroom where reading and mathematics assessments are being administered to students. The booklets will be bundled such that when they are distributed, the assessment varies per seat. Here we see that the student in seat one will receive the reading assessment, the student in seat two will receive the mathematics assessment, the student in seat three will receive the Reading assessment, and so on; alternating the subject at each seat. The students in seats 19, 20, 25, and 26 would receive booklets corresponding to a special study being conducted during the administration, in this case in either reading or mathematics. These special study booklets are added to the sequence at a lower rate when pilot and field-tests are conducted.

If this classroom were to be administered reading, mathematics, science and writing assessments, the booklets would be bundled in the sequence that ensured equal distribution of booklets across all sessions.

Now, let's take a look at the content of the NAEP assessments.

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The NAEP long-term trend reading assessment is designed to measure students' ability to locate specific information, make inferences based on information in two or more parts of a passage, and identify the main idea in a passage. More information about the Long-Term Trend Reading assessment can be accessed by clicking the corresponding underlined screen text.

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The assessment requires students to read and answer questions based on a variety of materials, including informational passages, literary texts, and documents. The selections included brief stories, passages from textbooks, and other age-appropriate reading material. Students' comprehension of these materials is assessed with both multiple-choice and constructed-response questions.

The current Long-Term Trend reading assessment framework and specifications can be accessed by clicking the corresponding underlined screen text.

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NAEP's Long-term Trend Assessments Mathematics assessment is designed to measure students' knowledge of basic facts, ability to carry out computations using paper and pencil, their knowledge of basic measurement formulas as they are applied in geometric settings, and their ability to apply mathematics to daily-living skills (such as those related to time and money). More information about the Long-Term Trend mathematics assessment can be accessed by clicking the corresponding underlined screen text.

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The assessment has a computational focus and contains a range of multiple-choice and constructed-response questions that cover numbers and numeration; measurement; shape, size, and position; probability and statistics; and variables and relationships.

The current Long-Term Trend mathematics assessment framework and specifications can be accessed by clicking the corresponding underlined screen text.

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NAEP administers assessments in 12 subject areas: the arts, civics, economics, foreign language, geography, mathematics, reading, science, technology and engineering literacy, US history, world history, and writing.

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The NAEP 2008 arts assessment measured the extent of what American students know and could do in the arts disciplines of music and visual arts. The assessment measured students' knowledge and skills in the arts by asking them to observe, describe, analyze, and evaluate existing works of music and visual art and to create original works of visual art. More information about the NAEP Arts assessment can be accessed by clicking the corresponding underlined screen text.

The current arts assessment framework and specifications can be accessed by clicking the corresponding underlined screen text.

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The visual arts area of the assessment consisted of questions that evaluated responding process and creating process. The constructed-response questions included not only questions that required students to generate written answers, but also questions that asked students to create original works of visual art. Many of these visual arts questions contained multiple parts.

For example, in order to assess knowledge of music, students were asked to listen to a rhythmic pattern and then complete the measure. In order to assess skills associated with music, students were asked to listen to pieces of music and then analyze, interpret, critique and place the pieces in a historical context.

To assess visual arts knowledge, students, using oil pastels, a mirror, and a charcoal pencil, were asked to create a self-portrait that communicates to a viewer something important about one's personality. As a way to assess students' skills associated with visual arts, they were asked to study artworks and then do exercises exploring aesthetic properties and expressive aspects of the works.

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The NAEP civics assessment measures the civics knowledge, skills, and dispositions that are critical to the responsibilities of citizenship in America's constitutional democracy. The assessment is administered to students at grades 4, 8, and 12 and is organized around three main components: civic knowledge; intellectual and participatory skills; and civic dispositions. More information about the NAEP civics assessment can be accessed by clicking the corresponding underlined screen text.

The current civics assessment framework and specifications can be accessed by clicking the corresponding underlined screen text.

