New England Common Assessment Program

Science
2008–2009
Technical Report

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Measured Progress

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Chapter 1. OVERVIEW

1.1 Purpose of the New England Common Assessment Program

The New England Common Assessment Program (NECAP) is the result of collaboration among New Hampshire, Rhode Island, and Vermont to build a set of tests for grades 3 through 8 and 11 to meet the requirements of the No Child Left Behind Act (NCLB). The specific purposes of the NECAP Science tests are (1) to provide data on student achievement in science at grades 4, 8, and 11 to meet NCLB requirements; (2) to provide information to support program evaluation and improvement; and (3) to provide information to parents and the public on the performance of students and schools. The tests are constructed to meet rigorous technical criteria, to include universal design elements and accommodations so that students can access test content, and to gather reliable student demographic information for accurate reporting. School improvement is supported by

- providing a transparent test design through the NECAP Science Assessment Targets, distributions of emphasis, and practice tests;
- reporting results by science domain, released items, and subgroups; and
- hosting test interpretation workshops to foster understanding of results.

Student level results are provided to schools and families to be used as one piece among all collected evidence about progress and learning that occurred on the assessment targets for the respective grade span (K–4, 5–8, 9–11). The results are a status report of a student's performance against the assessment targets, and they should be used cautiously in concert with local data.

1.2 Purpose of This Report

The purpose of this report is to document the technical aspects of the 2008–09 NECAP Science tests. Students in grades 4, 8, and 11 participated in the second operational administration of NECAP Science in May 2009. This report provides evidence on the technical quality of those tests, including descriptions of the processes used to develop, administer, and score the tests and of those used to analyze the results. This report is intended to serve as a guide for replicating and/or improving the procedures in subsequent years.

Though some parts of this technical report may be used by educated laypeople, it is intended for experts in psychometrics and educational research. The report assumes a working knowledge of measurement concepts such as *reliability* and *validity* and statistical concepts such as *correlation* and *central tendency*. In some chapters, the reader is presumed also to have basic familiarity with advanced topics in measurement and statistics.

1.3 Organization of This Report

The organization of this report is based on the conceptual flow of a test's life span. The report begins with the initial test specifications and addresses all intermediate steps that lead to final score reporting. Chapters 1 through 4 give a description of NECAP Science by covering the test design and development process, the administration of the tests, and scoring. Chapters 5 through 7 provide statistical and psychometric information, including chapters on scaling and equating, item analysis, and reliability. Chapter 8 is devoted to NECAP Science score reporting and Chapter 9 is devoted to discussions on validity. Finally, the references cited throughout the report are provided, followed by the report appendices.

Chapter 2. TEST DESIGN AND DEVELOPMENT

2.1 Test Design and Blueprints

2.1.1 Overview of Test Design

The 2008–09 NECAP Science test consisted of four forms per grade. Each form included common items, equating items, and embedded field test items. Common items are items that appear on every form of the test and are used to determine a student's test score. Each equating item appears on one form only, and because these items have been on previous tests, they are used by psychometricians to keep the test scores on the same scale from year to year. This design provides reliable and valid results at the student level (the common items) and breadth of science coverage for school results (the common plus equating items) while minimizing testing time.

The NECAP Science test includes an embedded field test. Because the field test is taken by all students, it provides the sample needed to produce reliable data with which to inform the process of selecting items for future tests. Each embedded field test item appears on one form only. The field test items are distributed equally among the forms. Embedding field test items into the operational test ensures that students take the items seriously, since the students do not know which items count for their test score and which items are being field tested. The embedded field test yields a pool of replacement items, which are needed due to the release of approximately 25% of the common items every year.

Each form of the test has three sessions. Physical Science, Earth Space Science, and Life Science are assessed in Sessions 1 and 2 of the test by standalone items. The equating and field test items are distributed among the common items in a way that is not evident to test takers. Scientific Inquiry is assessed in Session 3 by an inquiry task. Session 3 contains only common items, as the inquiry task goes through a separate (not embedded) field test.

2.1.2 Item Types

Since the beginning of the program, the goal of NECAP has been to measure what students know and are able to do by using a variety of test item types. The item types used and the functions of each are described below.

- **Multiple-choice** items were administered to provide breadth of coverage of the assessment targets. Because they require approximately one minute for most students to answer, these items make efficient use of limited testing time and allow coverage of a wide range of knowledge and skills. Multiple-choice items were administered in Sessions 1 and 2 of the test in the Physical Science, Earth Space Science, and Life Science domains.
- **Short-answer** items were administered in the inquiry task (Session 3) to assess students' skills and their abilities to work with brief, well structured problems that had one solution or a very

limited number of solutions. Short-answer items require approximately two to five minutes for most students to answer. The advantage of this item type is that it requires students to demonstrate knowledge and skills by generating, rather than merely selecting, an answer.

- **Constructed-response** items typically require students to use higher order thinking skills—evaluation, analysis, and summarization—in constructing a satisfactory response. Constructed-response items should take most students approximately 5 to 10 minutes to complete. Four-point constructed-response items were administered in Sessions 1 and 2 of the test in the Physical Science, Earth Space Science, and Life Science domains. Three-point constructed-response items were administered in the Session 3 inquiry task.

2.1.3 Science Test Design

Table 2-1 summarizes the numbers and types of items that were used in the NECAP Science assessment for 2008–09. In Sessions 1 and 2, each multiple-choice item was worth 1 point, and each constructed-response item was worth 4 points. In Session 3, each short-answer item was worth 2 points, and each constructed-response item was worth 3 points.

Table 2-1. 2008–09 NECAP Science: Numbers of Items per Item Type

	MC 1 pt	*SA 2 pt*	*CR 3 pt*	*CR 4 pt*
Common	33	6	2	3
Equating	36			6
Embedded field test	36			6
Total per form	51	6	2	6

MC = multiple-choice; SA = short-answer; CR = constructed-response

2.1.4 Science Blueprint

As indicated earlier, the assessment framework for science was based on the NECAP Science Assessment Targets, and all items on the test were designed to measure a specific assessment target. NECAP Science items can be broken down into the following science domains: Physical Science, Earth Space Science, Life Science, and Scientific Inquiry.

The distribution of emphasis for science is shown in Table 2-2.

Table 2-2. 2008–09 NECAP Science: Distribution of Common Items Across Domains

Domain	*MC 1 pt*	*SA 2 pt*	*CR 3 pt*	*CR 4 pt*
Physical Science	11			1
Earth Space Science	11			1
Life Science	11			1
Scientific Inquiry		6	2	
Total	33	6	2	3

MC = multiple-choice; SA = short-answer; CR = constructed-response

Table 2-3 displays the total raw score points that students could earn.

Table 2-3. 2008–09 NECAP Science: Total Raw Score Points

Domain	*Points*	*Emphasis*
Physical Science	15	24%
Earth Space Science	15	24%
Life Science	15	24%
Scientific Inquiry	18	28%
Total	63	100%

Table 2-4 lists the percentage of total score points assigned to each depth of knowledge (DOK) level.

Table 2-4. 2008–09 NECAP Science: DOK Percentages

	Grade 4	*Grade 8*	*Grade 11*
DOK 1	19%	14%	22%
DOK 2	70%	70%	68%
DOK 3	11%	16%	10%

2.1.5 Calculator Use

Science specialists from the New Hampshire, Rhode Island, and Vermont Departments of Education acknowledge that the use of calculators is a necessary and important skill. Calculators can save time and allow students to solve more sophisticated and intricate problems by reducing errors in calculations. For these reasons, it was decided that calculators should be permitted in all three sessions of the NECAP Science assessment. The state science specialists chose to prohibit scientific and graphing calculators in Session 3 because the inquiry task includes a graphing item.

2.1.6 Test Sessions

The NECAP Science tests were administered to grades 4, 8, and 11 from May 11 to 28, 2009. Schools were able to schedule testing sessions at any time during the three week period, provided they followed the sequence in the scheduling guidelines detailed in test administration manuals and that all testing classes within a school were on the same schedule. Schools were asked to provide makeup testing sessions for students who were absent from initial testing sessions.

The timing and scheduling guidelines for the NECAP tests were based on estimates of the time it would take an average student to respond to each type of item making up the test:

- Multiple-choice—1 minute
- Short-answer (2 point)—2 minutes
- Constructed-response—10 minutes

Table 2-5 shows the distribution of items across the test sessions for all three grades.

Table 2-5. 2008–09 NECAP Science: Number of Items per Session

Item type	*Session 1*	*Session 2*	*Session 3*
MC	25	26	0
SA2	0	0	6
CR3	0	0	2
CR4	3	3	0

MC = multiple-choice; SA = short-answer; CR = constructed-response; number beside item type indicates point value

Though the guidelines for scheduling are based on the assumption that most students will complete the test within the time estimated, each test session was scheduled so that additional time was provided for students who needed it. For Sessions 1 and 2, up to 100% additional time was allocated for each session (e.g., a 45 minute session could have up to an additional 45 minutes). For Session 3, additional time was allocated, though times varied by grade. For grade 4, the test session was designed to be completed in 75 minutes, but students were allowed extra time, if needed, in each part of the session; therefore, administrators were asked to schedule 120 minutes for Session 3. This decision was made because Session 3 at grade 4 included a hands-on experiment. For grades 8 and 11, Session 3 had a time limit of 60 minutes, which included additional allocated time because, based on field test data, most students were expected to complete the session in 45 to 50 minutes.

If classroom space was not available for students who required additional time to complete the tests, schools were allowed to consider using another space for this purpose. Detailed instructions on test administration and scheduling were provided in the *NECAP Test Administrator* and *Principal/Test Coordinator Manuals*.

2.2 Operational Development Process

2.2.1 Assessment Targets

NECAP Science items are directly aligned to the assessment targets and statements of enduring knowledge for each science domain, as described in the NECAP Science Assessment Targets. The assessment targets and statements of enduring knowledge were used by content specialists to help guide the development of test items. Each item addresses one assessment target. The NECAP Science Assessment Targets fall into four domains: Physical Science, Earth Space Science, Life Science, and Scientific Inquiry.

2.2.2 Inquiry Tasks

The assessment targets for the Scientific Inquiry domain are known as *inquiry constructs*. The 13 inquiry constructs are spread across four broad areas of inquiry: formulating questions and hypothesizing; planning and critiquing investigations; conducting investigations; and developing and evaluating

explanations. The state science specialists from the departments of education developed a document to aid inquiry task development, *Guidelines for the Development of Science Inquiry Tasks*, which is Appendix A of this report.

The state departments of education wanted Scientific Inquiry on the NECAP science test so that students could conduct an experiment, analyze data, and draw conclusions based on that data, all of which require scientific thinking skills. The Partnership for the Assessment of Standards-Based Science (PASS at WestEd) was contracted to work with the state science specialists and Measured Progress to develop the inquiry tasks.

For the 2008–09 operational tests, PASS at WestEd developed three inquiry tasks at grade 4, two inquiry tasks at grade 8, and three inquiry tasks at grade 11. The original plan was to put two fully developed tasks per grade through the external item review process by collecting feedback from the item review committees and then field testing all the inquiry tasks in non-NECAP states. However, in 2007 PASS at WestEd worked with the state science specialists to develop and field test one inquiry task at grade 4, two inquiry tasks at grade 8, and one inquiry task at grade 11. Therefore, in 2008–09 PASS at WestEd developed and field tested an additional inquiry task at grades 4 and 11 to fulfill contractual requirements. PASS at WestEd conducted the field testing of the eight inquiry tasks in the fall of 2008 in classrooms throughout northern California and a high school in Maine. The selected schools had varying demographics and population sizes, and each of the eight inquiry tasks was administered to approximately 100 students. PASS at WestEd submitted its *Inquiry Task Field Test Report* to the state science specialists and Measured Progress in December 2008. Based on their review of the *Inquiry Task Field Test Report*, the state science specialists selected one inquiry task at each grade for the May 2009 operational test, and the other inquiry tasks were banked for use on future NECAP Science tests.

The *Inquiry Task Field Test Report* is not included as an appendix due to space limitations, but it can be obtained from any of the three NECAP states as a standalone document.

2.2.3 Item Reviews by Measured Progress

Measured Progress conducted two reviews of the multiple-choice and constructed-response items as well as a review of the inquiry tasks. These reviews, performed by science test developers, focused on three major areas.

- Item alignment to the assessment target: The reviewers considered whether the item measured the content as outlined in the assessment target and whether the content was grade appropriate. The reviewers also checked the DOK level of the item.
- Correctness of science content: The reviewers considered whether the information in the item was scientifically correct. For multiple-choice items, the keyed answer had to be the only correct answer. For constructed-response items, the scoring guide had to reflect correct science content and grade level appropriate responses.
- Universal design: The reviewers considered item structure, clarity, possible ambiguity, and the appropriateness and relevance of graphics. For constructed-response items, the reviewers

considered whether the item adequately prompted an examinee to give a response similar to the one in the scoring guide.

2.2.4 Item Reviews by the States

The state science specialists reviewed the items. Measured Progress revised the items based on edits requested by the specialists.

Item review committees (IRCs), composed of state teachers and curriculum supervisors, were formed in order to conduct another evaluation of the items. A list of the 2008–09 NECAP IRC participants for science in grades 4, 8, and 11 and their affiliations is included as Appendix B. The IRCs met in Providence, Rhode Island, in August 2008. Their primary role was to evaluate and provide feedback on potential field test items. For each grade level, the committee members reviewed potential multiple-choice and constructed-response field test items as well as potential inquiry tasks. During the meeting, committee members were asked to evaluate the items for the following criteria:

- Assessment target alignment
  - Is the test item aligned to the identified assessment target?
- Depth of knowledge
  - Are the items coded to the appropriate DOK level?
- Scientific correctness
  - Are the items and distracters correct with respect to content and grade level appropriateness?
  - Are the scoring guides consistent with the item and do they provide grade level appropriate responses?
- Universal design
  - Is the item language clear and grade appropriate?
  - Is the item language accurate (syntax, grammar, conventions)?
  - Is there an appropriate use of simplified language (is language that interferes with the assessment target avoided)?
  - Are charts, tables, and diagrams easy to read and understandable?
  - Are charts, tables, and diagrams necessary to the item?
  - Are instructions easy to follow?
  - Is the item amenable to accommodations—read aloud, signed, or Braille?

2.2.5 Bias and Sensitivity Review

Bias review is an essential component of the development process. During the bias review process, NECAP Science items were reviewed by a committee of general education teachers, English language learner (ELL) specialists, special education teachers, and other educators and members of major constituency groups who represent the interests of legally protected and/or educationally disadvantaged groups. A list of bias and sensitivity review committee participants and affiliations is included in Appendix B. Items were examined for issues that might offend or dismay students, teachers, or parents. Including such groups in the development of

assessment items and materials can avoid many unduly controversial issues, and unfounded concerns can be allayed before the test forms are produced.

2.2.6 Reviewing and Refining

After the IRC and bias and sensitivity review committee meetings, Measured Progress and the state science specialists met to review the committees' feedback. The specialists decided what edits should be made to the items.

2.2.7 Item Editing

Measured Progress editors then reviewed and edited the items to ensure uniform style (based on *The Chicago Manual of Style,* 15th edition) and adherence to sound testing principles. These principles included the stipulation that items were

- correct with regard to grammar, punctuation, usage, and spelling;
- written in a clear, concise style;
- written at a reading level that allows the student to demonstrate his or her knowledge of science, regardless of reading ability;
- written in a way that did not cue the correct answer (for multiple-choice options); and
- free of potentially sensitive content.

2.2.8 Item Selection and Test Assembly

In preparation for the face to face meeting with the state science specialists for item selection, test developers and psychometricians at Measured Progress considered the following when selecting sets of items to propose for the common (including items for release) and the embedded field tests:

- **Content coverage/match to test design**. The test design stipulates a specific number of multiple-choice and constructed-response items from each content area. Item selection for the embedded field test was based on the number of items in the existing pool of items eligible for the common.
- **Item difficulty and complexity**. Item statistics drawn from the data analysis of previously tested items were used to ensure similar levels of difficulty and complexity from year to year as well as quality psychometric characteristics.
- **"Cueing" items**. Items were reviewed for any information that might "cue," or provide information that would help to answer, another item.

At the face to face meeting, the state specialists reviewed the proposed sets of items and made the final selection of items for the common, including which items would be released after the test was

administered. The state specialists also made the final selection of items for the embedded field test and approved the final wording of these items.

During assembly of the test forms, the following criteria were considered:

- **Option balance**. Items were balanced among the forms so that each form contained a fairly equal distribution of keys (correct answers).
- **Key patterns**. The sequence of keys was reviewed to ensure that their order appeared random.
- **Page fit**. Item placement was modified to ensure the best fit and arrangement of items on any given page.
- **Facing page issues**. For multiple items associated with a single stimulus (inquiry task) and multiple-choice items with large graphics, consideration was given to whether those items needed to begin on a left or right hand page and to the nature and amount of material that needed to be placed on facing pages. These considerations serve to minimize the amount of page flipping required of students.
- **Relationship between forms**. Although equating and field test items differ across forms, these items must take up the same number of pages in each form so that sessions begin on the same page in every form. Therefore, the number of pages needed for the longest form often determines the layout of each form.
- **Visual appeal**. The visual accessibility of each page of the form was always taken into consideration, including such aspects as the amount of white space, the density of the text, and the number of graphics.

2.2.9 Review of Operational Test Forms

After the forms were laid out as they would appear in the final test booklets, they were again thoroughly reviewed by Measured Progress editors and test developers to ensure that the items appeared exactly as the state science specialists had requested. Finally, all the forms were reviewed by the state science specialists for their final approval.

2.2.10 Braille and Large-Print Translation

Common items for grades 4, 8, and 11 were translated into Braille by a subcontractor that specializes in test materials for students who are blind or visually impaired. In addition, Form 1 for each grade was also adapted into a large-print version.

2.2.11 Released Items

Approximately 25% of the common NECAP items in Sessions 1 and 2, as well as the entire inquiry task at each grade, were released to the public in September, 2009. The released NECAP items are posted on a Web site hosted by Measured Progress and on the state departments of education Web sites. Schools are encouraged to incorporate the use of released items in their instructional activities so that students will be familiar with them.

Chapter 3. TEST ADMINISTRATION

3.1 Responsibility for Administration

The *2008–09 NECAP Science Principal/Test Coordinator Manual* indicated that principals and/or their designated NECAP test coordinators were responsible for the proper administration of NECAP Science. The *Test Administrator Manual*, which contained explicit directions and read-aloud scripts, was used in order to ensure the uniformity of administration procedures from school to school.

3.2 Administration Procedures

Principals and/or their schools' designated NECAP coordinators were instructed to read the *Principal/Test Coordinator Manual* before testing and to be familiar with the instructions provided in the *Test Administrator Manual*. The *Principal/Test Coordinator Manual* provided each school with checklists to help them to prepare for testing. The checklists outlined tasks to be performed by school staff before, during, and after test administration. Besides these checklists, the *Principal/Test Coordinator Manual* described the testing material being sent to each school and how to inventory the material, track it during administration, and return it after testing was complete. The *Test Administrator Manual* included checklists for the administrators to ready themselves, their classrooms, and the students for the administration of the test. It also contained sections detailing the procedures to be followed for each test session and instructions for preparing the material before its return to Measured Progress.

3.3 Participation Requirements and Documentation

The intent of NCLB legislation is for *all* students in grades 4, 8, and 11 to participate in the NECAP Science test through standard administration, administration with accommodations, or alternate assessment. Furthermore, any student who is absent during any session of the NECAP Science test is expected to make up the missed sessions within the three week testing window.

Schools were required to return a student answer booklet for every enrolled student in the grade level. On those occasions when it was deemed impossible to test a particular student, school personnel were required to inform their state department of education. The states included a grid on the student answer booklets that listed the approved reasons why a student answer booklet could be returned blank for one or more sessions of the science test.

- Student withdrew from school after May 11, 2009
  - If a student withdrew after May 11, 2009, but before completing all of the test sessions, school personnel were instructed to code this reason on the student's answer booklet.

- Student enrolled in school after May 11, 2009
  - If a student enrolled after May 11, 2009, and was unable to complete all of the test sessions before the end of the testing administration window, school personnel were instructed to code this reason on the student's answer booklet.

- State approved special consideration
  - Each state department of education had a process for documenting and approving circumstances that made it impossible or not advisable for a student to participate in testing. Schools were required to obtain state approval before beginning testing.

- Student was enrolled on May 11, 2009, and did not complete test for reasons other than those listed above
  - If a student was not tested for a different reason, school personnel were instructed to code this reason on the student's answer booklet. These "other" categories were considered not state approved.

Table 3-1 lists the science participation rates of the three states combined.

Table 3-1. 2008–09 NECAP Science: Participation Rates

Category	*Description*	*Enrollment*	*Not tested state approved*	*Not tested other*	*Number tested*	*% Tested*
All students		98,897	860	1,226	96,811	98
Gender	Male	50,786	551	715	49,520	98
	Female	48,098	309	511	47,278	98
	Not reported	13	0	0	13	100
Ethnicity	American Indian or Alaskan Native	422	8	14	400	95
	Asian	2,294	13	35	2,246	98
	Black or African American	4,035	53	84	3,898	97
	Hispanic or Latino	7,086	80	164	6,842	97
	Native Hawaiian or Pacific Islander	46	0	0	46	100
	White (non-Hispanic)	84,619	699	917	83,003	98
	No primary race/ethnicity reported	395	7	12	376	95
LEP	Currently receiving LEP services	2,211	12	50	2,149	97
	Former LEP student—monitoring year 1	284	0	1	283	100
	Former LEP student—monitoring year 2	341	2	2	337	99
	All other students	96,061	846	1,173	94,042	98
IEP	Students with an IEP	15,424	734	438	14,252	92
	All other students	83,473	126	788	82,559	99
SES	Economically disadvantaged students	27,574	341	537	26,696	97
	All other students	71,323	519	689	70,115	98
Migrant	Migrant students	18	0	0	18	100
	All other students	98,879	860	1,226	96,793	98
Title 1	Students receiving Title 1 services	9,240	93	157	8,990	97
	All other students	89,657	767	1,069	87,821	98
Plan 504	Plan 504	971	7	6	958	99
	All other students	97,926	853	1,220	95,853	98

3.4 Administrator Training

In addition to distributing the *Principal/Test Coordinator* and *Test Administrator Manual*s, the New Hampshire, Rhode Island, and Vermont Departments of Education, along with Measured Progress, conducted test administration workshops in multiple locations in each state to inform school personnel about the NECAP Science test and to provide training on the policies and procedures regarding administration.

3.5 Documentation of Accommodations

Though every effort was made to provide a test that would be as accessible as possible, a need still remained to allow some students to take the test with accommodations. An operating principle employed during the development of the accommodations protocols and policy development was to allow only accommodations that would not change the construct of what was being measured by the item.

The *Principal/Test Coordinator* and *Test Administrator Manuals* provided directions for coding the information related to accommodations and modifications on page 2 of the student answer booklet. All accommodations used during any test session were required to be coded by authorized school personnel—not students—after testing was completed.

The training guide *Accommodations, Guidelines, and Procedures* also provides detailed information on planning and implementing accommodations. This guide can be located on each state's department of education Web site. The states collectively made the decision that accommodations be made available to all students based on individual need, regardless of disability status. Decisions regarding accommodations were to be made by the students' educational teams on an individual basis and were to be consistent with those used during the students' regular classroom instruction. Making accommodations decisions on an entire group basis rather than on an individual basis was not permitted. If the decision made by a student's educational team required an accommodation not listed in the state approved Table of Standard Test Accommodations, schools were instructed to contact their department of education in advance of testing for specific instructions for coding the "Other Accommodations (E)" and/or "Modifications (F)" sections.

Table 3-2 shows the accommodations observed for the May 2009 NECAP Science administration. The accommodation codes are defined in the Table of Standard Test Accommodations, found in Appendix C. The appropriateness and impact of accommodations are discussed in Appendix D.

Table 3-2. 2008–09 NECAP Science: Accommodation Frequencies

Accommodation	*Grade 4*	*Grade 8*	*Grade 11*	*Accommodation*	*Grade 4*	*Grade 8*	*Grade 11*
A01	800	394	304	C12	44	94	34
A02	4,077	3,393	2,483	C13	0	0	0
A03	1,339	507	362	D01	37	111	59
A04	225	203	59	D02	68	36	17
A05	24	5	1	D03	3	3	3
A06	11	11	2	D04	155	32	31
A07	1,395	1,246	1,002	D05	1,297	216	68
A08	1,302	465	295	D06	55	11	5
A09	9	3	193	D07	1	0	524
B01	214	131	43	E01	0	4	3
B02	2,166	1,317	539	E02	0	0	0
B03	2,713	1,739b	1,001	F01	16	42	79
C01	4	0	6	F02	0	0	0
C02	38	25	11	F03	0	2	1
C03	19	14	12	N01	0	0	437
C04	3,693	1,402	567	N02	0	0	653
C05	483	74	10	N03	0	0	70
C06	53	26	44	N04	0	0	277
C07	555	272	86	N05	0	0	132
C08	13	4	0	N06	0	0	79
C09	124	12	7	N07	0	0	100
C10	4	1	0	N08	0	0	237
C11	34	17	2				

3.6 Test Security

Maintaining test security is critical to the success of NECAP and the continued partnership among the three states. The *Principal/Test Coordinator* and *Test Administrator Manuals* explain in detail all test security measures and test administration procedures. School personnel were informed that any concerns about breaches in test security were to be reported to the test coordinator and principal immediately. The test coordinator and/or principal were responsible for immediately reporting the concern to the district superintendent and the state director of testing at the department of education. Test security was strongly emphasized at the test administration workshops conducted in all three states. The states required the principal of each school that participated in testing to log on to a secure Web site to complete the Principal's Certification of Proper Test Administration form for each grade level tested. The principal was required to provide the number of secure tests received from Measured Progress, the number of tests administered to students, and the number of secure test materials being returned to Measured Progress. The principal was then required to enter his or her name in the online form as an electronic signature. By signing the form, the principal was certifying that the tests were administered according to the procedures outlined in the *Principal/Test Coordinator* and *Test Administrator Manuals*, that he or she maintained the security of the test materials, that no secure material was duplicated or in any way retained in the school, and that all test materials had been accounted for and scheduled for return to Measured Progress.

3.7 Test and Administration Irregularities

Several irregularities in the test forms and ancillary materials necessitated changes in scoring procedures. At grade 4, the Session 3 test items did not appear in the Braille version of the test. The 18 raw score points in Session 3 were removed from scaling and scoring calculations for the two grade 4 students who took the test with a Braille version.

The grade 11 Braille reference sheets were mislabeled by the vendor as grade 8, and the grade 8 Braille reference sheets were mislabeled by the vendor as grade 11. Four grade 11 students took the test with a Braille test booklet and reference sheet. There were five grade 11 common items that asked the student to use the reference sheet to answer the item. These five items (composing 8 raw score points) were removed from scaling and scoring calculations for the four affected students. No grade 8 students took the test with a Braille version.

At grade 11, Session 3 contained a data table with incorrect data. In one of the Session 3 test items, students were asked to graph the data from that data table. It was determined that the incorrect data in the table did not affect students' ability to construct an appropriate graph and earn full credit on the item. This 3 point item was scored with a modified rubric so that students who either identified the error in the data table or worked around it would still receive full credit for identifying the trend in the data the item was attempting to elicit.

3.8 Test Administration Window

The test administration window was May 11 to 28, 2009.

3.9 NECAP Service Center

To provide additional support to schools before, during, and after testing, Measured Progress established the NECAP Service Center. The additional support that the service center provided was an essential element to the successful administration of any statewide test program. Individuals in the field could call the centralized location using a toll free number and ask questions or report any problems they were experiencing.

The service center was staffed based on call volume and was available from 8:00 a.m. to 4:00 p.m. beginning two weeks before the start of testing and ending two weeks after testing. The representatives were responsible for receiving, responding to, and tracking calls and then routing issues to the appropriate person(s) for resolution.

Chapter 4. SCORING

Upon receipt of used NECAP Science answer booklets following testing, Measured Progress scanned all student responses, along with student identification and demographic information. Imaged data for multiple-choice items were machine scored. Images of constructed-response items were processed and organized by iScore, a secure server-to-server electronic scoring software designed by Measured Progress, for hand scoring.

Student responses that could not be physically scanned (e.g., answer documents damaged during shipping) were physically reviewed and scored on an individual basis by trained, qualified readers. These scores were linked to the student's demographic data and merged with the student's scoring file by Measured Progress's data processing department.

4.1 Machine Scored Items

Multiple-choice responses were compared to scoring keys using item analysis software. Correct answers were assigned a score of 1 point; incorrect answers were assigned a score of 0 points. Student responses with multiple marks or blank responses were also assigned 0 points.

The hardware elements of the scanners monitored themselves continuously for correct read, and the software driving these scanners monitored the correct data reads. Standard checks included recognition of a sheet that did not belong, was upside down, or was backward; identification of missing critical data, including a student ID number or test form that was out of range or missing; and identification of page/document sequence errors. When a problem was detected, the scanner stopped and displayed an error message directing the operator to investigate and correct the situation.

4.2 Hand Scored Items

The images of student responses to constructed-response items were hand scored through the iScore system. Using iScore minimized the need for readers to physically handle actual answer booklets and related scoring materials. Student confidentiality was easily maintained, as all NECAP Science scoring was "blind" (i.e., district, school, and student names were not visible to readers). The iScore system maintained the link between the student response images and their associated test booklet numbers.

Through iScore, qualified readers accessed electronically scanned images of student responses at computer terminals. The readers evaluated each response and recorded each student's score via keypad or mouse entry through the iScore system. When a reader finished one response, the next response immediately appeared on the computer screen.

Imaged responses from all answer booklets were sorted into item specific groups for scoring purposes. Readers reviewed responses from only one item at a time; however, when necessary, imaged

responses from a student's entire booklet were available for viewing, and the physical booklet was also available to the onsite chief reader.

The use of iScore also helped ensure that access to student response images was limited to only those who were scoring or who were working for Measured Progress in a scoring management capacity.

4.3 Inquiry Task Scoring

Of special interest during this cycle of scoring 2008–09 NECAP Science was implementing the scoring requirements associated with inquiry task items. These items were unique in that students conducted a single scientific experiment and then answered approximately eight questions about that experiment. The questions were designed to stand alone, meaning that each one could be scored separately instead of as part of a set of eight combined questions. This maximized the number of readers that could be assigned to score responses for each student.

4.4 Scoring Location and Staff

Scoring Location

The iScore database, its operation, and its administrative controls are all based in Dover, New Hampshire; in addition, all 2008–09 NECAP Science responses were scored in Dover.

The iScore system monitored accuracy, reliability, and consistency across the scoring site. Constant daily communication and coordination were accomplished through e-mail, telephone, and secure Web sites, to ensure that critical information and scoring modifications were shared and implemented throughout the scoring site.

Staff Positions

The following staff members were involved with scoring the 2008–09 NECAP Science responses:

- The NECAP Science scoring project manager, an employee of Measured Progress based in Dover, New Hampshire, oversaw the communication and coordination of scoring constructed-response items.
- The iScore operational manager and iScore administrators, employees of Measured Progress based in Dover, New Hampshire, coordinated technical communication pertaining to the scoring of constructed-response items.
- A chief reader in science ensured the consistency of scoring across the scoring site for all grades tested. The chief reader, an employee of Measured Progress, also provided read behind activities for quality assurance coordinators.
- Numerous quality assurance coordinators (QACs), selected from a pool of experienced senior readers for their ability to score accurately and their ability to instruct and train readers,

participated in benchmarking activities for each grade. QACs provided read behind activities for senior readers. The ratio of QACs and senior readers to readers was approximately 1 to 11.

- Numerous senior readers (SRs), selected from a pool of skilled and experienced readers, provided read behind activities for the readers at their scoring tables (2 to 12 readers at each table).
- Readers at the scoring site scored the 2008–09 NECAP Science operational and field test student responses.

4.4.1 Reader Recruitment and Qualifications

For scoring of the 2008–09 NECAP Science test, Measured Progress actively sought a diverse scoring pool that was representative of the population of the three participating NECAP states. The broad range of readers included scientists, editors, business professionals, authors, teachers, graduate school students, and retired educators. Demographic information for readers (e.g., gender, race, educational background) was electronically captured and reported.

Although a four year college degree or higher was preferred for all readers, readers of the responses of grade 4, 8, and 11 students were required to have successfully completed at least two years of college and to have demonstrated knowledge of science. This permitted the recruitment of readers who were currently enrolled in a college program, a sector of the population that had relatively recent exposure to classroom practices and current trends in their field of study. In all cases, potential readers submitted documentation (e.g., resume and/or transcripts) of their qualifications.

Table 4-1 summarizes the qualifications of the 2008–09 NECAP Science scoring leadership (QACs and SRs) and readers.

Table 4-1. 2008–09 NECAP Science: Qualifications of Scoring Leadership and Readers

Scoring responsibility	*Spring 2009 Administration educational credentials*				*Total*
	Doctorate	*Master's*	*Bachelor's*	*Other*	
Scoring leadership	4.8%	38.1%	57.1%	0.0%	100.0%
Readers	4.4%	25.0%	52.9%	17.6%*	100.0%

*Indicates the 3 readers with associate's degrees and the 17 readers with at least 48 college credits

Readers were either temporary Measured Progress employees or were secured through the services of one or more temporary employment agencies. All readers signed a nondisclosure/confidentiality agreement.

4.4.2 Reader Training

Reader training began with an introduction of onsite scoring staff and an overview of the NECAP Science program's purpose and goals, including a discussion about the security, confidentiality, and proprietary nature of testing, scoring materials, and procedures.

Next, readers thoroughly reviewed and discussed the scoring guide for the item to be scored. Each item specific scoring guide included the item itself and score point descriptions.

Following review of the item specific scoring guide for any constructed-response item, readers began reviewing or scoring response sets organized for specific training purposes:

- Anchor set
- Training set
- Qualifying set

During training, readers were able to highlight or mark hard copies of the anchor and training sets, even if all or part of the sets was also presented online via computer.

4.4.2.1 Anchor Set

Readers first reviewed an anchor set of exemplary responses, approved by the state science specialists representing the three participating departments of education, for the item to be scored. Responses in anchor sets were typical, rather than unusual or uncommon; solid, rather than controversial or borderline; and true, meaning that they had scores that could not be changed by anyone other than the NECAP client and Measured Progress test development staff.

For constructed-response items, each item specific anchor set contained, for each respective score point, a client approved sample response that was to be considered a midrange example of its respective score point. When necessary, a second sample response was included to illustrate an alternate way to achieve that score point.

Responses were read aloud to the room of readers and presented in descending score order. Trainers then announced the true score of each anchor response and facilitated a group discussion of the response in relation to the score point descriptions to allow readers to internalize typical characteristics of each score point.

This anchor set served as a reference for readers as they continued with calibration, scoring, and recalibration activities for that item.

4.4.2.2 Training Set

Next, readers practiced applying the scoring guide and anchors to responses in the training set. The training set typically included 10 to 15 student responses designed to help establish the score point range and the range of responses within each score point. The training set often represented unusual responses that were less clear or solid (e.g., were shorter than normal, employed atypical approaches, contained both very low and very high attributes, or included difficult handwriting). Responses in the training set were presented in randomized score point order.

After readers had independently read and scored a training set response, trainers polled readers or used online training system reports to record the initial range of scores. Then they led a group discussion of one or two responses, directing reader attention to scoring issues that were particularly relevant to the specific

scoring group, such as the line between two score points. Trainers modeled for readers how to discuss scores by referring to the anchor set and scoring guides.

4.4.2.3 Qualifying Set

After the training set had been completed, readers were required to measurably demonstrate their ability to accurately and reliably score all items, according to the appropriate anchor set in concert with its scoring rubric, by scoring the qualifying set. The qualifying set consisted of 10 responses selected from an array of responses that clearly illustrated the range of score points for that item. The set was chosen in accordance with the responses reviewed and approved by the state specialists.

To be eligible to score operational 2008–09 NECAP Science responses, readers were required to demonstrate scoring accuracy rates of at least 80% exact agreement and at least 90% exact or adjacent agreement across all items. In other words, exact scores were required on at least eight of the qualifying set responses and either exact or adjacent scores were required on at least nine. Readers were allowed one discrepant score as long as they had at least eight exact scores.

4.4.2.4 Retraining

Readers who did not pass the first qualifying set were retrained as a group by reviewing their performance with scoring leadership and then scored a second qualifying set of responses. If they achieved a minimum scoring accuracy rate of 80% exact and 90% exact or adjacent agreement on this second set, they were allowed to score operational responses.

If readers did not achieve the required scoring accuracy rates on the second qualifying set, they were not allowed to score responses for that item. Instead, they were either trained on a different item or dismissed from scoring.

4.4.3 QAC and SR Training

QACs and select SRs were trained in a separate training session that occurred immediately prior to reader training. In addition to discussing the items and their responses, QAC and SR training included emphasis on the states' rationale behind the score points. This rationale was discussed in greater detail with QACs and SRs then with regular readers to better equip leadership to handle questions from the readers.

4.4.4 Benchmarking Meetings

In preparation for implementing NECAP Science guidelines for the scoring of field test responses, Measured Progress scoring staff prepared and facilitated benchmarking meetings held with the NECAP state science specialists. The purpose of the meetings was to establish item specific guidelines for scoring each NECAP Science item for the current field test scoring session and for future operational scoring sessions.

Prior to these meetings, scoring staff collected a set of several dozen student responses that chief readers identified as being illustrative midrange examples of their respective score points. The chief readers and science specialists worked collaboratively during benchmarking meetings to finalize an authoritative set of score point exemplars for each field test item. As a matter of practice, each of these authoritative sets is included as part of the scoring training materials and used to train readers each time that item is scored—both as a field test item and as part of a future NECAP Science administration.

This repeated use of approved sets of midrange score point exemplars helps ensure that each time a particular NECAP Science item is scored readers follow the guidelines established by the state science specialists.

4.5 Methodology for Scoring Constructed-Response Items

Constructed-response items were scored based on possible score points and scoring procedures, as shown in Table 4-2.

Table 4-2. 2008–09 NECAP Science: Possible Score Points for Constructed-Response Items

Item type	*Possible score points*	*Possible highest score*
Constructed-response	0–4	4
Inquiry task—constructed-response	0–3	3
Inquiry task—short-answer	0–2	2
Nonscorable	0	0

Nonscorable Items

Readers could designate a response as nonscorable for any of the following reasons:

- Response was blank (no attempt to respond to the question)
- Response was unreadable (illegible, too faint to see, or only partially legible/visible)
- Response was written in the wrong location (seemed to be a legitimate answer to a different question)[1]
- Response was written in a language other than English
- Response was completely off task or off topic
- Response included an insufficient amount of material to make scoring possible
- Response was an exact copy of the assignment
- Response was incomprehensible
- Student made a statement refusing to write a response to the question

- Unreadable and wrong location responses were eventually resolved, whenever possible, by researching the actual answer document (electronic copy or hard copy, as needed) to identify the correct location or to more closely examine the response and then assign a score.

Scoring Procedures

Scoring procedures for constructed-response items included both single scoring and double scoring. Single scored items were scored by one reader. Double scored items were scored independently by two readers, whose scores were tracked for agreement (known as *interrater agreement*). For further discussion of double scoring and interrater agreement, see subsection 4.5.1.3 and Appendix E.

Table 4-3 shows by which method(s) common and equating constructed-response items for each operational test were scored.

Table 4-3. 2008–09 NECAP Science: Methods of Scoring Common and Equating Constructed-Response Items by Grade and Test

Grade	*Test/Field test name*	*Responses single scored (per grade and test/field test)*	*Responses double scored (per grade and test/field test)*
4	Science	100%	2% randomly
8	Science	100%	2% randomly
11	Science	100%	2% randomly
All	Unreadable responses	100%	100%
All	Blank responses	100%	100%

For each field test item, 1,500 student responses were scored.

4.5.1 Monitoring of Scoring Quality Control and Consistency

Readers were monitored for continued accuracy rates and scoring consistency throughout the scoring process, using the following methods and tools:

- Embedded committee reviewed responses (CRRs)
- Read behind procedures
- Double blind scoring
- Scoring reports

If readers met or exceeded the expected accuracy rate, they continued scoring operational responses. Any reader who fell below the expected accuracy rate for the particular item and monitoring method was retrained on that item and, upon approval by the QAC or chief reader as appropriate, was allowed to resume scoring.

It is important to note the difference between the accuracy rate each reader must have achieved to qualify for scoring live responses and the accuracy rate each reader must have maintained to continue scoring

live responses. Specifically, the qualification accuracy rate was stricter than the live scoring accuracy rate. The reason for this difference is that an "exact score" in double blind statistics requires that two readers both identify the same score for a response; an exact score during qualification requires that an individual reader match the score predefined by leadership. Thus, the latter is dependent on matching an expert, not a peer.

During live scoring, reader accuracy rates are monitored using an array of techniques, thereby providing a more complete picture of a reader's performance than would be the case by relying on just one technique. These techniques are described in the next subsections.

4.5.1.1 Embedded CRRs

Previously scored CRRs were selected and loaded into iScore for blind distribution to readers as a way to monitor accuracy. Embedded CRRs, either chosen before scoring had begun or selected by leadership during scoring, were inserted into the scoring queue so as to be indistinguishable from all other live student responses.

Between 5 and 30 embedded CRRs were distributed at random points throughout the first full day of scoring an item to ensure that readers were sufficiently calibrated at the beginning of the scoring period. Individual readers often received up to 20 embedded CRRs within the first 100 responses scored, and up to 10 CRRs within the next 100 responses scored on that first day of scoring that item.

If any reader fell below the required live scoring accuracy rate, he or she was retrained before being allowed by the QAC to continue. Once the reader was allowed to resume scoring, leadership carefully monitored him or her by increasing the number of read behinds.

4.5.1.2 Read Behind Procedures

Read behind scoring refers to the practice of scoring leadership, usually an SR, scoring a response after a reader has already scored it.

Responses to be placed into the read behind queue were randomly selected by scoring leadership; readers were not made aware as to which of their responses would be reviewed by their SR. The iScore system allowed one, two, or three responses per reader to be placed into the read behind queue at a time.

The SR entered his or her score into iScore before being allowed to see the score assigned by the reader for whom the read behind was being performed. The SR then compared the two scores, and the ultimate reported score was determined as follows.

- If there was exact agreement between the scores, no action was taken; the regular reader's score remained.
- If the scores were adjacent (i.e., the difference was not greater than 1), the SR's score became the score of record. If there were a significant number of adjacent scores for this reader across items,

an individual scoring consultation was held with the reader, and the QAC determined whether or when the reader could resume scoring.

- If there was a discrepant difference between the scores (greater than 1 point), the SR's score became the score of record. An individual consultation was held with the reader, with the QAC determining whether or when the reader could resume scoring.

These three scenarios are illustrated in Table 4-4.

Table 4-4. 2008–09 NECAP Science: Examples of Read Behind Scoring Resolutions

Reader	*QAC/SR resolution*	*Final**
4	4	4
4	3	3
4	2	2

* QAC/SR score is score of record.

Approximately 3.3% of all student responses were reviewed by QACs and SRs as read behinds. In cases where a reader's scoring rate fell below the required accuracy percentage, QACs and SRs conducted additional read behinds for that reader.