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The civic knowledge component is organized into five main categories, expressed as questions. What are civic life, politics, and government? What are the foundations of the American political system? How does the government established by the Constitution embody the purpose, values, and principles of American democracy? What is the relationship of the United States to other nations and to world affairs? What are the roles of citizens in American democracy?

The intellectual skills component covers those skills of mind and action that allow individuals to apply civic knowledge to good effect. The framework distinguishes three skills, though they are clearly overlapping. They are: identifying and describing, explaining and analyzing, and evaluating, taking, and defending positions.

Civic dispositions, "refers to the traits of private and public character essential to the preservation and improvement of American constitutional democracy." The framework defines five dispositions as follows: becoming an independent member of society, assuming the personal, political, and economic responsibilities of a citizen, respecting

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individual worth and human dignity, participating in civic affairs in an informed, thoughtful, and effective manner, and promoting the healthy functioning of American constitutional democracy.

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The 2012 NAEP economics assessment measured twelfth-graders understanding of how economies and markets work, the benefits and costs of economic interaction and interdependence, and the choices people make regarding limited resources. The economics assessment measured and reported results for three main content areas the market economy, the national economy, and the international economy. More information about the NAEP economics assessment can be accessed by clicking the corresponding underlined screen text.

The current economics assessment framework and specifications can be accessed by clicking the corresponding underlined screen text.

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Recognizing that students acquire economics knowledge and skills inside and outside of school, NAEP uses questions that are set in various contexts. Individual and Household questions focus on topics related to personal finance (i.e., earning, spending, saving, borrowing, and investing). Business questions relate to entrepreneurs, workers, producers, and investors. And, the public domain includes questions about government, policy, citizenship, and domestic and international organizations.

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The inaugural NAEP Foreign Language assessment is currently under development and is scheduled to be added to the assessment cycle beginning in 2018. The foreign language assessment is expected to measure four skills: listening, speaking, reading, and writing. These skills can be assessed within three modes of communication: interpersonal (involving two-way interactive communication), interpretive (relating to the understanding of spoken or written language), and presentational (involving creating spoken or written communication). More information about the NAEP foreign language assessment can be accessed by clicking the corresponding underlined screen text.

The current foreign language assessment framework and specifications can be accessed by clicking the corresponding underlined screen text.

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Performances on assessment tasks will be evaluated by how well the student understands (comprehension) and can be understood (comprehensibility). This evaluation subsumes language knowledge, the appropriate use of communication strategies, and the application of cultural knowledge to enhance communication.

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The planned NAEP Foreign Language assessment in Spanish will assess: listening and speaking in the interpersonal mode; reading and listening in the interpretive mode; and writing in the presentational mode.

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The NAEP geography assessment is organized around two primary dimensions: a content dimension and a cognitive dimension. Each question in the assessment has a content and a cognitive skills dimension.

The content dimension includes the following three areas: Space and place questions measure students' knowledge of geography related to particular places on Earth, spatial patterns on Earth's surface, and physical and human processes that shape spatial patterns. Environment and society questions measure students' knowledge of how people depend upon, adapt to, are affected by, and modify the natural environment. Spatial dynamics and connections questions measure students' ability to understand geography as it relates to spatial variations and the connections among people and places.

The cognitive dimension of the assessment includes the following three categories: Knowing questions ask: What is it? Where is it? Understanding questions ask: Why is it there? How did it get there? What is its significance? Applying questions ask: How can knowledge and understanding be used to solve geographic problems? More information about the NAEP geography assessment can be accessed by clicking the corresponding underlined screen text.

The current geography assessment framework and specifications can be accessed by clicking the corresponding underlined screen text.

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Here examples of easy, medium, and hard questions from the Grade 4, 8, and 12 NAEP geography assessment are presented. In 2010, 4th graders were asked to recognize how land is used in a photograph, to identify a continent, and to draw the safest route on a map. In 2001, 8th graders were asked to identify the epicenter of an earthquake, interpret a map, and identify population pattern differences. In 2010, students in the 12th grade were asked to identify the origin of most Hispanic people from a graph, demonstrate that they understood how the Great Lakes were formed, and describe air mass across the Great Lakes.