In addition to the daily read behinds, scoring leadership could choose to read behind any reader at any point during the scoring process and thereby take an immediate, real-time "snapshot" of a reader's accuracy.

4.5.1.3 Double Blind Scoring

Double blind scoring refers to the practice of two readers independently scoring a response, each without knowing the response had already been or soon would be scored by another reader as well. Table 4-3 provides information about the proportion of responses that were double scored. Appendix E presents the percentages of double blind agreement for each grade level test.

If there was a discrepancy (a difference greater than 1) between scores, the response was placed in an arbitration queue. Arbitration responses were reviewed by scoring leadership (SR or QAC) without any background knowledge of the scores assigned by the two previous readers.

Scoring leadership consulted individually with any reader whose scoring rates on the different monitoring methods fell below the required accuracy percentage, and the QAC determined whether or when the reader could resume scoring. Once the reader was allowed to resume scoring, leadership carefully monitored him or her by increasing the frequency of read behinds.

4.5.2 Scoring Reports

Measured Progress's electronic scoring software, iScore, generated multiple reports that were used by scoring leadership to measure and monitor readers for scoring accuracy, consistency, and productivity.

Reports Generated During Scoring

Because the 2008–09 NECAP Science administration was complex, computer generated reports were necessary to ensure all of the following:

- overall group level accuracy, consistency, and reliability of scoring
- immediate, real-time individual reader data availability for early reader intervention when necessary
- scoring schedule maintenance

The following reports were produced by iScore:

- The **Read Behind Summary** showed the total number of read behind responses for each reader, and noted the numbers and percentages of scores that were exact, adjacent, and discrepant between that reader and the SR or QAC. Scoring leadership could choose to generate this report by selecting options such as "Today," "Past Week," or "Cumulative" from a pull down menu. The report could also be filtered to display data for a particular item or across all items. This report was used in conjunction with other reports to determine whether a reader's scores would be voided (i.e., sent back out to the floor to be rescored by other readers). The benefit of this report is that it measures the degree to which individual readers agree with their QAC or SR on how to best score live responses.
- The **Double-Blind Summary** showed the total number of double score responses scored by each reader, and noted the numbers and percentages of scores that were exact, adjacent, and discrepant between that reader and the second reader. This report was used in conjunction with other reports to determine whether a reader's scores would be voided. The benefit of this report is that it reveals the degree to which readers are in agreement with each other about how to best score live responses.
- The **Accuracy Summary** combined read behind and double score data, showing the total number of double score and read behind responses scored for each reader, and noting his or her accuracy percentages and score point distributions.
- The **Embedded CRR Summary** showed, for each reader and for either a particular item or across all items, the total number of responses scored, the number of embedded CRRs scored, and the numbers and percentages of scores that were exact, adjacent, and discrepant between the reader and the chief reader (by virtue of the chief reader's approval of the prescored embedded CRRs). This report was used in conjunction with other reports to determine whether a reader's scores would be voided. The benefit of this report is that it measures the degree to which individual readers agree with their chief reader on how to best score live responses—and since

embedded responses are administered during the first hours of scoring, this report provides an early indication of agreement between readers and their chief reader.

- The **Qualification Statistics Report** listed all readers by name and ID number, identifying which qualifying set(s) they did and did not take and, for the ones they did take, whether they passed or failed. The total number of qualifications passed and failed was noted for each reader, as was the total number of individuals passing or failing a particular qualifying set. The QAC could use this report to determine how the readers within his or her specific scoring group performed on a specific qualifying set.
- The **Summary Report** showed the total number of student responses for an item and identified, for the time at which the report was generated, (1) the number of single and double scorings that had been performed, and (2) the number of single and double scorings yet to be performed.

Chapter 5. CLASSICAL ITEM ANALYSES

As noted in Brown (1983), "A test is only as good as the items it contains." A complete evaluation of a test's quality must include an evaluation of each question. Both *Standards for Educational and Psychological Testing* (American Educational Research Association [AERA], American Psychological Association, & National Council on Measurement in Education, 1999) and *Code of Fair Testing Practices in Education* (Joint Committee on Testing Practices, 1988) include standards for identifying quality questions. Questions should assess only the knowledge or skills identified as part of the domain being measured and should avoid assessing irrelevant factors. They should also be unambiguous and free of grammatical errors, potentially insensitive content or language, and other confounding characteristics. Further, questions must not unfairly disadvantage test takers from particular racial, ethnic, or gender groups.

Both qualitative and quantitative approaches were taken to ensure that NECAP Science questions met these standards. Qualitative work was discussed in Chapter 2. The following discussion summarizes several types of quantitative analyses that were carried out on the 2008–09 NECAP Science items: classical statistics, differential item functioning (subgroup differences in item performance), dimensionality analyses, and item response theory analyses.

5.1 Classical Statistics

All 2008–09 NECAP Science items were evaluated in terms of difficulty according to standard classical test theory (CTT) practice. The expected item difficulty, also known as the *p*-value, is the main index of item difficulty under the CTT framework. This index measures an item's difficulty by averaging the proportion of points received across all students who took the item. Multiple-choice items were scored dichotomously (correct versus incorrect), so the difficulty index is simply the proportion of students who correctly answered the item. To place all item types on the same 0–1 scale, the *p*-value of a constructed-response item was computed as the average score on the item divided by its maximum possible score. Although the *p*-value is traditionally called a measure of difficulty, it is properly interpreted as an easiness index, because larger values indicate easier items. An index of 0.0 signifies that no student received credit for the item. At the opposite extreme, an index of 1.0 signifies that every student received full credit for the item.

Items that are answered correctly by almost all students provide little information about differences in student ability, but they do indicate knowledge or skills that have been mastered by most students. The converse is true of items that are incorrectly answered by most students. In general, to provide the most precise measurement, difficulty indices should range from near chance performance (0.25 for four-option multiple-choice items, 0.00 for constructed-response items) to 0.90. Experience has indicated that items conforming to this guideline tend to provide satisfactory statistical information for the bulk of the student population. However, on a criterion referenced test such as NECAP Science, it may be appropriate to include some items with difficulty values outside this region in order to measure well, throughout the range, the skills

present at a given grade. Having a range of item difficulties also helps to ensure that the test does not exhibit an excess of scores at the floor or ceiling of the distribution.

A desirable feature of an item is that higher ability students should perform better than lower ability students. A commonly used measure of this characteristic is the correlation between total test score (excluding the item of interest) and student performance on the item. Within CTT, this item-test correlation is referred to as the item's *discrimination*, because it indicates the extent to which successful performance on an item discriminates between high and low scores on the test. For polytomous items on the 2008–09 NECAP Science test, the corrected Pearson product-moment correlation was used as the item discrimination index, and the corrected point-biserial correlation was used for dichotomous items. The theoretical range of these statistics is -1.0 to 1.0, with a typical range from 0.2 to 0.6.

One can think of a discrimination index as a measure of how closely an item assesses the same knowledge and skills as other items that contribute to the criterion total score; in other words, the discrimination index can be interpreted as a measure of construct consistency. In light of this, it is quite important that an appropriate total score criterion be selected. For 2008–09 NECAP Science, raw score—the sum of student scores on the common items—was selected. Item-test correlations were computed for each common item, and the results are summarized below.

Summary statistics of the difficulty and discrimination indices by grade are provided in Tables 5-1 and 5-2. Means and standard deviations of *p*-values and discriminations are presented by form in Table 5-1 and by item type in Table 5-2. A comparison of indices across grade levels is complicated because the indices are population dependent. Direct comparisons would require that either the items or students were common across groups. As that was not the case, it cannot be determined whether differences in item functioning across grade levels were due to differences in student cohorts' abilities or differences in item-set difficulties, or both. Comparing the difficulty indices between item types is also tricky. Multiple-choice items can be answered correctly by guessing; thus, it is not surprising that the *p*-values for multiple-choice items were higher than those for constructed-response items. Similarly, because of partial-credit scoring, the discrimination indices of constructed-response items tended to be larger than those of multiple-choice items.

Table 5-1. 2008–09 NECAP Science: Classical Item Difficulty and Discrimination Indices by Grade and Test Form

Grade	*Form*	*N Items*	*Difficulty*		*Discrimination*	
			Mean	SD	Mean	SD
4	Common	44	0.64	0.16	0.36	0.08
	01	10	0.68	0.12	0.32	0.06
	02	10	0.65	0.18	0.30	0.12
	03	10	0.72	0.13	0.34	0.11
	04	9	0.68	0.13	0.31	0.06
8	Common	44	0.51	0.15	0.39	0.10
	01	10	0.63	0.16	0.38	0.11
	02	10	0.58	0.13	0.33	0.11
	03	10	0.59	0.14	0.38	0.10
	04	9	0.63	0.16	0.32	0.07
11	Common	44	0.52	0.13	0.37	0.13
	01	10	0.55	0.19	0.33	0.13
	02	10	0.54	0.17	0.33	0.12
	03	10	0.54	0.11	0.34	0.12
	04	9	0.57	0.12	0.34	0.07

SD = standard deviation

Table 5-2. 2008–09 NECAP Science: Classical Item Difficulty and Discrimination Indices by Item Type Across All Test Forms

Grade	*Statistic*	*All*	*MC*	*CR*
4	Difficulty	0.66 (0.15)	0.70 (0.13)	0.49 (0.14)
	Discrimination	0.34 (0.09)	0.32 (0.07)	0.45 (0.08)
	N	83	69	14
8	Difficulty	0.55 (0.16)	0.59 (0.14)	0.39 (0.12)
	Discrimination	0.37 (0.10	0.34 (0.07)	0.52 (0.09)
	N	83	69	14
11	Difficulty	0.53 (0.14)	0.56 (0.13)	0.39 (0.11)
	Discrimination	0.35 (0.12)	0.31 (0.09)	0.55 (0.08)
	N	83	69	14

All = MC and CR; MC = multiple-choice; CR = constructed-response

5.2 Differential Item Functioning

Code of Fair Testing Practices in Education (Joint Committee on Testing Practices, 1988) explicitly states that subgroup differences in performance should be examined when sample sizes permit, and action should be taken to ensure that differences in performance are due to construct relevant, rather than irrelevant, factors. *Standards for Educational and Psychological Testing* (AERA et al., 1999) includes similar guidelines. As part of the effort to identify such problems, 2008–09 NECAP Science items were evaluated by means of differential item functioning (DIF) statistics.

DIF procedures are designed to identify items on which the performance by certain subgroups of interest differs after controlling for construct relevant achievement. For 2008–09 NECAP Science, the standardization DIF procedure (Dorans & Kulick, 1986) was employed. This procedure calculates the

difference in item performance for two groups of students (at a time) matched for achievement on the total test. Specifically, average item performance is calculated for students at every total score. An overall average is then calculated, weighting the total score distribution so that it is the same for the two groups. The criterion (matching) score for 2008–09 NECAP Science was computed two ways. For common items, total score was the sum of scores on common items. The total score criterion for matrix items was the sum of item scores on both common and matrix items (excluding field test items). Based on experience, this dual definition of criterion scores has worked well in identifying problematic common and matrix items.

Differential performances between groups may or may not be indicative of bias in the test. Group differences in course taking patterns, interests, or school curricula can lead to DIF. If subgroup differences are related to construct relevant factors, items should be considered for inclusion on a test.

Computed DIF indices have a theoretical range from -1.00 to 1.00 for multiple-choice items; those for constructed-response items are adjusted to the same scale. For reporting purposes, items were categorized according to the DIF index range guidelines suggested by Dorans and Holland (1993). Indices between -0.05 and 0.05 (Type A) can be considered negligible. Most items should fall in this range. DIF indices between -0.10 and -0.05 or between 0.05 and 0.10 (Type B) can be considered low DIF but should be inspected to ensure that no possible effect is overlooked. Items with DIF indices outside the -0.10 to 0.10 range (Type C) can be considered high DIF and should trigger careful examination.

Tables 5-3 through 5-5 present the number of 2008–09 NECAP Science items classified into each DIF category, broken down by grade, form, and item type. Results are given, respectively, for comparisons between male and female, White and Black, and White and Hispanic students. In addition to the DIF categories previously defined, "Type D" in the tables indicates not enough students in the grouping to perform a reliable DIF analysis (i.e., fewer than 200 in at least one of the subgroups).

Table 5-3. 2008–09 NECAP Science: Items Classified Into DIF Categories by Grade, Test Form, and Item Type—Male Versus Female

Grade	*Form*	*All A*	*All B*	*All C*	*All D*	*MC A*	*MC B*	*MC C*	*MC D*	*CR A*	*CR B*	*CR C*	*CR D*
4	Common	37	7	0	0	26	7	0	0	11	0	0	0
	01	9	1	0	0	8	1	0	0	1	0	0	0
	02	10	0	0	0	9	0	0	0	1	0	0	0
	03	8	1	1	0	7	1	1	0	1	0	0	0
	04	8	1	0	0	8	1	0	0	0	0	0	0
8	Common	27	14	3	0	22	10	1	0	5	4	2	0
	01	6	4	0	0	6	3	0	0	0	1	0	0
	02	6	4	0	0	5	4	0	0	1	0	0	0
	03	8	2	0	0	7	2	0	0	1	0	0	0
	04	5	3	1	0	5	3	1	0	0	0	0	0
11	Common	34	9	1	0	26	6	1	0	8	3	0	0
	01	9	1	0	0	8	1	0	0	1	0	0	0
	02	8	2	0	0	7	2	0	0	1	0	0	0
	03	7	2	1	0	6	2	1	0	1	0	0	0
	04	7	1	1	0	7	1	1	0	0	0	0	0

All = MC and CR; MC = multiple-choice; CR = constructed-response; A = negligible DIF; B = low DIF; C = high DIF; D = not enough students to perform reliable DIF analysis

Table 5-4. 2008–09 NECAP Science: Items Classified Into DIF Categories by Grade, Test Form, and Item Type—White Versus Black

Grade	Form	All A	All B	All C	All D	MC A	MC B	MC C	MC D	CR A	CR B	CR C	CR D
4	Common	37	6	1	0	26	6	1	0	11	0	0	0
	01	9	1	0	0	8	1	0	0	1	0	0	0
	02	6	4	0	0	5	4	0	0	1	0	0	0
	03	8	2	0	0	7	2	0	0	1	0	0	0
	04	6	2	1	0	6	2	1	0	0	0	0	0
8	Common	38	6	0	0	27	6	0	0	11	0	0	0
	01	10	0	0	0	9	0	0	0	1	0	0	0
	02	9	1	0	0	8	1	0	0	1	0	0	0
	03	10	0	0	0	9	0	0	0	1	0	0	0
	04	8	1	0	0	8	1	0	0	0	0	0	0
11	Common	42	2	0	0	31	2	0	0	11	0	0	0
	01	6	4	0	0	5	4	0	0	1	0	0	0
	02	7	3	0	0	6	3	0	0	1	0	0	0
	03	8	0	2	0	7	0	2	0	1	0	0	0
	04	7	2	0	0	7	2	0	0	0	0	0	0

All = MC and CR; MC = multiple-choice; CR = constructed-response; A = negligible DIF; B = low DIF; C = high DIF; D = not enough students to perform reliable DIF analysis

Table 5-5. 2008–09 NECAP Science: Number of Items Classified Into DIF Categories by Grade, Test Form, and Item Type—White Versus Hispanic

Grade	Form	All A	All B	All C	All D	MC A	MC B	MC C	MC D	CR A	CR B	CR C	CR D
4	Common	38	6	0	0	27	6	0	0	11	0	0	0
	01	10	0	0	0	9	0	0	0	1	0	0	0
	02	6	3	1	0	6	2	1	0	0	1	0	0
	03	10	0	0	0	9	0	0	0	1	0	0	0
	04	7	2	0	0	7	2	0	0	0	0	0	0
8	Common	33	11	0	0	23	10	0	0	10	1	0	0
	01	8	2	0	0	7	2	0	0	1	0	0	0
	02	9	0	1	0	8	0	1	0	1	0	0	0
	03	9	1	0	0	8	1	0	0	1	0	0	0
	04	8	1	0	0	8	1	0	0	0	0	0	0
11	Common	42	2	0	0	31	2	0	0	11	0	0	0
	01	8	2	0	0	7	2	0	0	1	0	0	0
	02	8	2	0	0	7	2	0	0	1	0	0	0
	03	6	4	0	0	5	4	0	0	1	0	0	0
	04	7	2	0	0	7	2	0	0	0	0	0	0

All = MC and CR; MC = multiple-choice; CR = constructed-response; A = negligible DIF; B = low DIF; C = high DIF; D = not enough students to perform reliable DIF analysis

The tables show that the majority of DIF distinctions in the 2008–09 NECAP Science tests were Type A, or negligible, DIF (Dorans & Holland, 1993). Although there were items with DIF indices in the high category, this does not necessarily indicate that the items are biased. Both *Code of Fair Testing Practices in Education* (Joint Committee on Testing Practices, 1988) and *Standards for Educational and Psychological Testing* (AERA et al., 1999) assert that test items must be free from construct irrelevant sources of differential difficulty. If subgroup differences in performance can be plausibly attributed to construct relevant factors, the

items may be included on a test. Thus, it is important to determine whether the cause of this differential performance is construct relevant.

Table 5-6 presents the number of items classified into each DIF category by direction, comparing males and females. For example, the F/A column denotes the total number of items classified as negligible DIF on which females performed better than males, relative to performance on the test as a whole. The adjacent M/A column gives the total number of negligible DIF items on which males performed better than females, relative to performance on the test as a whole. The N/A and P/A columns display the aggregate number and proportion of negligible DIF items, respectively. To provide a complete summary across items, both common and matrix items are included in the tally that falls into each category. Results are broken down by grade and item type.

Table 5-6. 2008–09 NECAP Science: Number and Proportion of Items Classified Into Each DIF Category and Direction by Item Type—Male Versus Female

Grade	*Item type*	*F/A*	*M/A*	*N/A*	*P/A*	*F/B*	*M/B*	*N/B*	*P/B*	*F/C*	*M/C*	*N/C*	*P/C*
4	MC	29	29	58	0.84	2	8	10	0.14	0	1	1	0.01
	CR	14	0	14	1.00	0	0	0	0.00	0	0	0	0.00
8	MC	17	28	45	0.65	4	18	22	0.32	0	2	2	0.03
	CR	6	1	7	0.50	5	0	5	0.36	2	0	2	0.14
11	MC	25	29	54	0.78	1	11	12	0.17	0	3	3	0.04
	CR	9	2	11	0.79	3	0	3	0.21	0	0	0	0.00

F = items on which females performed better than males (controlling for total test score); M = items on which males performed better than females (controlling for total test score); N = number of items; P = proportion of items; A = negligible DIF; B = low DIF; C = high DIF; D = not enough students to perform a reliable DIF analysis; MC = multiple-choice; CR = constructed-response

5.3 Dimensionality Analyses

Because tests are constructed with multiple content area subcategories and their associated knowledge and skills, the potential exists for a large number of dimensions being invoked beyond the common primary dimension. Generally, the subcategories are highly correlated with each other; therefore, the primary dimension they share typically explains an overwhelming majority of variance in test scores. In fact, the presence of just such a dominant primary dimension is the psychometric assumption that provides the foundation for the unidimensional item response theory (IRT) models that are used for calibrating, linking, and scaling the NECAP Science test forms for grades 4, 8, and 11.

The purpose of dimensionality analysis is to investigate whether violation of the assumption of test unidimensionality is statistically detectable and, if so, (1) the degree to which unidimensionality is violated and (2) the nature of the multidimensionality. Findings from dimensionality analyses performed on the spring 2009 NECAP Science common items for grades 4, 8, and 11 are reported below. (Note: Only common items were analyzed since they are used for score reporting.)

The dimensionality analyses were conducted using the nonparametric IRT-based methods DIMTEST (Stout, 1987; Stout, Froelich, & Gao, 2001) and DETECT (Zhang & Stout, 1999). Both use as their basic

statistical building block the estimated average conditional covariances for item pairs. A conditional covariance is the covariance between two items conditioned on total score for the rest of the test, and the average conditional covariance is obtained by averaging over all possible conditioning scores. When a test is strictly unidimensional, all conditional covariances are expected to take on values within random noise of zero, indicating statistically independent item responses for examinees with equal expected scores. Nonzero conditional covariances are essentially violations of the principle of local independence, and such local *dependence* implies multidimensionality. Thus, nonrandom patterns of positive and negative conditional covariances are indicative of multidimensionality.

DIMTEST is a hypothesis testing procedure for detecting violations of local independence. The data are first randomly divided into a training sample and a crossvalidation sample. An exploratory analysis of the conditional covariances is conducted on the training sample data to find the cluster of items that displays the greatest evidence of local dependence. The crossvalidation sample is then used to test whether the conditional covariances of the selected cluster of items displays local dependence, conditioning on total score on the nonclustered items. The DIMTEST statistic follows a standard normal distribution under the null hypothesis of unidimensionality.

DETECT is an effect size measure of multidimensionality. As with DIMTEST, the data are first randomly divided into a training sample and a crossvalidation sample (these samples are drawn independent of those used with DIMTEST). The training sample is used to find a set of mutually exclusive and collectively exhaustive clusters of items that best fit a systematic pattern of positive conditional covariances for pairs of items from the same cluster and negative conditional covariances from different clusters. Next, the clusters from the training sample are used with the crossvalidation sample data to average the conditional covariances. The within cluster conditional covariances are summed, and from this sum the between cluster conditional covariances are subtracted. The resulting difference is divided by the total number of item pairs, and this average is multiplied by 100 to yield an index of the average violation of local independence for an item pair. DETECT values less than 0.2 indicate very weak multidimensionality (or near unidimensionality); values of 0.2 to 0.4, weak to moderate multidimensionality; values of 0.4 to 1.0, moderate to strong multidimensionality; and values greater than 1.0, very strong multidimensionality.

DIMTEST and DETECT were applied to the spring 2009 NECAP Science tests for grades 4, 8, and 11. The data for each grade were split into a training sample and a crossvalidation sample. Each grade had at least 30,000 student examinees. Because DIMTEST was limited to 24,000 students, the training and crossvalidation samples for the DIMTEST analyses used 12,000 each, randomly sampled from the total sample. DETECT, on the other hand, had an upper limit of 50,000 students, so every training and crossvalidation sample used with DETECT had at least 15,000 students. DIMTEST was then applied to each grade. DETECT was applied to each data set for which the DIMTEST null hypothesis was rejected in order to estimate the effect size of the multidimensionality.

The results of DIMTEST were that the null hypothesis was strongly rejected for every data set (p<0.00005 in all three cases). Because strict unidimensionality is an idealization that almost never holds exactly for a given data set, these DIMTEST results were not surprising. Indeed, because of the very large sample sizes of NECAP Science, DIMTEST would be expected to be sensitive to even quite small violations of unidimensionality. Thus, it was important to use DETECT to estimate the effect size of the violations of local independence found by DIMTEST. Table 5-7 displays the multidimensional effect size estimates from DETECT.

Table 5-7. 2008–09 NECAP Science: Multidimensionality Effect Sizes

Grade	*Multidimensionality effect size*	
	2007–08	2008–09
4	0.27	0.18
8	0.13	0.27
11	0.22	0.21

The DETECT values indicated weak multidimensionality for grades 8 and 11 and very weak multidimensionality for grade 4. Table 5-7 also presents the results from last year's analysis, which similarly registered weak or very weak multidimensionality for all three grades. The way in which DETECT divided the tests into clusters was investigated to see if there were any discernable patterns with respect to item type. In all three grades there was strong evidence of the multiple-choice items and constructed-response items tending to cluster separately, with the strongest separation occurring in grade 8 (not surprisingly, since it had the largest DETECT effect size). The 2007–08 results also showed strong separate clustering of the multiple-choice and constructed-response items, although the strongest separation occurred for grade 4 (the largest DETECT effect size that year). None of the DETECT analyses indicated multidimensionality due to substantive content subcategories. If multidimensionality due to such substantive content was indeed present, it was small compared to the multidimensionality due to item type. Despite the evidence of multidimensionality between the multiple-choice and constructed-response items in grades 4 and 11, the effect sizes are weak and do not warrant changes in test design, scoring, or administration.

Chapter 6. SCALING AND EQUATING

6.1 Item Response Theory

All 2008–09 NECAP Science items were calibrated using item response theory (IRT). IRT uses mathematical models to define a relationship between an unobserved measure of student performance, usually referred to as theta (θ), and the probability (p) of getting a dichotomous item correct or of getting a particular score on a polytomous item. In IRT, it is assumed that all items are independent measures of the same construct (i.e., of the same θ). Another way to think of θ is as a mathematical representation of the latent trait of interest. Several common IRT models are used to specify the relationship between θ and p (Hambleton & van der Linden, 1997; Hambleton & Swaminathan, 1985). The process of determining the specific mathematical relationship between θ and p is called item calibration. After items are calibrated, they are defined by a set of parameters that specify a nonlinear, monotonically increasing relationship between θ and p. Once the item parameters are known, $\hat{\theta}$, an estimate of θ for each student, can be calculated. ($\hat{\theta}$ is considered to be an estimate of the student's true score or a general representation of student performance. It has characteristics that may be preferable to those of raw scores for equating purposes.)

For 2008–09 NECAP Science, the three-parameter logistic (3PL) model was used for dichotomous items (multiple-choice and short-answer), and the graded-response model (GRM) was used for polytomous items. The 3PL model for dichotomous items can be defined as follows:

$$P_i\left(1\middle|\theta_j,\xi_i\right)=c_i+\left(1-c_i\right)\frac{\exp\left[Da_i\left(\theta_j-b_i\right)\right]}{1+\exp\left[Da_i\left(\theta_j-b_i\right)\right]}$$

where
i indexes the items,
j indexes students,
a represents item discrimination,
b represents item difficulty,
c is the pseudoguessing parameter,
ξ_i represents the set of item parameters (a, b, and c), and
D is a normalizing constant equal to 1.701.

In the GRM for polytomous items, an item is scored in $k + 1$ graded categories, which can be viewed as a set of k dichotomies. At each point of dichotomization (i.e., at each threshold), a two-parameter model can be used. This implies that a polytomous item with $k + 1$ categories can be characterized by k item category threshold curves (ICTCs) of the two-parameter logistic form:

$$P_{ik}^{*}\left(1\middle|\theta_j, a_i, b_i, d_{ik}\right) = \frac{\exp\left[Da_i\left(\theta_j - b_i + d_{ik}\right)\right]}{1+\exp\left[Da_i\left(\theta_j - b_i + d_{ik}\right)\right]}$$

where
i indexes the items,
j indexes students,
k indexes threshold,
a represents item discrimination,
b represents item difficulty,
d represents threshold, and
D is a normalizing constant equal to 1.701.

After computing k ICTCs in the GRM, $k + 1$ item category characteristic curves (ICCCs) are derived by subtracting adjacent ICTCs:

$$P_{ik}(1 \mid \theta_j) = P_{i(k-1)}^{*}(1 \mid \theta_j) - P_{ik}^{*}(1 \mid \theta_j)$$

where
P_{ik} represents the probability that the score on item i falls in category k, and
P_{ik}^{*} represents the probability that the score on item i falls above the threshold k
($P_{i0}^{*} = 1$ and $P_{i(m+1)}^{*} = 0$).

The GRM is also commonly expressed as

$$P_{ik}\left(k\middle|\theta_j, \xi_i\right) = \frac{\exp\left[Da_i\left(\theta_j - b_i + d_k\right)\right]}{1+\exp\left[Da_i\left(\theta_j - b_i + d_k\right)\right]} - \frac{\exp\left[Da_i\left(\theta_j - b_i + d_{k+1}\right)\right]}{1+\exp\left[Da_i\left(\theta_j - b_i + d_{k+1}\right)\right]}$$

where
ξ_i represents the set of item parameters for item i.

Finally, the item characteristic curve (ICC) for polytomous items is computed as a weighted sum of ICCCs, where each ICCC is weighted by a score assigned to a corresponding category:

$$P_i(1 \mid \theta_j) = \sum_{k}^{m+1} w_{ik} P_{ik}(1 \mid \theta_j)$$

For more information about item calibration and determination, refer to Lord and Novick (1968), Hambleton and Swaminathan (1985), or Baker and Kim (2004).

Test characteristic curves (TCCs) display the expected (average) raw score associated with each θ_j value between -4.0 and 4.0. Mathematically, the TCC is computed by summing the ICCs of all items that contribute to the raw score. Using the notation introduced above, the expected raw score at a given value of θ_j is

$$E(X \mid \theta_j) = \sum_{i=1}^{n} P_i\left(1 \middle| \theta_j\right),$$

where
i indexes the items (and n is the number of items contributing to the raw score);
j indexes the students (here, θ_j runs from -4 to 4); and
$E(X \mid \theta_j)$ is the expected raw score for a student of ability θ_j.

The expected raw score monotonically increases with θ_j, consistent with the notion that students of high ability tend to earn higher raw scores than students of low ability. Most TCCs are S-shaped—flatter at the ends of the distribution and steeper in the middle.

The test information function (TIF) displays the amount of statistical information that the test provides at each value of θ_j. There is a direct relationship between the information of a test and its standard error of measurement (SEM). Information functions depict test precision across the entire latent trait continuum. For long tests, the SEM at a given θ_j is approximately equal to the inverse of the square root of the statistical information (I) at θ_j (Hambleton, Swaminathan, & Rogers, 1991):

$$SEM(\theta_j) = \frac{1}{\sqrt{I(\theta_j)}}$$

TIFs are often higher near the middle of the θ distribution, where most students are located and most items are sensitive by design.

6.2 IRT Results

All 2008–09 NECAP Science items were calibrated using IRT. The results of those analyses are presented here and in Appendix F. The tables in Appendix F give the IRT item parameters of all common items on the 2008–09 NECAP Science tests, broken down by grade. Graphs of the corresponding TCCs and TIFs, defined below, accompany the data tables.

The number of Newton cycles required for convergence for each grade during the IRT analysis can be found in Table 6-1. The number of cycles required for the solution to converge fell within acceptable ranges (e.g., below 150 cycles).

Table 6-1. 2008–09 NECAP Science: Number of Newton Cycles Required for Convergence

Content area	*Grade*	*Cycles*
Science	4	42
	8	47
	11	136

For some items the guessing parameter was poorly estimated. This is not at all unusual, as difficulty in estimating the *c* parameter has been well documented in the psychometric literature. It often happens when item discrimination is low (e.g., less than 0.50). Careful study of these items found that fixing the lower asymptote to a value of 0.00, for example, resulted in stable and reasonable estimates for both the *a* and *b* parameters (relative to classical test theory statistics). Additionally, the *a* parameter is sometimes difficult to estimate for items that are either very easy or very difficult. In these cases the *a* parameter was set to the initial value estimated by PARSCALE from the classical item statistics.

These techniques produced item parameters that resulted in excellent model fit (comparing theoretical ICCs to observed ICCs). Details of items that required intervention during IRT analysis are presented in Table 6-2. The number of items that required intervention across the grades was very typical.

Table 6-2. 2008–09 NECAP Science: Items Requiring Intervention

Grade	*IREF*	*Reason*	*Action*
4	46525	*c* parameter	*c* = 0
	135360	*c* parameter	*c* = 0
	59919	*c* parameter	*c* = 0
	49861	*c* parameter	*c* = 0
	46276	*c* parameter	*c* = 0
	14092	*a* parameter	*a* set to initial value
8	50133	*c* parameter	*c* = 0
	18096	*a* parameter	*a* set to initial value
11	60181	*c* parameter	*c* = 0
	46139	*c* parameter	*c* = 0
	135344	*c* parameter	*c* = 0
	61150	*c* parameter	*c* = 0
	47917	*c* parameter	*c* = 0
	46099	*a* parameter	*a* set to initial value

6.3 Equating

The purpose of equating is to ensure that scores obtained from different forms of a test are equivalent. Equating may be used when administering multiple forms in the same year or when comparing one year's forms to those given in the previous year. Equating ensures that students are not given an unfair advantage or disadvantage because of the difficulty of the test form they took.

The 2008–09 administration of NECAP Science used a raw score to theta equating procedure in which test forms are equated every year to the theta scale of the reference test forms. (In the case of NECAP Science, the reference forms are those from the 2007–08 administration.) This is accomplished through the chained linking design, in which every new form is equated back to the theta scale of the previous year's test form. It can therefore be assumed that the theta scale of every new test form is the same as the theta scale of the reference form, since this is where the chain originated.

Students who took the equating items on the 2008–09 and 2007–08 NECAP Science tests are not equivalent groups. IRT is particularly useful for equating scenarios that involve nonequivalent groups (Allen

& Yen, 1979). Equating for NECAP Science uses the anchor-test-nonequivalent-groups design described by Petersen, Kolen, and Hoover (1989). In this equating design, no assumption is made about the equivalence of the examinee groups taking different test forms; that is, naturally occurring groups are assumed. Comparability is instead evaluated through utilizing a set of anchor items (also called equating items). NECAP Science uses an *external* anchor test design, which means that the equating items are not counted toward students' test scores. However, the equating items are designed to mirror the common test in terms of item types and distribution of emphasis. Subsets of the equating items are distributed across forms.

Item parameter estimates for 2008–09 were placed on the 2007–08 scale by using the Stocking and Lord (1983) method, which is based on the IRT principle of item parameter invariance. According to this principle, the equating items for both the 2007–08 and 2008–09 NECAP Science tests should have the same item parameters. After the item parameters for each 2007–08 NECAP Science test were estimated using PARSCALE, as described earlier, the Stocking and Lord method was employed to find the linear transformation (slope and intercept) that adjusted the equating items' parameter estimates such that the 2008–09 TCC was as close as possible to that of 2007–08.

6.4 Equating Results

An equating report was submitted to the NECAP state testing directors for their approval prior to production of student reports. Various elements from the equating report are presented throughout this technical report and its appendices.

In addition to the equating and scaling activities described in the previous subsection, various quality control procedures were implemented within the Psychometrics and Research Department at Measured Progress and reviewed with the NECAP state testing directors and NECAP Technical Advisory Committee (see Appendix B for committee membership).

Appendix G presents the results from the delta analysis. This procedure was used to evaluate the adequacy of equating items, and the discard status presented in the appendix indicates whether the item was used in equating. Also presented in Appendix G are the results from the rescore analysis. For polytomous equating items, 200 random papers from the previous year were interspersed with the 2008–09 papers to evaluate scorer consistency from one year to the next. Only items with effect sizes greater than 0.80 were automatically excluded as equating items.

To compare the presentation of each equating item from year to year, a copy match was performed and the *a* and *b* parameters were plotted. Any items where changes in presentation were noted, or where outliers were detected during review of the parameter plots, were further scrutinized to determine if they should be removed from the equating set. Table 6-3 displays all items removed from the equating set, along with the reason for their removal.

Table 6-3. 2008–09 NECAP Science: Items Removed From the Equating Set

Grade	*IREF*	*Reason*	*Action*
4	47624	Delta analysis	Removed from equating
11	46099	b/b plot	Removed from equating

The transformation constants resulting from the equating process are presented in Table 6-4.

Table 6-4. 2008–09 NECAP Science: Stocking and Lord Transformation Constants

Grade	*Content area*	*Slope*	*Intercept*
4	Science	0.999	-0.040
8	Science	1.015	-0.034
11	Science	0.960	0.035

The next administration of NECAP (2009–10) will be scaled to the 2008–09 administration by the same equating method.

6.5 Standard Setting

Achievement level cut scores in science were established in August 2008. The standard setting meetings and results were discussed in the 2007–08 technical report. As alluded to in the previous discussion of equating, the respective NECAP reporting scales were established during those base years, and the forms serve as the reference for subsequent equating. The θ metric cut scores that emerged from the standard setting meetings will remain fixed throughout the assessment program unless standards are reset for any reason.

6.6 Reported Scaled Scores

Description of Scale

Because the theta scale used in the IRT calibrations is not readily understood by most stakeholders, reporting scales were developed for the NECAP Science tests. The reporting scales, simple linear transformations of the underlying θ scale, are developed such that they range from x00 through x80 (where x is grade level). In other words, grade 4 scaled scores range from 400 through 480, grade 8 from 800 through 880, and grade 11 from 1100 through 1180. The lowest scaled score in the Proficient range is fixed at x40 for each grade level. For example, to be classified in the Proficient achievement level or above, a minimum scaled score of 440 was required at grade 4, 840 at grade 8, and 1140 at grade 11.

Scaled scores supplement achievement level results by providing information that is more specific about the position of a student's results within an achievement level. School and district level scaled scores are calculated by computing the average of student level scaled scores. Students' raw scores (i.e., total

number of points) on the 2008–09 NECAP Science tests were translated to scaled scores using a data analysis process called scaling. Scaling simply converts from one scale to another. In the same way that a given temperature can be expressed on either Fahrenheit or Celsius scales or the same distance can be expressed in either miles or kilometers, student scores on the 2008–09 NECAP Science tests can be expressed in raw or scaled scores. In Figure 6-1, two-way arrows depict how raw scores (vertical axis) map through the S-shaped TCC to corresponding scores on the theta scale, which in turn map directly to scaled scores. (More details on transforming theta scores to scaled scores are presented in subsection 6.6.2.) Converting from raw scores to scaled scores does not change students' achievement level classifications.

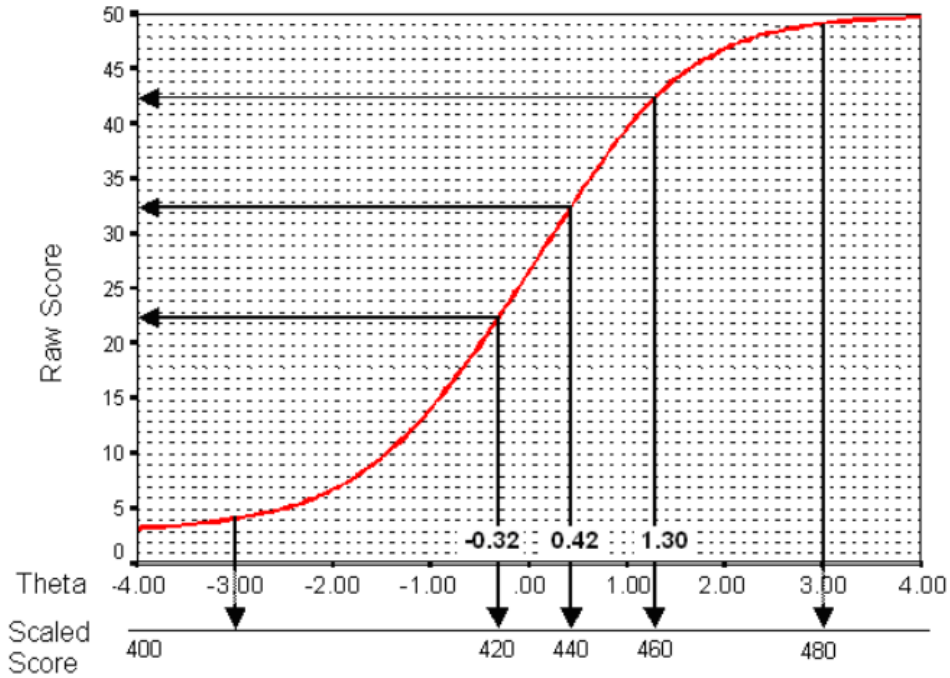


Figure 6-1. 2008–09 NECAP Science: Illustration of Raw Score–Theta–Scaled Score Transformation Using TCC

Given the relative simplicity of raw scores, it is fair to question why scaled scores are reported for NECAP Science instead of raw scores. Scaled scores make the reporting of results consistent. To illustrate, standard setting typically results in different raw cut scores across content areas and grades. The raw cut score between Partially Proficient and Proficient could be, say, 38 in grade 4 and 40 in grade 8, yet both of these raw scores would be transformed to scaled scores of x40 (i.e., 440 and 840). It is this uniformity across scaled scores that facilitates the understanding of student performance. The psychometric advantage of scaled scores over raw scores comes from their being linear transformations of θ. Since the θ scale is used for equating, scaled scores are comparable from one year to the next. Raw scores are not.

6.6.2 Calculations

Scaled scores are obtained by a simple translation of ability estimates ($\hat{\theta}$) using the linear relationship between threshold values on the θ metric and their equivalent values on the scaled score metric. Students' ability estimates are based on their raw scores and are found by mapping through the TCC. Scaled scores are calculated using the linear equation

$$SS = m\hat{\theta} + b$$

where
m is the slope, and
b is the intercept.

A separate linear transformation is used for each grade level test of NECAP Science. The transformation function is determined by fixing the Partially Proficient/Proficient cut score and the bottom of the scale—that is, the x40 and the x00 values (e.g., 440 and 400 for grade 4). The x00 location on the θ scale is beyond (i.e., below) the scaling of all items. To determine this location, a chance score (approximately equal to a student's expected performance by guessing) is mapped to a value of -4.0 on the θ scale. A raw score of 0 is also assigned a scaled score of x00. The maximum possible raw score is assigned a scaled score of x80 (e.g., 480 in the case of grade 4).

Because only two points within the θ scaled score space are fixed, the scaled score cuts between Substantially Below Proficient and Partially Proficient and between Proficient and Proficient With Distinction are free to vary across grades.

Table 6-5 illustrates the scaled score cuts for each grade (i.e., the minimum scaled score for getting into the next achievement level) and the slope and intercept terms used to calculate the scaled scores. Again, the values in Table 6-5 do not change from year to year because the cut scores along the θ scale do not change. In any given year, it may not be possible to attain a particular scaled score, but the scaled score cuts will remain the same.

Table 6-5. 2008–09 NECAP Science: Reporting Scale Range, Cut Scores, Intercept, and Slope for Each Achievement Level by Grade

			Scaled score cuts				
Grade	*Minimum*	*Maximum*	SBP/PP	PP/P	P/PWD	*Intercept*	*Slope*
4	400	480	427	440	463	9.881	439.5
8	800	880	829	840	855	8.420	833.7
11	1100	1180	1130	1140	1152	8.354	1133.4

SBP = Substantially Below Proficient; PP = Partially Proficient; P = Proficient; PWD = Proficient With Distinction

Table 6-6 shows the cut scores on the θ metric resulting from standard setting (see the *2007–08 NECAP Science Technical Report* for a description of the standard setting process). Note that the numbers in Table 6-6 will not change unless the standards are reset.

Table 6-6. 2008–09 NECAP Science: Cut Scores on *θ* Metric by Grade

Grade	*θ Cuts*		
	SBP/PP	PP/P	P/PWD
4	-1.222	0.048	2.371
8	-0.612	0.751	2.578
11	-0.432	0.788	2.193

SBP = Substantially Below Proficient; PP = Partially Proficient; P = Proficient; PWD = Proficient With Distinction

Appendix H contains the raw score to scaled score conversion tables for the 2008–09 NECAP Science tests. These are the actual tables used to determine student scaled scores, error bands, and achievement levels.

6.6.3 Distributions

Appendix I includes scaled score cumulative density functions. These distributions were calculated using the sparse data matrix files from the IRT calibrations. For each grade, these distributions show the cumulative percentage of students scoring at or below a particular scaled score across the entire scaled score range.