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The NAEP mathematics assessment measures students' knowledge and skills in mathematics and students' ability to apply their knowledge in problem-solving situations. Questions asked of 4th and 8th grade students are based on five content areas: number properties and operations; measurement; geometry; data analysis, statistics, and probability; and algebra. More information about the NAEP mathematics assessment can be accessed by clicking the corresponding underlined screen text.

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For 2005, the NAGB adopted a new mathematics framework for grade 12 to reflect changes in high school standards and coursework. Additional changes were made for the 2009 assessment to facilitate reporting on twelfth-graders' preparedness for post-secondary education and training. Results from a special analyses (or analysis – ALT recording) determined the 2009 grade 12 mathematics assessment results could be compared with those from 2005. More information about changes to the 2009 assessment and how the 2005 mathematics framework compares with the 1990–2003 mathematics framework can be accessed by clicking the underlined screen text, **changes**.

The current mathematics assessment frameworks and specifications can be accessed by clicking the corresponding underlined screen text.

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Here examples of easy, medium, and hard questions from the Grade 4, 8, and 12 NAEP mathematics assessment are presented. In 2013, 4th graders were asked to multiply three whole numbers, recognize the result of cutting and folding paper, and to draw a line segment of a given length. Eighth graders were asked to measure the length of a line segment, determine complete sample space, and interpret slope from a verbal description. Students in the 12th grade were asked to read a scatterplot, identify the formula to solve a problem using a spreadsheet, and to analyze the conjunction and disjunction of inequalities.

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The NAEP reading assessment measures students' reading and comprehension skills by asking them to read selected grade-appropriate passages and answer questions based on what they have read. Students are assessed on their ability to understand written text, develop and interpret meaning, and use meaning as appropriate to the type of text, purpose, and situation.

Three areas are assessed: literary and informational texts; cognitive targets (mental processes and kinds of thinking that underlie reading comprehension); and vocabulary. More information about the NAEP reading assessment can be accessed by clicking the corresponding underlined screen text.

The current reading assessment framework and specifications can be accessed by clicking the corresponding underlined screen text.

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Both literary and informational texts are assessed. Literary texts include three types at each grade: fiction, literary nonfiction, and poetry. Informational texts include three broad categories: exposition; argumentation and persuasive text; and procedural text and documents. The inclusion of distinct text types recognizes that students read different texts for different purposes.

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Three dimensions of cognitive targets include students' ability to locate and recall by identifying explicitly stated main ideas or may focus on specific elements of a story. They are also asked to integrate and interpret what they have read by making comparisons, explaining character motivation, or examining relations of ideas across the text. Finally, they are asked to critique and evaluate texts by viewing the text critically, by examining it from numerous perspectives, or by evaluating overall text quality or the effectiveness of particular aspects of the text.

Vocabulary questions measure students' knowledge of specific words as used in the passages they are asked to read for the assessment. To answer these questions, students integrate their understanding of the word with their passage comprehension.

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Here examples of easy, medium, and hard questions from the Grade 4, 8, and 12 NAEP Reading assessment are presented. In 2013, 4th graders were asked to recognize explicitly stated dialogue from a story, use story events to support an opinion about a story genre, and to interpret thematic connections between two literary texts and to support it with details. Eighth graders were asked to explain the relationship of a phrase to the main point of a persuasive essay, recognize an implicit supporting idea in a persuasive essay, and to explain the relationship of a paragraph to the main point of a persuasive essay. Students in the 12th grade were asked to explain the relationship of a phrase to the main point of a persuasive essay, explain the relationship between specific paragraphs and the author's main point, and to explain the central purpose of a speech with supporting ideas.