Chapter 7. RELIABILITY

Although an individual item's performance is an important focus for evaluation, a complete evaluation of an assessment must also address the way items function together and complement one another. Tests that function well provide a dependable assessment of the student's level of ability. Unfortunately, no test can do this perfectly. A variety of factors can contribute to a given student's score being either higher or lower than his or her true ability. For example, a student may misread an item or mistakenly fill in the wrong bubble when he or she knew the answer. Collectively, extraneous factors that impact a student's score are referred to as *measurement error*. Any assessment includes some amount of measurement error; that is, no test is perfect. This is true of all academic assessments—some students will receive scores that underestimate their true ability, and other students will receive scores that overestimate their true ability. When tests have a high amount of measurement error, student scores are very unstable. Students of high ability may get low scores, or vice versa. Consequently, one cannot reliably measure a student's true level of ability with such a test. Assessments that have less measurement error (i.e., errors are small on average and student scores consistently represent ability) are described as *reliable*.

There are a number of ways to estimate an assessment's reliability. One possible approach is to give the same test to the same students at two different points in time. If students receive the same scores on each test, then the extraneous factors affecting performance are small and the test is reliable. A potential problem with the test-retest reliability approach is that students may remember items from the first administration or may have gained (or lost) knowledge or skills in the interim between the two administrations. A solution to the "remembering items" problem is to give a different but parallel test at the second administration. If student scores on each test correlate highly, the test is considered reliable. The alternate-forms reliability approach, however, does not address the problem that students may have gained (or lost) knowledge or skills in the interim. In addition, the practical challenges of developing and administering parallel forms generally preclude the use of such indices. A way to address these problems is to split the test in half and then correlate students' scores on the two half-tests; this in effect treats each half-test as a complete test. In doing so, the problems associated with an intervening time interval or with creating and administering two parallel forms of the test are alleviated. This is known as a split-half estimate of reliability. If the two half-test scores correlate highly, items on the two half-tests must be measuring very similar knowledge or skills. This is evidence that the items complement one another and function well as a group. This also suggests that measurement error will be minimal.

The split-half method requires psychometricians to select items that contribute to each half-test score. This decision may have an impact on the resulting correlation, since each different possible split of the test halves will result in a different correlation. Another problem with the split-half method is that it underestimates reliability, because test length is cut in half. All else being equal, a shorter test is less reliable than a longer test. Cronbach (1951) provided a statistic, alpha (α), which avoids these concerns of the split-

half method by comparing individual item variances to total test variance. Cronbach's α was used to assess the reliability of the 2008–09 NECAP Science tests. The formula for computing alpha is as follows:

$$\alpha \equiv \frac{n}{n-1}\left[1-\frac{\sum_{i=1}^{n}\sigma^2{}_{(Y_i)}}{\sigma_x^2}\right]$$

where
i indexes the item,
n is the total number of items,
Error! Objects cannot be created from editing field codes. represents individual item variance, and
σ_x^2 represents the total test variance.

7.1 Reliability and Standard Errors of Measurement

Table 7-1 presents descriptive statistics, Cronbach's α coefficient, and the raw score standard error of measurement (SEM) for each grade (statistics are based on common items only).

Table 7-1. 2008–09 NECAP Science: Common Item Raw Score Descriptive Statistics, Reliability Coefficients, and SEMs by Grade

Grade	*N*	*Possible score*	*Minimum score*	*Maximum score*	*Mean score*	*Score SD*	*Reliability (α)*	*SEM*
4	31,495	63	2	61	37.91	10.00	0.88	3.51
8	33,732	63	0	61	28.88	11.43	0.90	3.64
11	35,265	63	0	62	30.02	11.54	0.89	3.79

SD = standard deviation

7.2 Subgroup Reliability

The reliability coefficients previously discussed were based on the overall population of students who took the 2008–09 NECAP Science tests. Table 7-2 presents reliabilities for various subgroups of interest. These reliabilities were computed using the formula for α as defined above but restricted to members of the subgroup in question.

Table 7-2. 2008–09 NECAP Science: Reliabilities by Subgroup and Grade

Grade	*Subgroup*	*N*	*α*
4	White	26,589	0.86
	Native Hawaiian or Pacific Islander	13	0.81
	Hispanic or Latino	2,405	0.87
	Black or African American	1,364	0.88
	Asian	823	0.87
	American Indian or Alaskan Native	131	0.86
	LEP	1,419	0.88
	IEP	4,737	0.87
	Low SES	10,279	0.87
8	White	28,738	0.89
	Native Hawaiian or Pacific Islander	16	0.87
	Hispanic or Latino	2,541	0.88
	Black or African American	1,396	0.88
	Asian	768	0.91
	American Indian or Alaskan Native	138	0.90
	LEP	838	0.86
	IEP	5,420	0.87
	Low SES	9,862	0.88
11	White	30,851	0.89
	Native Hawaiian or Pacific Islander	21	0.89
	Hispanic or Latino	2,150	0.87
	Black or African American	1,284	0.87
	Asian	734	0.90
	American Indian or Alaskan Native	141	0.87
	LEP	627	0.84
	IEP	4,624	0.85
	Low SES	7,492	0.87

For several reasons, the results of this subsection should be interpreted with caution. First, inherent differences between grades preclude making valid inferences about the quality of a test based on statistical comparisons with other tests. Second, reliabilities are dependent not only on the measurement properties of a test but on the statistical distribution of the studied subgroup. For example, it is readily seen in Table 7-2 that subgroup sizes vary considerably, which results in natural variation in reliability coefficients. Also, α, which is a type of correlation coefficient, may be artificially depressed for subgroups with little variability (Draper & Smith, 1998). Third, there is no industry standard to interpret the strength of a reliability coefficient; this is particularly true when the population of interest is a single subgroup.

7.3 Stratified Coefficient Alpha

According to Feldt and Brennan (1989), a prescribed distribution of items over categories (such as different item types) indicates the presumption that at least a small, but important, degree of unique variance is associated with the categories. Cronbach's α coefficient, however, is built on the assumption that there are no such local or clustered dependencies. A stratified version of coefficient α corrects for this problem by taking item category into account. The formula for stratified αα is as follows:

$$\alpha_{strat} = 1 - \frac{\sum_{j=1}^{k} \sigma_{x_j}^2 (1-\alpha)}{\sigma_x^2}$$

where
j indexes the subtests or categories,
$\sigma_{x_j}^2$ represents the variance of the k individual subtests or categories,
α is the unstratified Cronbach's α coefficient, and
σ_x^2 represents the total test variance.

Stratified α based on item type was calculated separately for the common items in each grade. This information is presented in Table 7-3. This is directly followed by the results of stratification based on form in Table 7-4.

Table 7-3. 2008–09 NECAP Science: Common Item α and Stratified α by Item Type

Grade	*All α*	*MC*		*CR*		*Stratified α*
		α	*N*	*α*	*N (poss)*	
4	0.88	0.84	33	0.77	11 (30)	0.89
8	0.90	0.85	33	0.82	11 (30)	0.90
11	0.89	0.81	33	0.85	11 (30)	0.90

All = MC and CR; MC = multiple-choice; CR = constructed-response
N = number of items; poss = total possible constructed-response points

Table 7-4. 2008–09 NECAP Science: Reliability Overall and Based on Item Type and Common Versus Matrix, Separate and Stratified, Within Form by Grade

Grade	*Reliability*	*Form 1*	*Form 2*	*Form 3*	*Form 4*
4	Whole form alpha	0.89	0.89	0.90	0.89
	– MC alpha	0.86	0.85	0.86	0.86
	– CR alpha	0.77	0.79	0.79	0.76
	Common/matrix stratified	0.90	0.90	0.90	0.90
	– Common alpha	0.88	0.88	0.88	0.88
	– Matrix alpha	0.52	0.51	0.57	0.54
	Item type stratified	0.89	0.89	0.90	0.89
8	Whole form alpha	0.91	0.91	0.92	0.91
	– MC alpha	0.88	0.87	0.88	0.87
	– CR alpha	0.84	0.84	0.84	0.82
	Common/matrix stratified	0.92	0.92	0.92	0.91
	– Common alpha	0.90	0.90	0.90	0.90
	– Matrix alpha	0.61	0.57	0.63	0.53
	Item type stratified	0.91	0.91	0.92	0.91
11	Whole form alpha	0.91	0.91	0.91	0.91
	– MC alpha	0.84	0.84	0.84	0.85
	– CR alpha	0.87	0.86	0.87	0.85
	Common/matrix stratified	0.92	0.91	0.92	0.92
	– Common alpha	0.89	0.89	0.89	0.89
	– Matrix alpha	0.57	0.56	0.57	0.58
	Item type stratified	0.91	0.91	0.91	0.91

MC = multiple-choice; CR = constructed-response

Not surprisingly, reliabilities were higher on the full test than on subsets of items (i.e., only multiple-choice or constructed-response).

7.4 Reporting Subcategories (Domains) Reliability

In subsection 7.3, the reliability coefficients were calculated based on form and item type. Item type represents just one way of breaking an overall test into subtests. Of even more interest are reliabilities for the reporting subcategories (domains) within NECAP Science described in 2.1.4. Cronbach's α coefficients for subcategories were calculated via the same formula defined at the beginning of this chapter, using just the items of a given subcategory in the computations. Results are presented in Table 7-5. Once again, as expected, computed subcategory reliabilities were lower (sometimes substantially so) than overall test reliabilities because they are based on a subset of items rather than the full test, and interpretations should take this into account.

Table 7-5. 2008–09 NECAP Science: Common Item α Coefficients by Grade and Reporting Subcategory

Grade	*Reporting subcategory*	*Possible points*	α
4	Physical Science	15	0.67
	Earth Space Science	15	0.62
	Life Science	15	0.68
	Inquiry Task	18	0.69
8	Physical Science	15	0.69
	Earth Space Science	15	0.67
	Life Science	15	0.72
	Inquiry Task	18	0.79
11	Physical Science	15	0.64
	Earth Space Science	15	0.59
	Life Science	15	0.70
	Inquiry Task	18	0.80

7.5 Reliability of Achievement Level Categorization

All test scores contain measurement error; thus, classifications based on test scores are also subject to measurement error. After the 2008–09 NECAP Science achievement levels were specified, each student was classified into one of the following achievement levels: Substantially Below Proficient, Partially Proficient, Proficient, or Proficient With Distinction. Empirical analyses were conducted to determine the statistical accuracy and consistency of the classifications. The following explains the methodologies used to assess the reliability of classification decisions and presents the results.

Accuracy refers to the extent to which decisions based on test scores match decisions that would have been made if the scores did not contain any measurement error. It must be estimated because errorless test scores do not exist.

Consistency measures the extent to which classification decisions based on test scores match the decisions based on scores from a second, parallel form of the same test. It can be evaluated directly from actual responses to test items if two complete and parallel forms of the test are given to the same group of students. In operational test programs, however, such a design is usually impractical. Instead, techniques have been developed to estimate both the accuracy and consistency of classification decisions based on a single administration of a test. The Livingston and Lewis (1995) technique was used for 2008–09 NECAP Science because it is easily adaptable to tests of all kinds, including mixed format tests.

The accuracy and consistency estimates reported in Table 7-6 make use of *true scores* in the classical test theory sense. A true score is the score that would be obtained if a test had no measurement error. Of course, true scores cannot be observed and so must be estimated. In the Livingston and Lewis (1995) method, estimated true scores are used to categorize students into their *true* achievement levels.

After various technical adjustments (described in Livingston & Lewis, 1995), a four by four contingency table of accuracy was created for each grade, where cell $[i, j]$ represented the estimated proportion of students whose true score fell into achievement level i (where i = 1–4) and observed score into

achievement level j (where j = 1–4). The sum of the diagonal entries (i.e., the proportion of students whose true and observed achievement levels matched) signified overall accuracy.

For consistency, true scores were used to estimate the joint distribution of classifications on two independent, parallel test forms. Following statistical adjustments per Livingston and Lewis (1995), a new four by four contingency table was created for each grade and populated by the proportion of students who would be classified into each combination of achievement levels according to the two (hypothetical) parallel test forms. Cell $[i, j]$ of this table represented the estimated proportion of students whose observed score on the first form would fall into achievement level i (where i = 1–4) and whose observed score on the second form would fall into achievement level j (where j = 1–4). The sum of the diagonal entries (i.e., the proportion of students categorized by the two forms into exactly the same achievement level) signified overall consistency.

Another way to measure consistency is to use Cohen's (1960) coefficient κ (kappa), which assesses the proportion of consistent classifications after removing the proportion that would be expected by chance. It is calculated using the following formula:

$$\kappa = \frac{\text{(Observed agreement) - (Chance agreement)}}{\text{1 - (Chance agreement)}} = \frac{\sum_i C_{ii} - \sum_i C_{i.}C_{.i}}{1 - \sum_i C_{i.}C_{.i}},$$

where
$C_{i.}$ is the proportion of students whose observed achievement level would be level i (where i = 1–4) on the first hypothetical parallel form of the test;
$C_{.i}$ is the proportion of students whose observed achievement level would be level i (where i = 1–4) on the second hypothetical parallel form of the test; and
C_{ii} is the proportion of students whose observed achievement level would be level i (where i = 1–4) on both hypothetical parallel forms of the test.

Because κ is corrected for chance, its values are lower than other consistency estimates.

7.6 Results of Accuracy, Consistency, and Kappa Analyses

The accuracy and consistency analyses described in the previous subsection are tabulated in Appendix J. The appendix includes the accuracy and consistency contingency tables and the overall accuracy and consistency indices, including kappa.

Accuracy and consistency values conditional upon achievement level are also given in Appendix J. For these calculations, the denominator is the proportion of students associated with a given achievement level. For example, a conditional accuracy value of 0.76 for the Partially Proficient achievement level would indicate that among the students whose true scores placed them in Partially Proficient, 76% would be expected to be in Partially Proficient when categorized according to their observed score. Similarly, a consistency value of 0.69 would indicate that 69% of students with observed scores in Partially Proficient

would be expected to score in the Partially Proficient achievement level again if a second, parallel test form were used.

For some testing situations, the greatest concern may be decisions around level thresholds. For example, if a college gave credit to students who achieved Advanced Placement test scores of 4 or 5, but not 1, 2, or 3, one might be interested in the accuracy of the dichotomous decision of below 4 versus 4 or above. Appendix J provides the accuracy and consistency estimates at each cutpoint as well as false positive and false negative decision rates for 2008–09 NECAP Science. (False positives are the proportion of students whose observed scores were above the cut and true scores below the cut. False negatives are the proportion of students whose observed scores were below the cut and true scores above the cut.)

Livingston and Lewis discuss two versions of the accuracy and consistency tables. A standard version performs calculations for forms parallel to the form taken. An adjusted version adjusts the results of one form to match the observed score distribution obtained in the data. The tables reported in Appendix J use the standard version for two reasons: (1) the unadjusted version can be considered a smoothing of the data, thereby decreasing the variability of the results; and (2) for results dealing with the consistency of two parallel forms, the unadjusted tables are symmetric, indicating that the two parallel forms have the same statistical properties. This second reason is consistent with the notion of forms that are parallel; that is, it is more intuitive and interpretable for two parallel forms to have the same statistical distribution.

Descriptive statistics relating to the decision accuracy and consistency of the 2008–09 NECAP Science tests can be derived from Appendix J. Table 7-6 summarizes most of the results at a glance. As with other types of reliability, it is inappropriate when analyzing the decision accuracy and consistency of a given test to compare results between grades.

Table 7-6. 2008–09 NECAP Science: Summary of Decision Accuracy (and Consistency) Results

		Conditional on level				*Conditional on cutpoint*		
Grade	*Overall*	SBP	PP	P	PWD	SBP/PP	PP/P	P/PWD
4	0.83 (0.76)	0.79 (0.69)	0.79 (0.74)	0.87 (0.81)	0.80 (0.50)	0.95 (0.93)	0.89 (0.85)	0.98 (0.98)
8	0.84 (0.77)	0.84 (0.79)	0.82 (0.77)	0.85 (0.75)	0.65 (0.23)	0.92 (0.88)	0.92 (0.89)	1.00 (0.99)
11	0.83 (0.76)	0.85 (0.80)	0.81 (0.75)	0.83 (0.73)	0.68 (0.31)	0.92 (0.88)	0.92 (0.89)	0.99 (0.99)

SBP = Substantially Below Proficient; PP = Partially Proficient; P = Proficient; PWD = Proficient With Distinction

Chapter 8. SCORE REPORTING

8.1 Teaching Year Versus Testing Year Reporting

The data used for the NECAP Science reports are the results of the spring 2009 administration of the NECAP Science test. NECAP Science tests are based on the NECAP Science Assessment Targets, which cover the grade spans K–4, 5–8, and 9–11. For example, the grade 8 NECAP Science test is based on the assessment targets of grades five through eight. Because the assessment targets cover grade spans, the state departments of education determined that assessing science in the spring—as opposed to the fall, when mathematics, reading, and writing are assessed—would allow students and schools adequate time to cover all assessment targets through the curriculum and would also avoid a testing overload in the fall. All students who participated in NECAP Science were represented in testing year reports, because the students took the test in the school where they completed their learning of the assessment targets for their particular grade span.

8.2 Primary Reports

Measured Progress created four primary reports for the 2008–09 NECAP Science test:

- Student Report
- Item Analysis Report
- School and District Results Report
- District Summary Report

With the exception of the Student Report, all reports were available for schools and districts to view or download on a password secure Web site hosted by Measured Progress. Student level data files were also available for districts to download. Each of these reports is described in the following subsections. Sample reports are provided in Appendix K.

8.3 Student Report

The NECAP Student Report is a single-page, two-sided report printed on 8.5 by 11 inch paper. The front side of the report includes informational text about the design and uses of the assessment. It also describes the three corresponding sections of the reverse side of the report as well as the achievement levels. The reverse side provides a complete picture of an individual student's performance on the NECAP Science test, divided into three sections. The first section provides the student's overall performance for science. In addition to giving the student's achievement level, it presents the scaled score numerically and in a graphic that places the score, including its standard error of measurement, within the full range of possible scaled scores demarcated into the four achievement levels.

The second section of the report displays the student's achievement level in science relative to the percentage of students at each achievement level across the school, district, and state.

The third section shows the student's performance compared to school, district, and statewide performances in each of the four tested science domains: Physical Science, Earth Space Science, Life Science, and Scientific Inquiry.

Student performance is reported in the context of possible points; average points earned for the school, district, and state; and average points earned by students who are minimally proficient on the test (scaled score of 440, 840, or 1140). The average points earned is reported as a range, because it is the average of all students who are minimally proficient, plus or minus one standard deviation.

To provide a more complete picture of the inquiry task portion of the science test (Session 3), each report includes a description of the inquiry task that was administered to all students at that grade. The grade 4 inquiry task always contains a hands-on experiment; the grade 8 inquiry task sometimes contains a hands-on experiment and sometimes contains a paper and pencil data analysis; and the grade 11 inquiry task always contains a paper and pencil data analysis.

The NECAP Student Report is confidential and should be kept secure within the school and district. The Family Educational Rights and Privacy Act (FERPA) requires that access to individual student results be restricted to the student, the student's parents/guardians, and authorized school personnel.

8.4 Item Analysis Report

The NECAP Item Analysis Report provides a roster of all the students in each school and their performances on the common items that will be released to the public. For all grades, the student names and identification numbers are listed as row headers down the left side of the report. The items are listed as column headers across the top in the order they appear in the released item documents (not the position in which they appeared on the test). For each item, seven pieces of information are shown: the released item number, the science domain, the assessment target code, the depth of knowledge code, the item type, the correct response letter (for multiple-choice items), and the total possible points. For each student, multiple-choice items are marked either with a plus sign (+), indicating that the student chose the correct response, or a letter (from A to D), indicating the incorrect response chosen by the student. For constructed-response items, the number of points that the student attained is shown. All responses to released items are shown in the report, regardless of the student's participation status.

The columns on the right side of the report show the total test results broken into several categories. The Domain Points Earned column displays points earned by the student relative to total points possible. The Total Points Earned column is a summary of all points earned and total possible points on the science test. The last two columns show the scaled score and achievement level for each student. For students who are reported as "Not Tested," a code appears in the Achievement Level column to indicate the reason why the student did not test. The descriptions of these codes are in the legend, located after the last page of data in the

report. Not all items used to compute student scores are included in this report; only those items that have been released are included. At the bottom of the report, the average percentage correct for each multiple-choice item and average scores for the short-answer and constructed-response items are shown across the school, district, and state.

The NECAP Item Analysis Report is confidential and should be kept secure within the school and district. The FERPA requires that access to individual student results be restricted to the student, the student's parents/guardians, and authorized school personnel.

8.5 School and District Results Reports

The NECAP School Results Report and the NECAP District Results Report consist of three parts: the grade level summary report (page 2), the content area results (page 3), and the disaggregated content area results (page 4).

The grade level summary report provides a summary of participation in the NECAP Science test and a summary of NECAP Science results. The participation section, on the top half of the page, gives the number and percentage of students who were enrolled on or after May 12, 2009. The total number of students enrolled is defined as the number of students tested plus the number of students not tested.

Because students who were not tested did not participate, average school scores were not affected by nontested students. These students were included in the calculation of the percentage of students participating but not in the calculation of scores. For students who participated in some but not all sessions of the NECAP Science test, overall raw and scaled scores were reported. These reporting decisions were made to support the requirement that all students participate in the NECAP testing program.

Data are provided for the following groups of students, who may not have completed the entire NECAP Science test:

- **Alternate assessment**—Students in this category completed an alternate assessment for the 2008–09 school year.
- **Withdrew after May 12**—Students withdrawing from a school after May 12, 2009, may have taken some sessions of the NECAP Science test prior to their withdrawal from the school.
- **Enrolled after May 12**—Students enrolling in a school after May 12, 2009, may not have had adequate time to participate fully in all sessions of the NECAP Science test.
- **Special consideration**—Schools received state approval for special consideration for an exemption on all or part of the NECAP Science test for any student whose circumstances were not described by the previous categories but for whom the school determined that taking the NECAP Science test would not be possible.
- **Other**—Occasionally, students did not complete the NECAP Science test for reasons other than those listed. These "other" categories were considered not state approved.

The results section, on the bottom half of the page, shows the number and percentage of students performing at each achievement level in science across the school, district, and state. In addition, a mean scaled score is provided across school, district, and state levels. For the district version of this report, the school information is blank.

The content area results page provides information on performance in the four tested science domains (Physical Science, Earth Space Science, Life Science, and Scientific Inquiry). The purpose of this section is to help schools determine the extent to which their curricula are effective in helping students achieve the particular standards and benchmarks contained in the NECAP Science Assessment Targets. Information about the content area for school, district, and state includes

- the total number of students enrolled, not tested for a state approved reason, not tested for another reason, and tested;
- the total number and percentage of students at each achievement level (based on the number in the Tested column); and
- the mean scaled score.

Information about each science domain includes the following:

- The total possible points for that domain. In order to provide as much information as possible for each domain, the total number of points includes both the common items used to calculate scores and additional items in each category used for equating the test from year to year.
- A graphic display of the percentage of total possible points for the school, state, and district. In this graphic display, symbols represent school, district, and state performance. In addition, a line symbolizes the standard error of measurement. This statistic indicates how much a student's score could vary if the student were examined repeatedly with the same test (assuming that no learning were to occur between test administrations).

The disaggregated content area results pages present the relationship between performance and student reporting variables in science across school, district, and state levels. The report shows the number of students categorized as enrolled, not tested for a state approved reason, not tested for another reason, and tested. The report also provides the number and percentage of students within each of the four achievement levels and the mean scaled score by each reporting category.

The list of student reporting categories is as follows:

- All students
- Gender
- Primary race/ethnicity
- Limited English proficiency (LEP) status

- Individualized education program (IEP)
- Socioeconomic status (SES)
- Migrant
- Title I
- 504 plan

The data for achievement levels and mean scaled score are based on the number shown in the Tested column. Reporting categories data were provided by information coded on the students' answer booklets by teachers and/or records linked to the student labels. Because performance is being reported by categories that can contain relatively low numbers of students, school personnel are advised, under FERPA guidelines, to treat these pages confidentially.

It should be noted that for New Hampshire and Vermont, no data were reported for the 504 plan. In addition, for Vermont, no data were reported for Title I.

8.6 District Summary Reports

The NECAP District Summary Report provides details on student performance for all grade levels of NECAP Science tested in the district. The purpose of the report is to help districts determine the extent to which their schools and students achieve the particular standards and benchmarks contained in the NECAP Science Assessment Targets. The NECAP District Summary Report contains no individual school data. The information provided includes

- the total number of students enrolled, not tested for a state approved reason, not tested for another reason, and tested;
- the total number and percentage of students at each achievement level (based on the number in the Tested column); and
- the mean scaled score.

8.7 Decision Rules

To ensure that reported results for the 2008–09 NECAP Science test are accurate relative to collected data and other pertinent information, a document that delineates analysis and reporting rules was created. These decision rules were observed in the analyses of test data and in reporting the test results. Moreover, these rules served as the main reference for quality assurance checks.

The decision rules document used for reporting results of the May 2009 administration of the NECAP Science test is found in Appendix L.

The first set of rules pertains to general issues in reporting scores. Each issue is described, and pertinent variables are identified. The actual rules applied are described by the way they impact analyses and

aggregations and their specific impact on each of the reports. The general rules are further grouped into issues pertaining to test items, school type, student exclusions, and number of students for aggregations.

The second set of rules pertains to reporting student participation. These rules describe which students were counted and reported for each subgroup in the student participation report.

8.8 Quality Assurance

Quality assurance measures are embedded throughout the entire process of analysis and reporting. The data processor, data analyst, and psychometrician assigned to work on the NECAP implement quality control checks of their respective computer programs and intermediate products. Moreover, when data are handed off to different functions within the Psychometrics and Research and Data Services and Static Reporting Departments, the sending function verifies that the data are accurate before handoff. When a function receives a data set, the first step is to verify the data for accuracy.

Another type of quality assurance measure is parallel processing. Students' scaled scores for science are assigned by a psychometrician through a process of equating and scaling. The scaled scores are also computed by a data analyst to verify that scaled scores and corresponding achievement levels are assigned accurately. Respective scaled scores and achievement levels assigned are compared across all students for 100% agreement. Different exclusions assigned to students that determine whether each student receives scaled scores and/or is included in different levels of aggregation are also parallel processed. Using the decision rules document, two data analysts independently write a computer program that assigns students' exclusions. For each grade, the exclusions assigned by each data analyst are compared across all students. Only when 100% agreement is achieved can the rest of the data analysis be completed.

The third aspect of quality control involves the procedures implemented by the quality assurance group to check the veracity and accuracy of reported data. Using a sample of schools and districts, the quality assurance group verifies that reported information is correct. The step is conducted in two parts: (1) verify that the computed information was obtained correctly through appropriate application of different decision rules, and (2) verify that the correct data points populate each cell in the NECAP Science reports. The selection of sample schools and districts for this purpose is very specific and can affect the success of the quality control efforts. Two sets of samples are selected, though they may not be mutually exclusive.

The first set includes those that satisfy the following criteria:

- One school district
- Two school district
- Multischool district

The second set of samples includes districts or schools that have unique reporting situations, as indicated by decision rules. This set is necessary to check that each rule is applied correctly. The second set includes the following criteria:

- Private school
- Small school that receives no school report
- Small district that receives no district report
- District that receives a report but all schools are too small to receive a school report
- School with excluded (not tested) students
- School with homeschooled students

The quality assurance group uses a checklist to implement its procedures. After the checklist is completed, sample reports are circulated for psychometric checks and program management review. The appropriate sample reports are then presented to the client for review and signoff.

Chapter 9. VALIDITY

Because the interpretations of test scores are evaluated for validity, and not the test itself, the purpose of the *2008–09 NECAP Science Technical Report* is to describe several technical aspects of the tests in support of score interpretations (AERA et al., 1999). Each chapter contributes an important component to the investigation of score validation: test development and design; test administration; scoring, scaling, and equating; item analyses; reliability; and score reporting.

The NECAP Science tests are based on, and aligned with, the content standards and performance indicators in the NECAP Science Assessment Targets. Achievement inferences are meant to be useful for program and instructional improvement, and as a component of school accountability.

Standards for Educational and Psychological Testing (AERA et al., 1999) provides a framework for describing sources of evidence that should be considered when evaluating validity. These sources include evidence on the following five general areas: test content, response processes, internal structure, consequences of testing, and relationship to other variables. Although each of these sources may speak to a different *aspect* of validity, they are not distinct *types* of validity. Instead, each contributes to a body of evidence about the comprehensive validity of score interpretations.

A measure of test content validity is to determine how well the test tasks represent the curriculum and standards for each grade level. This is informed by the item development process, including how test blueprints and test items align with the curriculum and standards. Validation through the content lens was extensively described in Chapter 2. Item alignment with content standards; item bias; sensitivity and content appropriateness review processes; adherence to the test blueprint; use of multiple item types; use of standardized administration procedures, with accommodated options for participation; and appropriate test administration training are all components of validity evidence based on test content.

All NECAP Science test questions were aligned by educators with specific content standards and underwent several rounds of review for content fidelity and appropriateness. Items were presented to students in multiple formats (multiple-choice, short-answer, and constructed-response). Finally, tests were administered according to mandated standardized procedures, with allowable accommodations, and all test coordinators and administrators were required to familiarize themselves with and adhere to all of the procedures outlined in the *NECAP Principal/Test Coordinator* and *Test Administrator Manuals*.

The scoring information in Chapter 4 described both the steps taken to train and monitor hand scorers and the quality control procedures related to scanning and machine scoring. Additional studies might be helpful for evidence on student response processes. For example, think-aloud protocols could be used to investigate students' cognitive processes when confronting test items.

Evidence on internal structure was extensively detailed in the discussions of item analyses, scaling, and reliability in Chapters 5, 6, and 7. Technical characteristics of the internal structure of the tests were presented in terms of classical item statistics (item difficulty and item-test correlation), differential item

functioning (DIF) analyses, a variety of reliability coefficients, standard errors of measurement (SEMs), multidimensionality hypothesis testing and effect size estimation, and item response theory (IRT) parameters and procedures. In general, item difficulty indices were within acceptable and expected ranges; very few items were answered correctly at near chance or near perfect rates. Similarly, the positive discrimination indices indicated that students who performed well on individual items tended to perform well overall.

Evidence on the consequences of testing was addressed in the information on scaled scores and reporting in Chapters 6 and 8 and in the *Guide to Using the 2009 NECAP Science Reports*, which is a separate document. Each of these speaks to efforts undertaken to provide the public with accurate and clear test score information. Scaled scores simplify results reporting across content areas, grade levels, and successive years. Achievement levels give reference points for mastery at each grade level—another useful and simple way to interpret scores. Several different standard reports were provided to stakeholders. Evidence on the consequences of testing could be supplemented with broader research on the NECAP Science test's impact on student learning.

9.1 Questionnaire Data

A measure of external validity was provided by comparing student performance with answers to a questionnaire administered at the end of the test. The number of questions to which students responded was 12, 16, and 19, respectively, in grades 4, 8, and 11. Most of the questions were designed to gather information about students and their study habits; however, a subset could be utilized in the test of external validity. Two questions were expected to correlate most highly with student performance on the NECAP Science tests. To the extent that the answers to those questions did correlate with student performance in the anticipated manner, the external validity of score interpretations was confirmed.

With minor variations by grade, Question No. 8 in grade 4, Question No. 9 in grade 8, and Question No. 8 in grade 11 read as follows:

> How often do you do science experiments or inquiry tasks in your class like the one that you did on this science test?
>
> A. one or more times each week
> B. once/a few times a month
> C. a few times a year
> D. never or almost never

It might be anticipated that students who did such activities more often would have higher average scaled scores and achievement level designations than students who did them less often. As can be seen in Table 9-1, with the exception of the students who responded "A," there was a very slight decreasing trend in

scores of students across responses. Overall, the relationship between responses to the question and performance on the science test is too weak to draw meaningful inferences about validity.

Table 9-1. 2008–09 NECAP Science: Average Scaled Scores, and Counts and Percentages Within Performance Levels, of Responses to Science Inquiry Item* on Student Questionnaire

Grade	*Response*	*Number of responses*	*% of responses*	*Avg SS*	*N SBP*	*% SBP*	*N PP*	*% PP*	*N P*	*% P*	*N PWD*	*% PWD*
4	(Blank)	3,519	12	438	491	14	1,418	40	1,589	45	21	1
	A	9,253	30	439	1,247	13	3,537	38	4,432	48	37	0
	B	8,583	28	440	905	11	3,202	37	4,432	52	44	1
	C	6,434	21	439	792	12	2,526	39	3,094	48	22	0
	D	2,696	9	438	357	13	1,147	43	1,186	44	6	0
8	(Blank)	3,692	11	830	1,515	41	1,528	41	631	17	18	0
	A	8,382	25	833	2,381	28	4,152	50	1,809	22	40	0
	B	15,932	47	834	3,793	24	8,304	52	3,773	24	62	0
	C	3,792	11	833	1,106	29	1,838	48	823	22	25	1
	D	1,934	6	829	868	45	846	44	218	11	2	0
11	(Blank)	4,584	14	1130	2,050	45	1,734	38	780	17	20	0
	A	2,650	8	1133	916	35	1,106	42	608	23	20	1
	B	7,656	23	1135	1,767	23	3,649	48	2,175	28	65	1
	C	8,089	25	1134	2,046	25	4,042	50	1,940	24	61	1
	D	9,617	30	1133	3,323	35	4,418	46	1,811	19	65	1

*Question: How often do you do science experiments or inquiry tasks in your class like the one that you did on this science test? Answer options: A. one or more times each week; B. once/a few times a month; C. a few times a year; D. never or almost never

SS = scaled score; SBP = Substantially Below Proficient; PP = Partially Proficient; P = Proficient; PWD = Proficient With Distinction

With minor variations by grade, Question No. 11 in grade 4, Question No. 13 in grade 8, and Question No. 15 in grade 11 read as follows:

How often do you do have science homework?

- A. every day
- B. a few times a week
- C. a few times a month
- D. I usually don't have homework in science
- E. I am not taking science this year (grade 11 only)

In this case, there is a discernable trend for grade 11, where students who reported having more science homework performed better on the test. For grades 4 and 8, however, there is little or no consistent relationship between responses to the question and performance on the test, as can be seen in Table 9-2.

Table 9-2. 2008–09 NECAP Science: Average Scaled Scores, and Counts and Percentages Within Performance Levels, of Responses to Science Homework Item* on Student Questionnaire

Grade	Response	Number of responses	% of responses	Avg SS	N SBP	% SBP	N PP	% PP	N P	% P	N PWD	% PWD
4	(Blank)	3,767	12	438	540	14	1,535	41	1,671	44	21	1
	A	550	2	433	181	33	207	38	160	29	2	0
	B	3,340	11	437	562	17	1,380	41	1,390	42	8	0
	C	5,695	19	440	578	10	2,144	38	2,943	52	30	1
	D	17,133	56	440	1,931	11	6,564	38	8,569	50	69	0
8	(Blank)	3,733	11	830	1,546	41	1,541	41	627	17	19	1
	A	5,325	16	833	1,518	29	2,693	51	1,088	20	26	0
	B	16,699	50	834	4,160	25	8,576	51	3,890	23	73	0
	C	4,686	14	834	1,194	25	2,333	50	1,138	24	21	0
	D	3,289	10	830	1,245	38	1,525	46	511	16	8	0
11	(Blank)	4,038	12	1130	1,855	46	1,478	37	685	17	20	0
	A	6,083	19	1136	1,119	18	2,826	46	2,057	34	81	1
	B	12,854	39	1135	2,832	22	6,449	50	3,466	27	107	1
	C	3,292	10	1133	1,117	34	1,507	46	651	20	17	1
	D	2,707	8	1130	1,300	48	1,140	42	262	10	5	0
	E	3,622	11	1129	1,879	52	1,549	43	193	5	1	0

*Question: How often do you have science homework? Answer options: A. every day; B. a few times a week; C. a few times a month; D. I usually don't have homework in science; E. I am not taking science this year
SS = scaled score; SBP = Substantially Below Proficient; PP = Partially Proficient; P = Proficient; PWD = Proficient With Distinction

See Appendix M for a copy of the questionnaire and complete data comparing questionnaire items and test performance.

9.2 Validity Studies Agenda

The remaining part of this chapter describes further studies of validity that could enhance the investigations that have already been performed. The proposed areas of validity to be examined fall into four categories: external validity, convergent and discriminant validity, structural validity, and procedural validity.

9.2.1 External Validity

In the future, investigations of external validity could involve targeted examination of the variables that correlate with NECAP Science results. For example, data could be collected on the grades of each student who took the NECAP Science tests. As with the analysis of student questionnaire data, crosstabulations of NECAP achievement levels and assigned grades could be created. The average NECAP scaled score could also be computed for each possible assigned grade (A, B, C, etc.). NECAP scores could also be correlated with other appropriate classroom tests in addition to final grades.

Further evidence of external validity might come from correlating NECAP Science scores with scores on another standardized test, such as the Iowa Test of Basic Skills.

9.2.2 Convergent and Discriminant Validity

The concepts of convergent and discriminant validity were defined by Campbell and Fiske (1959) as specific types of validity that fall under the umbrella of construct validity. *Convergent validity* is the notion that measures or variables that are intended to align should actually be aligned in practice. *Discriminant validity*, on the other hand, is the idea that measures or variables that are intended to differ should not be too highly correlated. Evidence for validity comes from examining whether the correlations among variables are as expected in direction and magnitude.

Campbell and Fiske (1959) introduced the study of different traits and methods as the means of assessing convergent and discriminant validity. *Traits* refer to the constructs that are being measured (e.g., mathematical ability), and *methods* are the instruments of measuring them (e.g., a mathematics test or grade). To utilize the framework of Campbell and Fiske, it is necessary that more than one trait and more than one method be examined. Analysis is performed through the multitrait/multimethod matrix, which gives all possible correlations of the different combinations of traits and methods. Campbell and Fiske defined four properties of the multitrait/multimethod matrix that serve as evidence of convergent and discriminant validity:

- The correlation among different methods of measuring the same trait should be sufficiently different from zero. For example, scores on a science test and grades in a science class should be positively correlated.
- The correlation among different methods of measuring the same trait should be higher than that of different methods of measuring different traits. For example, scores on a science test and grades in a science class should be more highly correlated than scores on a science test and grades in a reading class.
- The correlation among different methods of measuring the same trait should be higher than the same method of measuring different traits. For example, scores on a science test and grades in a science class should be more highly correlated than scores on a science test and scores on an analogous reading test.
- The pattern of correlations should be similar across comparisons of different traits and methods. For example, if the correlation between test scores in science and mathematics is higher than the correlation between test scores in science and writing, it is expected that the correlation between grades in science and mathematics would also be higher than the correlation between grades in science and writing.

For NECAP Science, convergent and discriminant validity could be examined by constructing a multitrait/multimethod matrix and analyzing these four pieces of evidence. The traits examined would be science versus mathematics, reading, and writing; different methods would include respective NECAP scores and such variables as grades, teacher judgments, and scores on another standardized test.

9.2.3 Structural Validity

Though the previous types of validity examine the concurrence between different measures of the same content area, structural validity focuses on the relationship between strands *within* a content area, thus supporting content validity. Standardized tests are carefully designed to ensure that all appropriate strands of a content area are adequately covered in the test, and *structural validity* is the degree to which these different strands are correlated in the intended manner. For instance, it is desired that performance on different strands of a content area be positively correlated; however, as these strands are designed to measure distinct components of the content area, it is reasonable to expect that each strand would contribute a unique component to the test. Additionally, it is desired that the correlation between different item types (multiple-choice, short-answer, and constructed-response) of the same content area be positive.

As an example, an analysis of NECAP Science structural validity would investigate the correlation of performance in Physical Science with that in Earth Space Science and Life Science. The concordance between performance on multiple-choice items and constructed-response items would also be examined. Such a study would address the consistency of NECAP Science tests within each grade. In particular, the dimensionality analyses of Chapter 5 could be expanded to include confirmatory analyses addressing these concerns.

9.2.4 Procedural Validity

As mentioned earlier, the *NECAP Principal/Test Coordinator* and *Test Administrator Manuals* delineated the procedures to which all NECAP Science test coordinators and administrators were required to adhere. A study of procedural validity would provide a comprehensive documentation of the procedures that were followed throughout the NECAP Science administration. The results of the documentation would then be compared to the manuals, and procedural validity would be confirmed to the extent that the two were in alignment. Evidence of procedural validity is important because it verifies that the actual administration practices were in accord with the intentions of the design.

Possible instances where discrepancies can exist between design and implementation include the following: a teacher spirals test forms incorrectly within a classroom; cheating among students occurs; or answer documents are scanned incorrectly. These are examples of administration error. A study of procedural validity involves capturing any administration errors and presenting them within a cohesive document for review.

REFERENCES

Allen, Mary J. & Yen, Wendy M. (1979). *Introduction to Measurement Theory.* Belmont, CA: Wadsworth, Inc.

American Educational Research Association, American Psychological Association, & National Council on Measurement in Education. (1999). *Standards for educational and psychological testing*. Washington, DC: American Educational Research Association.

Baker, F.B., & Kim, S-H.(2004). *Item Response Theory: parameter estimation techniques* (2nd ed.). New York: Marcel Dekker, Inc.

Brown, F. G. (1983). *Principles of educational and psychological testing* (3rd ed.). Fort Worth, TX: Holt, Rinehart and Winston.

Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin, 56*, 81–105.

Cohen, J. (1960). A coefficient of agreement for nominal scales. *Educational and Psychological Measurement*, *20*, 37–46.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, *16*, 297–334.

Dorans, N. J., & Holland, P. W. (1993). DIF detection and description. In P. W. Holland & H. Wainer (Eds.) *Differential item functioning* (pp. 35–66). Hillsdale, NJ: Lawrence Erlbaum Associates.

Dorans, N. J., & Kulick, E. (1986). Demonstrating the utility of the standardization approach to assessing unexpected differential item performance on the Scholastic Aptitude Test. *Journal of Educational Measurement*, *23,* 355–368.

Draper, N. R., & Smith, H. (1998). *Applied regression analysis* (3rd ed.). New York: John Wiley & Sons.

Feldt, L. S., & Brennan, R. L. (1989). Reliability. In R. L. Linn (Ed.) *Educational measurement* (3rd ed.) (pp. 105–146). New York: Macmillan.

Hambleton, R. K., & Swaminathan, H. (1985). *Item response theory: Principles and applications.* Boston, MA: Kluwer Academic Publishers.

Hambleton, R. K., Swaminathan, H., & Rogers, H. J. (1991). *Fundamentals of item response theory.* Newbury Park, CA: Sage Publications.

Hambleton, R. K., & van der Linden, W. J. (1997). *Handbook of modern item response theory.* New York: Springer-Verlag.

Joint Committee on Testing Practices. (1988). C*ode of fair testing practices in education*. Washington, DC: National Council on Measurement in Education.

Livingston, S. A., & Lewis, C. (1995). Estimating the consistency and accuracy of classifications based on test scores. *Journal of Educational Measurement*, *32,* 179–197.

Lord, F. M., & Novick, M. R. (1968). *Statistical theories of mental test scores.* Reading, MA: Addison-Wesley.