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The NAEP science assessment was designed to measure students' knowledge of three broad content areas: physical science; life science; and Earth and space sciences. In addition to science content, four science practices describe how students use their science knowledge by measuring what they are able to do with science content: identifying science principles; using science principles; using scientific inquiry; and using technological design. More information about the NAEP science assessment can be accessed by clicking the corresponding underlined screen text.

The current science assessment framework and specifications can be accessed by clicking the corresponding underlined screen text.

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Here examples of easy, medium, and hard questions from the Grade 4, 8, and 12 NAEP science assessment are presented. In 2009, 4th graders were asked to identify the organism with a change in habitat from young to old, predict the shape of the moon, and to relate a weather condition to patterns in data. In 2011, 8th graders were asked to predict a geological consequence of tectonic plate movement, identify the atomic components of a molecule, and to identify chemically similar elements in the Periodic Table. In 2009, students in the 12th grade were asked to determine relationships

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between species based on an evolutionary tree, recognize atomic particles in an ion, and to recognize the nuclear fission reaction.

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As computers and digital tools play an increasingly important role in today's classroom, NAEP is advancing with technology-based assessments. Eighth-grade students throughout the nation took the NAEP Technology and Engineering Literacy (TEL) assessment in the winter of 2014.

TEL is a new frontier for NAEP and large-scale assessment. It is a computer-based, cross-curricular assessment that challenges students to perform interactive tasks and engage in solving problems within realistic scenarios. TEL gauges how well students understand and apply technology and engineering principles to real-life situations.

The Technology and Engineering Literacy assessment focused on student knowledge about technology, engineering, and how technology and engineering shapes their lives. More information about the NAEP TEL assessment can be accessed by clicking the corresponding underlined screen text.

The current TEL assessment framework and specifications can be accessed by clicking the corresponding underlined screen text.

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The NAEP U.S. history assessment presents a broad view of what our students know about U.S. history in the context of democracy, culture, technological and economic changes, and our nation's changing world role. The assessment is organized around three components: themes in U.S. History; periods of U.S. History; and ways of knowing and thinking about U.S. History. More information about the NAEP U.S. history assessment can be accessed by clicking the corresponding underlined screen text.

The current U.S. history assessment framework and specifications can be accessed by clicking the corresponding underlined screen text.

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Here examples of the types of information assessed in the NAEP U.S. history assessment are presented across the two ways of knowing and thinking about U.S. history. Within historical knowledge and perspective, students are asked questions that assess the degree to which they know and understand people, events, concepts, themes, movements, contexts, and historical sources; sequence events, recognize multiple perspectives and see an era or movement through the eyes of different groups; and the degree to which they have developed a general conceptualization of U.S. history. Within historical analysis and interpretation, students are asked questions where they explain issues, and identify historical patterns; establish cause-and-effect relationships; find value statements; establish significance; apply historical knowledge; weigh evidence to draw sound conclusions; make defensible generalizations; and render insightful accounts of the past.

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The first-ever NAEP assessment of world history was originally scheduled to be administered in 2012 to students in the twelfth grade. The assessment has been postponed with the intention of including it in the 2018 assessment cycle. The assessment framework, specifications, and background variables are currently being developed. More information about the NAEP world history assessment can be accessed by clicking the corresponding underlined screen text.

The world history assessment framework and specifications will be accessible by clicking the corresponding underlined screen text, when it is available.

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Students participating in the 2011 NAEP computer-based writing assessment responded to tasks designed to measure one of three communicative purposes common to many typical writing situations: to persuade, in order to change the reader's point of view or affect the reader's action; to explain, in order to expand the reader's understanding; and to convey experience (real or imagined), in order to communicate individual and imagined experiences to others. More information about the NAEP writing assessment can be accessed by clicking the corresponding underlined screen text.

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The 2011 assessment was the first NAEP computer-based writing assessment developed under a new writing framework. More information about the current writing assessment framework and specifications can be accessed by clicking the corresponding underlined screen text.