Muraki, E., & Bock, R. D. (2003). *PARSCALE 4.1*. Lincolnwood, IL: Scientific Software International.

Petersen, N.S., Kolen, M.J., & Hoover, H.D. (1989). Scaling, norming, and equating. In R.L. Linn (Ed.), *Educational measurement* (3rd ed., pp. 221-262).

Stocking, M. L., & Lord, F. M. (1983). Developing a common metric in item response theory. *Applied Psychological Measurement, 7,* 201-210

Stout, W. F. (1987). A nonparametric approach for assessing latent trait dimensionality. *Psychometrika, 52,* 589–617.

Stout, W. F., Froelich, A. G., & Gao, F. (2001). Using resampling methods to produce an improved DIMTEST procedure. In A. Boomsma, M. A. J. van Duign, & T. A. B. Snijders (Eds.) *Essays on item response theory* (pp. 357–375). New York: Springer–Verlag.

Zhang, J., & Stout, W. F. (1999). The theoretical DETECT index of dimensionality and its application to approximate simple structure. *Psychometrika, 64,* 213–249.

APPENDICES

Appendix A—Guidelines for the Development of Science Inquiry Tasks

NECAP
Science Assessment

Guidelines for the Development of Science Inquiry Tasks

Created in Partnership by the New Hampshire, Rhode Island, and Vermont Departments of Education

February 2008

Introduction: Inquiry in the NECAP Science Assessment

Defining the NECAP Science Assessment Inquiry Task

Focus – The Science Inquiry Task at every grade level should be rich and engaging. The task may be an experimental question or observational question – it is the quality of the task that is most important. Regardless of the type of task, all Four Broad Areas of Inquiry as defined in the *NECAP Schema for Assessing Scientific Inquiry* (see column headings in the table on page 6), will be assessed. The task should flow from beginning to end in a purposeful way that allows students to make connections, express their ideas, and provide evidence of scientific thinking.

Design – Inquiry Tasks should be rooted in one or more NECAP Science Assessment Targets (one of which should have INQ code) and over time should address a variety of content domains. For every task at grades four and eight there must be scoreable components from each of the Four Broad Areas of Inquiry. At grade 11, while the focus of the task may be on constructs in the Area of Developing and Evaluating Explanations (column 4), scoreable items from each of the other three Broad Areas of Inquiry should also be included.

Task development will be guided by *Guidelines for the Development of Science Inquiry Tasks* (*GDIT*). For each item within a Science Inquiry Task, the developer must identify the Depth of Knowledge (DOK), the Inquiry Construct number, score points, and key elements (scoring notes). Over time, all Inquiry Constructs should be addressed at each grade level. See the Appendix for additional information about the Inquiry Task development process.

Goal – Science Inquiry Tasks will engage students in a range of Depth of Knowledge experiences up to and including strategic thinking (DOK 3). Individual tasks may look different, but each should focus on providing insight into how students engage in scientific thinking. The goal is to encourage the meaningful inclusion of inquiry in classrooms at all levels.

Applying the Guidelines of the Science NECAP Assessment Task in the Classroom

Background – The first version of *Guidelines for Development of Science Inquiry Tasks* was originally created by the Science Specialists from the New Hampshire, Rhode Island, and Vermont Departments of Education to facilitate and refine the development of Inquiry Tasks for the NECAP Science Assessment. It became clear that such a tool would be useful to teachers and local science specialists to guide them in the development of similar tasks for classroom use at all levels. The State Science Specialists have collaborated on this version of *GDIT* to help educators understand and employ the constructs of the Four Broad Areas of Inquiry as they design or evaluate inquiry tasks for classroom instruction and assessment.

Focus - Classroom inquiry tasks should be relevant, engaging and meaningful learning experiences for students. The classroom inquiry tasks included on the state Department of Education website are examples of the kinds of tasks found in the NECAP Science Assessment. In the classroom any inquiry activity should provide regular opportunities for students to experience the science process as defined in the *NECAP Schema for Assessing Scientific Inquiry* (see page 4). Analysis of student performance on classroom inquiry tasks can inform instruction by providing data on student proficiencies within the constructs across the Four Broad Areas of Inquiry. Classroom inquiry tasks might be used as a component of local assessment or as a classroom summative assessment for a specific unit.

Design - While there are many ways to design inquiry experiences and an assessment for the classroom, *GDIT* provides a framework for the development of rich performance assessments that are aligned with this component of the NECAP Science Assessment. *GDIT* offers the necessary details for teachers to develop classroom inquiry tasks that are similar in structure to the NECAP Science Inquiry Tasks. Each classroom inquiry task will include elements from each of the Four Broad Areas of Inquiry, and address specific constructs within each Broad Area. Classroom inquiry tasks can span a class period, a few days or the length of a unit. Classroom inquiry tasks related to units of study provide opportunities for students to become familiar with the format of the NECAP Science Inquiry Tasks and will help to prepare them for the state assessment

Goals - The main goals of *Guidelines for Development of Science Inquiry Tasks* are to help educators:

- encourage the inclusion of engaging and relevant inquiry experiences in classrooms that contribute to increasing the science literacy of the citizens of New Hampshire, Rhode Island and Vermont;

- develop, evaluate and implement rich science tasks that allow students to gain skills across the Four Broad Areas of Inquiry;

- understand the process and parameters used in the development of Inquiry Tasks for the NECAP Science Assessment;

- provide opportunities for students to become familiar with the format and requirements of the NECAP Science Inquiry Tasks.

NECAP Science Inquiry Constructs for all Grade Levels

NECAP Science Schema for Assessing Scientific Inquiry (with DOK levels for constructs)				
Broad Areas of Inquiry to be Assessed	**Formulating Questions & Hypothesizing**	**Planning and Critiquing of Investigations**	**Conducting Investigations**	**Developing and Evaluating Explanations**
Constructs for each Broad Area of Inquiry (including intended DOK Ceiling Levels, based on Webb Depth of Knowledge Levels for Science – see also Section II) ***Inquiry Constructs answer the question: What is it about the broad area of Inquiry that we want students to know and be able to do?***	**1.** Analyze information from observations, research, or experimental data for the purpose of formulating a question, hypothesis, or prediction: **(DOK 3)** **1a.** Appropriate for answering with scientific investigation **1b.** For answering using scientific knowledge **2.** Construct coherent argument in support of a question, hypothesis, prediction **(DOK 2 or 3 depending on complexity of argument)** **3.** Make and describe observations in order to ask questions, hypothesize, make predictions related to topic **(DOK 2)**	**4.** Identify information/evidence that needs to be collected in order to answer the question, hypothesis, prediction **(DOK 2 – routine; DOK 3 non-routine/ more than one dependant variable)** **5.** Develop an organized and logical approach to investigating the question, including controlling variables **(DOK 2 – routine; DOK 3 non-routine)** **6.** Provide reasoning for appropriateness of materials, tools, procedures, and scale used in the investigation **(DOK 2)**	**7.** Follow procedures for collecting and recording qualitative or quantitative data, using equipment or measurement devices accurately **(DOK 1 – use tools; routine procedure;** DOK 2 – follow multi-step procedures; make observations) **8.** Use accepted methods for organizing, representing, and manipulating data **(DOK 2 – compare data; display data)** **9.** Collect sufficient data to study question, hypothesis, or relationships **(DOK 2 – part of following procedures)** **10.** Summarize results based on data **(DOK 2)**	**11.** Analyze data, including determining if data are relevant, artifact, irrelevant, or anomalous **(DOK 2 – specify relationships between facts; ordering, classifying data)** **12.** Use evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis **(DOK 3)** **13.** Communicate how scientific knowledge applies to explain results, propose further investigations, or construct and analyze alternative explanations **(DOK 3)**

NECAP Science Assessment Inquiry Task Flow

Administration of each Science Inquiry Performance Task (Grades 4 and 8) should follow the sequence below:

Prior to start of Session 3:

- Set up materials
- Group students

Standard Flow of NECAP Science Inquiry Performance Tasks:
(Grades 4 and 8)

1. Directions read aloud by Test Administrator (basic info)
2. Scenario read aloud by Test Administrator (context)
3. Description of the materials and/or model explained by Test Administrator. Students make a prediction individually
4. Students conduct investigation with partner
5. Students clean up kits/experiment with partner
6. Students return to desks with their own Task Booklet to work individually
7. Test Administrator distributes Student Answer Booklets to students
8. Students copy data from Task Booklet to Student Answer Booklet (non-scored)
9. Students answer eight (8) scored questions in Student Answer Booklet

   A. For analyzing the prediction, there will be Yes/No check boxes with space for the narrative below.

   B. At grades 4 and 8, the question where students must graph data will have a hard-coded grid (1/2- inch squares) in the answer box with lines for *x* and *y* axis labels as well as a title. At grade 11, use 1/4- inch squares.

   .

Standard Flow of NECAP Science Inquiry Data Analysis Tasks:
(Grades 8 and 11)

1. Test Administrator distributes Student Answer Booklets to students
2. Directions read aloud by Test Administrator (basic info)
3. Scenario read aloud by Test Administrator (task context)
4. Students answer questions related to the scenario and complete data analysis in the Student Answer Booklet.
5. Items will require high school students to consider the Inquiry Constructs in relation to a selected data set.
6. Upon completion of the task students sit quietly and read until dismissal.

Broad Area 1: Formulating Questions and Hypothesizing

Grade 4

Standard: *Task must provide students a scenario that describes objects, organisms, or events within the environment. The scenario must include information relevant to grade 4 students and sufficient for them to construct questions and/or predictions based upon observations, past experiences, and scientific knowledge.*

Note: *bullets addressing constructs are not all inclusive.*

Inquiry Construct:	Items addressing this construct require students to:
1. Analyze information from observations, research, or experimental data for the purpose of formulating a question, hypothesis, or prediction: **1a.** Appropriate for answering with scientific investigation **1b.** For answering using scientific knowledge **DOK 3**	• analyze scientific data and use that information to generate a testable question or a prediction that includes a cause and effect relationship; • generate a question or prediction which is reasonable in terms of available evidence; • support a question or prediction with an explanation. **Note:** Addressing this construct may appear at the beginning of the task, the end, or both.
2. Construct coherent argument in support of a question, hypothesis, prediction **DOK 2 or 3** depending on complexity of argument	• identify evidence that supports or does not support a question or prediction.
3. Make and describe observations in order to ask questions, hypothesize, make predictions related to topic **DOK 2**	• connect observations to a question or prediction. **Note:** Items may refer to an existing, new, or student-generated question or prediction.

Broad Area 2: Planning and Critiquing of Investigations

Grade 4

Standard: *Task requires students to plan or analyze a simple experiment based upon questions or predictions derived from the scenario. The experiment and related items should emphasize fairness in its design.*

Note: The words "procedure" and "plan" are synonymous.

Inquiry Construct:	Items addressing this construct require students to:
4. Identify information and/or evidence that needs to be collected in order to answer the question, hypothesis, prediction **DOK 2** (routine) **DOK 3** (non-routine or more than one dependant variable)	• identify the types of evidence that should be gathered to answer the question; • design an appropriate format, such as data tables or charts, for recording data. **Note:** These items could appear at the end of the task.
5. Develop an organized and logical approach to investigating the question, including controlling variables **DOK 2** (routine) **DOK 3** (non-routine)	• develop a procedure to gather sufficient evidence (including multiple trials) to answer the question or test the prediction; • develop a procedure that lists steps logically and sequentially; • develop a procedure that changes one variable at a time. **Note:** These items could appear at the end of the task. Use of the term "variable" should not appear in the item stem.
6. Provide reasoning for appropriateness of materials, tools, procedures, and scale used in the investigation **DOK 2**	• explain why the materials, tools, or procedure for the task are or are not appropriate for the investigation.

Broad Area 3: Conducting Investigations

Grade 4

Standard: *The procedure requires the student to demonstrate simple skills (observing, measuring, basic skills involving fine motor movement). The investigation requires the student to use simple scientific equipment (rulers, scales, thermometers) to extend their senses. The procedure provides the student with an opportunity to collect sufficient data to investigate the question, prediction, or relationships. Student is required to organize and represent qualitative or quantitative data using blank graph/chart templates. Student is required to summarize data.*

Note: Metric measurements are used for Grade 4, except for those pertaining to weather.

Note: Multiple trials mean repeating the experiment to collect multiple sets of data.

Inquiry Construct	Items addressing this construct require students to:
7. Follow procedures for collecting and recording qualitative or quantitative data, using equipment or measurement devices accurately **DOK 1:** use tools; routine procedure; **DOK 2:** follow multi-step procedures; make observations	• record precise data and observations that are consistent with the procedure of the investigation; • include appropriate units of all measurements; • use appropriate measurement tools correctly to collect data; • record and label relevant details within a scientific drawing or diagram.
8. Use accepted methods for organizing, representing, and manipulating data **DOK 2:** compare data; display data	• represent data accurately in a graph/table/chart; • include titles , labels, keys or symbols as needed; • select a scale appropriate for the range of data to be plotted; • use common terminology to label representations; • identify relationships among variables based upon evidence.
9. Collect sufficient data to study question, hypothesis, or relationships **DOK 2** part of following procedures	• show understanding of the value of multiple trials; • relate data to original question and prediction; • determine if the quantity of data is sufficient to answer the question or support or refute the prediction.
10. Summarize results based on data **DOK 2**	• consider all data when developing an explanation and/or conclusion; • identify patterns and trends in data.

Broad Area 4: Developing and Evaluating Explanations

Grade 4

Standard: *Task must provide the opportunity for students to use data to construct an explanation based on their science knowledge and evidence from experimentation or investigation.*

Inquiry Construct	Items addressing this construct require students to:
11. Analyze data, including determining if data are relevant, artifact, irrelevant, or anomalous **DOK 2 -** specify relationships between facts; ordering, classifying data	• identify data relevant to the task or question ; • identify factors that may affect experimental results (e.g. variables, experimental error, environmental conditions); • classify data into meaningful categories.
12. Use evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis **DOK 3**	• identify data that seem inconsistent ; • use evidence to support or refute a prediction; • use evidence to justify an interpretation of data or trends; • identify and explain differences or similarities between prediction and experimental data; • provide a reasonable explanation that accurately reflects data; • use mathematical reasoning to determine or support conclusions.
13. Communicate how scientific knowledge applies to explain results, propose further investigations, or construct and analyze alternative explanations **DOK 3**	• explain how experimental results compare to accepted scientific understanding; • suggest ways to modify the procedure in order to collect sufficient data; • identify additional data that would strengthen an investigation; • connect the investigation or model to a real world example; • propose new questions, predictions, next steps or technology for further investigations; • design an investigation to further test a prediction.

Broad Area 1: Formulating Questions and Hypothesizing

Grade 8

Standard: *Task must provide students a scenario that describes objects, organisms, or events to which the student will respond. The task will provide the student with the opportunity to develop their own testable questions or predictions based upon their experimental data, observations, and scientific knowledge. The task could include opportunities for the student to refine and refocus questions or hypotheses related to the scenario using their scientific knowledge and information*

Inquiry Construct	Items addressing this construct require students to:
1. Analyze information from observations, research, or experimental data for the purpose of formulating a question, hypothesis, or prediction: **(DOK 3)** **1a.** Appropriate for answering with scientific investigation **1b.** For answering using scientific knowledge	• analyze scientific data and use that information to generate a testable question or a prediction that includes a cause and effect relationship; • generate a question or a prediction which is reasonable in terms of available evidence; • support their question or prediction with a <u>scientific</u> explanation; • <u>refine or refocus a question or hypothesis using experimental data, research, or scientific knowledge.</u> **Note:** Addressing this construct may appear at the beginning of the task, the end, or both.
2. Construct coherent argument in support of a question, hypothesis, prediction **DOK 2 or 3** depending on complexity of argument	• identify evidence that supports or does not support a question, <u>hypothesis</u> or prediction; • <u>explain the cause and effect relationship within the hypothesis or prediction;</u> • <u>use a logical argument to explain how the hypothesis or prediction is connected to a scientific concept, or observation.</u>
3. Make and describe observations in order to ask questions, hypothesize, make predictions related to topic **DOK 2**	• connect observations to a question or prediction. **Note:** Items may refer to an existing, new, or student-generated question or prediction.

Broad Area 2: Planning and Critiquing of Investigations

Grade 8

Standard: *The task will require students to plan or analyze an experiment or investigation based upon questions, hypothesis, or predictions derived from the scenario. An experiment must provide students with the opportunity to identify and control variables. The task will provide opportunities for students to think critically about experiments and investigations and may ask students to propose alternatives.* **Note:** Scale refers to proportionality between the model and what it represents or the frequency with which data are collected.	
Inquiry Construct	***Items addressing this construct require students to:***
4. Identify information/evidence that needs to be collected in order to answer the question, hypothesis, prediction **DOK 2:** routine; **DOK 3:** non-routine/ more than one dependant variable	• identify the types of evidence that should be gathered to answer the question, or support or refute the prediction ; • identify the variables that may affect the outcome of the experiment or investigation; • design an appropriate format for recording data; • evaluate multiple data sets to determine which data are relevant to the question, hypothesis or prediction. **Note:** These items could appear at the end of the task
5. Develop an organized and logical approach to investigating the question, including controlling variables **DOK 2**: routine (replicates existing procedure); **DOK 3:** non-routine (extends, refines, or improves existing procedure)	• develop a procedure to gather sufficient evidence (including multiple trials) to answer the question, or test the hypothesis, or prediction; • develop a procedure that lists steps sequentially and logically; • explain which variable will be manipulated or changed (independent) and which variable will be affected by those changes (dependent); • identify variables that will be kept constant throughout the investigation; • use scientific terminology that supports the identified procedures; • evaluate the organization and logical approach of a given procedure including variables, controls, materials, and tools; • evaluate investigation design, including opportunities to collect appropriate and sufficient data. **Note:** These items could appear at the beginning or the end of the task.
6. Provide reasoning for appropriateness of materials, tools, procedures, and scale used in the investigation **DOK 2**	• explain why the materials, tools, procedure, or scale for a task are appropriate or are inappropriate for the investigation. • evaluate the investigation for the safe and ethical considerations of the materials, tools, and procedures.

Broad Area 3: Conducting Investigations

Grade 8

Standard: *The procedure requires the student to demonstrate skills (observing, measuring, basic skills involving fine motor movement) and mathematical understanding. The materials involved in the investigation are authentic to the task required. The procedure provides the student with an opportunity to collect sufficient data to investigate the question, prediction/hypothesis, or relationships. Student is required to organize and represent qualitative or quantitative data. Student is required to summarize data to form a logical argument.* **Note:** Metric units are used for all Grade 8 measurements. **Note:** Multiple trials means repeating the experiment to collect multiple sets of data.	
Inquiry Construct	**Items addressing this construct require students to:**
7. Follow procedures for collecting and recording qualitative or quantitative data, using equipment or measurement devices accurately **DOK 1:** use tools; routine procedure; **DOK 2:** follow multi-step procedures; make observations	• record precise data and observations that are consistent with the procedure of the investigation; • include appropriate units of all measurements; • use appropriate measurement tools correctly to collect data; • record and label relevant details within a scientific drawing.
8. Use accepted methods for organizing, representing, and manipulating data **DOK 2:** compare data; display data	• represent data accurately in an appropriate graph/table/chart; • include titles, labels, keys or symbols as needed; • select a scale appropriate for the range of data to be plotted; • use scientific terminology to label representations; • identify relationships among variables based upon evidence. **Note:** The standard practice of graphing in science is to represent the independent on the *x*-axis and the dependent variable on the *y*- axis.
9. Collect sufficient data to study question, hypothesis, or relationships **DOK 2**: part of following procedures	• show understanding of the value of multiple trials; • relate data to original question, hypothesis or prediction; • determine if the quantity of data is sufficient to answer the question or support or refute the hypothesis or prediction.
10. Summarize results based on data **DOK 2**	• consider all data when developing an explanation/conclusion; • identify patterns and trends in data.

Broad Area 4: Developing and Evaluating Explanations

Grade 8

Standard *Task must provide the opportunity for students to use data to construct an explanation based on their science knowledge and evidence from experimentation or investigation. The task requires students to use qualitative and quantitative data to communicate conclusions and support/refute prediction/hypothesis.*	
Inquiry Construct	**Items addressing this construct require students to:**
11. Analyze data, including determining if data are relevant, artifact, irrelevant, or anomalous **DOK 2:** specify relationships between facts; ordering, classifying data	• identify data relevant to the task or question; • identify factors that may affect experimental results (e.g. variables, experimental error, environmental conditions); • classify data into meaningful categories; • compare experimental data to accepted scientific data provided as part of the task; • use mathematical and statistical techniques to analyze data; • provide a reasonable explanation that accurately reflects data; • use content understanding to question data that might seem inaccurate; • evaluate the significance of experimental data.
12. Use evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis **DOK 3**	• identify and explain data, interpretations or conclusions that seem inaccurate; • use evidence to support or refute question or hypothesis; • use evidence to justify an interpretation of data or trends; • identify and explain differences or similarities between predictions and experimental data; • provide a reasonable explanation that accurately reflects data; • use mathematical computations to determine or support conclusions.
13. Communicate how scientific knowledge applies to explain results, propose further investigations, or construct and analyze alternative explanations **DOK 3**	• explain how experimental results compare to accepted scientific understanding; • recommend changes to procedures to produce data that would provide sufficient data and more accurate analysis; • identify and justify additional data that would strengthen an investigation; • connect the investigation or model to an authentic situation; • propose and evaluate new questions, predictions, next steps or technology for further investigations or alternative explanations; • account for limitations and/or sources of error within the experimental design; • apply experimental results to a new problem or situation.