The assessment included 22 writing tasks at grade 8 and 22 tasks at grade 12. Writing tasks were presented to students in a variety of ways, including text, audio, photographs, video, or animation on the computer. Students composed their responses on laptop computers. Each student at grade 8 and at grade 12 was given a handout to help them prepare.

Students were randomly assigned two writing tasks and had 30 minutes to complete each of the tasks. Before being presented with the first task, students were shown a tutorial to familiarize them with the way material is presented on the computer screen and show them how to use the custom-developed software program provided in the assessment. Students completed their writing tasks on laptop computers provided by NAEP, using software similar to common word-processing programs.

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Here examples of easy, medium, and hard questions from the Grade 4, 8, and 12 NAEP writing assessment are presented. In 2002, 4th graders were asked to describe a very unusual day, describe lunchtime, and to convince the school librarian. In 2011, 8th graders were asked tell a story about the exploration of a remote island, write an article

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explaining change in thoughts or feelings, and to write a letter persuading the principal to require or not require community service. In 2011, students in the 12th grade were asked to tell a story or personal narrative about a real or imagined difficult choice, write an essay about a technology that is important to them, and to construct a letter persuading the council to build or not build a convenience store.

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In addition to assessing subject-area achievement, NAEP collects information that fulfills reporting requirements of federal legislation and to provide a context for reporting student performance. The legislation requires that, whenever feasible, NAEP include information on special groups (e.g., information reported by race, ethnicity, socioeconomic status, gender, disability, and limited English proficiency). This information helps inform group membership, which is used in estimation.

As part of most NAEP assessments, four types of questionnaires are used to collect background information: student questionnaires, teacher questionnaires, school questionnaires, and SD/ELL (students with disabilities/English language learners) questionnaires.

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NAEP student questionnaires collect background information on students' demographic characteristics, classroom experiences, and educational support. They are completed by students during the NAEP assessment administration. Students complete the questionnaires voluntarily and their responses are kept confidential. Student names are never reported with their responses or with the other information collected by NAEP.

Teacher questionnaires gather background information on teacher training and instructional practices. They are completed by teachers at grades 4 and 8. NAEP typically does not collect teacher information for grade 12.

School questionnaires gather background information on school policies and characteristics. They are completed by the principal or assistant principal at each school.

SD/ELL (students with disabilities or English language learners) questionnaires collect background information about students selected in the sample who have disabilities or limited English proficiency. These questionnaires are completed by special education teachers, bilingual education/ESL teachers, or staff members who are most familiar with each sampled student.

Several student, teacher, school, and SD/ELL questionnaires are available for review on the 'Questionnaires for Students, Teachers, and Schools' webpage, which can be accessed by clicking the corresponding underlined screen text.

The current background information framework can be accessed by clicking the corresponding underlined screen text.

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A Student Background Questionnaire specific to each assessment and grade is administered as part of the NAEP assessment. A core set of background questions are given to all students across all of the assessments. Background questions provide context for reporting NAEP results. They address specific behaviors, not personal conclusions, attitudes, or beliefs. Background questions are designed to be non-intrusive and free from bias, secular, neutral, and non-ideological. All NAEP background questions follow multiple-choice format.

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Here are a few examples of core and subject-specific background questions. Students in grade 4 were asked, “Does your family get a newspaper at least four times a week?” and “About how many pages a day do you have to read in school and for homework?” as part of the core. Two subject-specific questions grade 4 students were asked as part of the reading assessment included, “How often do you read for fun on your own time?” and “So far this year, how many times have you written a book report?”

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This module provided information about the data collected through the National Assessment of Educational Progress (NAEP). It described the assessment design and administration procedures. It also described the Long-Term Trend and Main NAEP assessments, as well as the background questionnaires for students, teachers, and schools.

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Important resources that have been provided throughout the module are summarized in this slide for your reference. You may now proceed to the next module in the series, or click the **Exit** button to return to the landing page.