Broad Area 1: Formulating Questions and Hypothesizing

Grade 11

***Standard**: Task must provide students a scenario with information and detail sufficient for the student to create a testable prediction or hypothesis. Students will draw upon their science knowledge base to advance a prediction or hypothesis using appropriate procedures and controls; this may include an experimental design.*

Inquiry Construct	Items addressing this construct require students to:
1. Analyze information from observations, research, or experimental data for the purpose of formulating a question, hypothesis, or prediction. **1a.** Appropriate for answering with scientific investigation **1b.** For answering using scientific knowledge **DOK 3**	• analyze scientific data and use that information to generate a testable question, hypothesis, or prediction that includes a cause and effect relationship; • generate a question, hypothesis or a prediction which is reasonable in terms of available evidence; • show connections between hypothesis or prediction and scientific knowledge, observations, or research; • support their question, hypothesis, or prediction with a scientific explanation; • refine or refocus a question or hypothesis using experimental data, research, or scientific knowledge. **Note:** Addressing this construct may appear at the beginning of the task, the end, or both.
2. Construct coherent argument in support of a question, hypothesis, prediction. **DOK 2 or 3:** depends on complexity of argument	• identify evidence that supports or does not support a question, hypothesis or prediction • explain the cause and effect relationship within the hypothesis or prediction; • use a logical argument to support the hypothesis or prediction using scientific concepts, principles, or observations.
3. Make and describe observations in order to ask questions, hypothesize, make predictions related to topic. **DOK 2**	• connect observations and data to a question, hypothesis, or prediction. **Note:** Items may refer to an existing, new, or student-generated question, hypothesis, or prediction.

Broad Area 2: Planning and Critiquing of Investigations

Grade 11

Standard: *The task will require students to plan or analyze an experiment or investigation based upon questions, hypothesis, or predictions derived from the scenario. An experiment must provide students with the opportunity to identify and control variables. The task will provide opportunities for students to think critically and construct an argument about experiments and investigations and may ask students to propose alternatives. Task will require the student to identify and justify the appropriate use of tools, equipment, materials, and procedures involved in the experiment.* **Note:** Scale refers to proportionality between the model and what it represents or the frequency with which data are collected.	
Inquiry Construct	**Items addressing this construct require students to:**
4. Identify information/evidence that needs to be collected in order to answer the question, hypothesis, prediction **DOK 2:** routine; **DOK 3:** non-routine; more than one dependent variable	• identify the types of evidence that should be gathered to answer the question, or support or refute the hypothesis or prediction; • identify the variables that may affect the outcome of the experiment or investigation; • design an appropriate format for recording data and include relevant technology; • evaluate multiple data sets to determine which data are relevant to the question, hypothesis or prediction. **Note:** These items could appear at the end of the task.
5. Develop an organized and logical approach to investigating the question, including controlling variables **DOK 2**: routine (replicates existing procedure); **DOK 3:** non-routine (extends, refines, or improves existing procedure)	• develop a procedure to gather sufficient evidence (including multiple trials) to answer the question, or test the hypothesis, or prediction; • develop a procedure that lists steps sequentially and logically and incorporates the use of appropriate technology; • explain which variable will be manipulated or changed (independent) and which variable will be affected by those changes (dependent); • identify variables that will be kept constant throughout the investigation; • distinguish between the control group and the experimental group in an investigation; • use scientific terminology that supports the identified procedures; • evaluate the organization and logical approach of a given procedure including variables, controls, materials, and tools. • evaluate investigation design, including opportunities to collect appropriate and sufficient data. **Note:** These items could appear at the beginning or the end of the task.
Inquiry Construct	**Items addressing this construct require students to:**
6. Provide reasoning for appropriateness of materials, tools, procedures, and scale used in the investigation **DOK 2**	• explain why the materials, tools, procedure, or scale for a task are appropriate or inappropriate for the investigation. • evaluate the investigation for the safe and ethical considerations of the materials, tools, and procedures.

Broad Area 3: Conducting Investigations

Grade 11

Standard: *The procedure requires the student to collect data through observation, inference, and prior scientific knowledge. Mathematics is required for the student to determine and report data. The task scenario is authentic to the realm of the student. The task requires the student to collect sufficient data to investigate the question, prediction/hypothesis, or relationships. Student is required to organize and represent qualitative or quantitative data. Student is required to summarize data to form a logical argument.* **Note:** Metric units are used for all Grade 11 measurements **Note:** Multiple trials mean repeating the experiment to collect multiple sets of data.	
Inquiry Construct	**Items addressing this construct require students to:**
7. Follow procedures for collecting and recording qualitative or quantitative data, using equipment or measurement devices accurately **DOK 1:** use tools; routine procedure; **DOK 2**: follow multi-step procedures; make observations	• record precise data and observations that are consistent with the procedure of the investigation; • include appropriate units of all measurements; • use appropriate measurement tools correctly to collect data; record and label relevant details within a scientific drawing.
8. Use accepted methods for organizing, representing, and manipulating data **DOK 2** : compare data; display data	• represent data accurately in an appropriate graph/table/chart; • include titles, labels, keys or symbols as needed; • select a scale appropriate for the range of data to be plotted; • use scientific terminology to label representations; • identify relationships among variables based upon evidence. **Note:** The standard practice of graphing in science is to represent the independent on the *x*-axis and the dependent variable on the *y*- axis.
9. Collect sufficient data to study question, hypothesis, or relationships **DOK 2** : part of following procedures	• show understanding of the value of multiple trials • relate data to original question, hypothesis or prediction; • determine if the quantity of data is sufficient to answer the question or support or refute the hypothesis or prediction.
10. Summarize results based on data **DOK 2**	• consider all data when developing an explanation/conclusion; • identify patterns and trends in data.

Broad Area 4: Developing and Evaluating Explanations

Grade 11

Standard: *Task must provide the opportunity for students to use data to construct an explanation based on their science knowledge and evidence from experiment or investigation. The task requires students to use qualitative and quantitative data to communicate conclusions and support/refute prediction/hypothesis. The task provides students the opportunity to recognize and analyze alternative methods and models to evaluate other plausible explanations.* ***Note:*** *The complexity of the scenario and associated data sets distinguishes this task from an 8th Grade task.*	
Inquiry Construct	**Items addressing this construct require students to:**
11. Analyze data, including determining if data are relevant, artifact, irrelevant, or anomalous **DOK 2**: specify relationships between facts; ordering, classifying data	• identify data relevant to the task or question; • identify factors that may affect experimental results (e.g. variables, experimental error, environmental conditions); • analyze data and sort into meaningful categories; • compare experimental data to accepted scientific data provided as part of the task; • use mathematical and statistical techniques to analyze data; • provide a reasonable explanation that accurately reflects data; use content understanding to question data that might seem inaccurate • evaluate the significance of experimental data.
12. Use evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis **DOK 3**	• identify and explain data, interpretations or conclusions that seem inaccurate; • use evidence to support or refute question or hypothesis; • use evidence to justify an interpretation of data or trend; • identify and explain differences or similarities between hypothesis and predictions and experimental data; • use evidence to justify a conclusion or explanation based on experimental data; • use mathematical computations to determine or support conclusions; • evaluate potential bias in the interpretation of evidence.

continued

Inquiry Construct	Items addressing this construct require students to:
13. Communicate how scientific knowledge applies to explain results, propose further investigations, or construct and analyze alternative explanations **DOK 3**	• explain how experimental results compare to accepted scientific understanding; • recommend changes to procedures to produce data that would provide sufficient data and more accurate analysis; • identify and justify additional data that would strengthen an investigation; • connect the investigation or model to an authentic situation; • propose and evaluate new questions, predictions, next steps or technology for further investigations or alternative explanations; • account for limitations and/or sources of error within the experimental design; • apply experimental results to a new problem or situation; • consider the impact (safety, ethical, social, civic, economic, environmental) of additional investigations.

APPENDIX

NECAP Science
Inquiry Task Development Process

Initial Steps for the Development of an Inquiry Task

1. Identify the NECAP Assessment **TARGET** to be addressed within the major idea for the task.

2. Refer to the ***Guidelines for the Development of Science Inquiry Tasks*** (***GDIT***). Brainstorm constructs that would be addressed under each broad area within the major idea for the task.

Formulating Questions and Hypothesizing	**Planning and Critiquing of Investigations**	**Conducting Investigations**	**Developing and Evaluating Explanation**

3. Develop a draft **SCENARIO** aligned to the major idea of the task that could generate testable questions.*

4. Identify an authentic **Data Set** (Grades 8 & 11) that applies to the **TARGET** and relates to the **SCENARIO** *

OR

Provide opportunity for **Collection of Data** (Grade 4 & 8) that applies to the **TARGET** and relates to the **SCENARIO** *

* **Note**: *The previous steps are interdependent. The construction of the draft SCENARIO and the identification of a data set, will inform one another. Either may necessitate modifications for alignment, as the task items are being developed.*

Components of the Final Inquiry Task

Each **Inquiry Task** must include:

- A cohesive series of scoreable items, totaling 16-18 points, that assess student understanding in each of the four broad areas of inquiry, as described in the ***GDIT***.
- Scoreable items that have sufficient complexity for students to demonstrate scientific thinking related to inquiry.
- An identified DOK level for each scoreable item.
- A scoring rubric for each scoreable item.

Appendix B—NECAP SCIENCE COMMITTEE MEMBERS

NECAP Technical Advisory Committee Members

New Hampshire

Name	*Affiliation*
Richard Hill	Board of trustees chair, Center for Assessment
Scott Marion	Associate director, Center for Assessment
Charles Pugh	Assessment coordinator, Moultonborough District
Rachel Quenemoen	Senior research fellow, University of Minnesota
Stanley Rabinowitz	Assessment and Standards Development Services director, WestEd
Christine Rath	Superintendent of schools, Concord
Steve Sireci	Professor, University of Massachusetts
Carina Wong	Consultant

Rhode Island

Name	*Affiliation*
Sylvia Blanda	Westerly School Department
Bill Erpenbach	WJE Consulting
Richard Hill	Board of trustees chair, Center for Assessment
Jon Mickelson	Providence School Department
Joe Ryan	Consultant
Lauress Wise	President, HumRRO

Vermont

Name	*Affiliation*
Dale Carlson	NAEP coach, NAEO-Westat
Lizanne DeStefano	Bureau of Educational Research
Jonathan Dings	Boulder (Colorado) School District
Brian Gong	Executive director, Center for Assessment
Bill Mathis	Superintendent of schools, Rutland Northeast Supervisory Union
Bob McNamara	Superintendent of schools, Washington West Supervisory Union
Bob Stanton	Assistant superintendent of schools, Lamoille South Supervisory Union
Phoebe Winter	Consultant

Item Review Committee Members
August 11 and 12, 2008

New Hampshire

First name	*Last name*	*School/association affiliation*	*Position*
Annette	Leel	Appleton Elementary School	Grade 3 teacher
Cynthia	Dunn	Pinkerton Academy	Science teacher
Debra	Almeida	Milford Middle School	Grade 8 science teacher
Jenny	Deenik	Souhegan High School	Grade 10 biology teacher
Joseph	Yahna	Bartlett Elementary School	Grade 7–8 teacher
Kelly	Marcotte	Richards SAU 43	Grade 4 teacher
Patricia	Sukduang	Spaulding High School	Science department chair
Robert	Schroeder	Swasey Central School	Classroom teacher
Sandra	Kent		Science consultant
Sandra	Tomellini	Hilltop Elementary School	Child specific coach
Stacy	Egan	Great Brook School	Grade 8 science teacher
Vincent	Tom	Souhegan High School	Science teacher

Item Review Committee Members
August 11 and 12, 2008

Rhode Island

First name	*Last name*	*School/association affiliation*	*Position*
Alan	Bostock	Hugh Bain Middle School	Science department head
Diana	Siliezar-Sheilds	Barrington High School	Science department head
Eva	Merolla	Charles E. Shea High School	Secondary science teacher
Jeff	Schoonover	Portsmouth High School	Physics teacher/department chair
Jennifer	TRUE	Smithfield High School	Chemistry teacher
Jennifer	Polacek	Globe Park Elementary School	Classroom teacher
Kathy	Tancrelle	Old County Road School	Teacher
Lori	Randall	Davisville Middle School	Grade 8 science teacher
Maria	Clarey	Tiverton Middle School	Science teacher
Stephen	Cormier	Chariho Middle School	Science teacher
Susan	Tardio	Woodridge School	Classroom teacher
Wendy	Lapuc	Elizabeth Baldwin Elementary School	Special education teacher

Item Review Committee Members
August 11 and 12, 2008

Vermont

First name	*Last name*	*School/association affiliation*	*Position*
Brian	Crane	Fairhaven Grade School	Science teacher
Cherrie	Torrey	Dothan Brook School	Classroom teacher
Graham	Clarke	Camels Hump Middle School	Assistant principal
Greg	Renner	Oxbow High School	Science teacher
Jim	Daly	Missisquoi Valley Union High School	Science department leader/teacher
Katie	Sullivan	Warren School	Grade 3–4 teacher
Maureen	Maidrand	Springfield High School	Network leader
Nathan	Reutter	Mount Anthony Union High School	Science teacher
Travis	H. Redman Jr.	Rutland Town School	Grade 6–8 teacher

Bias and Sensitivity Committee Members
August 11 and 12, 2008

New Hampshire

First name	*Last name*	*School/association affiliation*	*Position*
Alexander	Markowsky	Franklin and Hill School District	School psychologist
Enchi	Chen	Farmington High School	ESL teacher
Karen	Dow	Southwick School	Reading specialist
Mary	Sohm	Londonderry High School	Special education teacher, science
Mary-Jo	Bourque	Memorial High School	Assistant principal
Maureen	Richardson	Manchester School District	ELL coordinator

Rhode Island

First name	*Last name*	*School/association affiliation*	*Position*
Amy	Simoes	Dr. Harry Halliwell School	Classroom teacher
Heather	Taylor	Westerly Middle School	Science teacher
Lisa	Fillippelli	Thornton School	Inclusion teacher/grade 1–2
Paula	Fillon	Emma G. Whiteknact School	Special education teacher
Sandra	Farone	Winsor Hill School	Classroom teacher
Soraya	Santana	Lillian Feinstein Elementary School	Bilingual Spanish teacher

Vermont

First name	*Last name*	*School/association affiliation*	*Position*
Ani	Lutz	Warren Elementary School	Speech-language pathologist
Brenda	Seitz	Vermont Center for the Deaf	Director of special education
Darlene	Petke	Central Elementary School	Intensive needs special educator
Linda	Hutchins	Addison Central School	Grade K–6 special educator
Sharon	Hunt	Gilman Middle School	Grade 5–8 special educator

Appendix C—Table of Standard Test Accommodations

Table of Standard Test Accommodations

Any accommodation(s) utilized for the assessment of individual students shall be the result of a formal or informal team decision made at the local level. Accommodations are available to all students on the basis of individual need regardless of disability status.

A. Alternative Settings

- A-1 Administer the test individually in a separate location
- A-2 Administer the test to a small group in a separate location
- A-3 Administer the test in locations with minimal distractions (e.g., study carrel or different room from rest of class)
- A-4 Preferential seating (e.g., front of room)
- A-5 Provide special acoustics
- A-6 Provide special lighting or furniture
- A-7 Administer the test with special education personnel
- A-8 Administer the test with other school personnel known to the student
- A-9 Administer the test with school personnel at a non-school setting

B. Scheduling and Timing

- B-1 Administer the test at the time of day that takes into account the student's medical needs or learning style
- B-2 Allow short supervised breaks during testing
- B-3 Allow extended time, beyond recommended until in the administrator's judgment the student can no longer sustain the activity

C. Presentation Formats

- C-1 Braille
- C-2 Large-print version
- C-3 Sign directions to student
- C-4 Test and directions read aloud to student (Math, Science, and Writing only) [1]
- C-5 Student reads test and directions aloud to self
- C-6 Translate directions into other language
- C-7 Underlining key information in directions
- C-8 Visual magnification devices
- C-9 Reduction of visual print by blocking or other techniques
- C-10 Acetate shield
- C-11 Auditory amplification device or noise buffers
- C-12 Word-to-word translation dictionary, non-electronic with no definitions (For ELL students in Math, Science, and Writing only)
- C-13 Abacus use for student with severe visual impairment or blindness (Mathematics and Science—any session)

D. Response Formats

- D-1 Student writes using word processor, typewriter, computer [2] (School personnel transcribes student responses exactly as written into the Student Answer Booklet.)
- D-2 Student hand writes responses on separate paper. (School personnel transcribes student responses exactly as written into the Student Answer Booklet.)
- D-3 Student writes using brailler (School personnel transcribes student responses exactly as written into the Student Answer Booklet.)
- D-4 Student indicates responses to multiple-choice items. (School personnel records student responses into the Student Answer Booklet.)
- D-5 Student dictates constructed responses (Reading, Math, and Science only) or observations (during the Science Inquiry Task) to school personnel. (School personnel scribes student responses exactly as dictated into the Student Answer Booklet.)
- D-6 Student dictates constructed responses (Reading, Math, and Science only) or observations (during the Science Inquiry Task) using assistive technology. (School personnel transcribes student response exactly as written into the Student Answer Booklet.)
- D-7 Not available at this time

If an accommodation is needed for a student that is not listed above, please contact the state personnel for accommodations to discuss it.

E. Other Accommodations [3]

- E-1 Accommodations team requested other accommodation not on list and DOE approved as comparable
- E-2 Scribing the Writing Test (only for students requiring special consideration)

F. Modifications [4]

- F-1 Using calculator and/or manipulatives on Session 1 of the Mathematics test or using a scientific or graphing calculator on Session 3 of the Science test.
- F-2 Reading the Reading test
- F-3 Other

1. Reading the reading test to the student invalidates all reading sessions.
2. Spell and grammar checks must be turned off. This accommodation is intended for unique individual needs, not an entire class
3. Test coordinators must obtain approval for the accommodation from the Department of Education prior to test administration.
4. All affected sessions using these modifications are counted as incorrect.

Appendix D—APPROPRIATENESS OF THE ACCOMMODATIONS ALLOWED IN NECAP GENERAL ASSESSMENT AND THEIR IMPACT ON STUDENT RESULTS

The New England Common Assessment Program

New Hampshire + Rhode Island + Vermont

Appropriateness of the Accommodations Allowed in NECAP General Assessment and Their Impact on Student Results

1) Overview and Purpose

To meet federal peer review requirements for approval of state assessment systems, in the spring of 2006 New Hampshire, Rhode Island, and Vermont submitted extensive documentation to the United States Department of Education on the design, implementation, and technical adequacy of the New England Common Assessment Program (NECAP), a state level achievement testing program developed through a collaborative effort of the three states. In response to peer review finding, the states were required to submit additional documentation for a second round of peer review, including information on the use, appropriateness, and impact of NECAP accommodations. This report was prepared in response to the questions posed by the peer reviewers, and has been included in the *2008–09 NECAP Science Technical Report* for other groups or individuals who may be interested in NECAP accommodation policies and procedures, and how well they have been working.

2) Report on the Appropriateness and Comparability of Accommodations allowed in statewide NECAP General Assessment

A. Who may use accommodations in NECAP assessment?

NECAP test accommodations are available to *all* students, regardless of whether or not a disability has been identified. Accommodations allowed are not group specific. For example, students in Title I reading programs, though not formally identified as "disabled" may still need extra time on assessments. Students with limited English proficiency sometimes break their arms and need to dictate multiple choice responses. Other students may need low vision accommodations even though they are not considered to be "blind". Before they are members of any subgroup, each student is first an individual with unique learning needs. NECAP assessment accommodations policy treats students in this way. The decision to allow *all* students to use accommodations, as needed, is consistent with prior research on best practice in the provision of accommodations (c.f., Elbaum, Aguelles, Campbell, & Saleh, 2004):

> "…the challenge of assigning the most effective and appropriate testing accommodations for students with disabilities, like that of designing the most effective and appropriate instructional programs for these students, is unlikely to be successfully addressed by disability. Instead, much more attention will need to be paid to individual student's characteristics and responses to accommodations in relation to particular types of testing and testing situations." (pp. 71-87)

The NECAP management team believes strongly that a fair and valid path of access to a universally designed test should not require that a student carry a label of disability. Rather, much like differentiated instruction, accommodated conditions of test participation that *preserve the essential construct of the standard being assessed* should be supported for *any* student who has been shown to need these differentiated test conditions. This philosophy is consistent with the NECAP team's commitment to building a universally accessible test that provides an accurate measure of what each student knows in reading, mathematics writing, and science content.

The following critical variables drive the process of providing NECAP accommodations:

1. The decision to use an accommodation for an individual student must be made using a valid and carefully structured team process consistent with daily instructional practice, and

2. The accommodated test condition *must preserve the essential construct being assessed*, resulting in a criterion-referenced measure of competency considered to be comparable to that produced under standard test conditions.

B. Are NECAP Accommodations Consistent with Accepted Best Practice?

NECAP provides a Table of Standard Test Accommodations that was assembled from the experience and long assessment histories of the three partner states. The NECAP Table of Standard Test Accommodations was created by establishing a three state cross-disciplinary consensus reached with key expert groups: special educators, ELL specialists, and reading, mathematics, writing, and science content specialists from each of the partner states.

In addition, the work of various stakeholder and research groups with special instructional expertise was also considered. These sources included:

- Meetings with state advocacy groups for students with severe visual impairment or blindness,
- Meetings with state advocacy groups for students with deafness or hearing impairment, and consultations with other research-based groups like:
- The American Printing House for the Blind, Accessible Tests Division,
- The National Center on Educational Outcomes (NCEO), and
- The New England Compact Group, who conducted federally-funded enhanced assessment research on accommodations, in partnership with Boston College (inTASC group) and the Center for Applied Special Technologies (CAST).

The NECAP cross-disciplinary team, consulting with these other specialists, chose accommodations that were commonly accepted as standard, well established on a national basis, and that were consistent with assessment practice across all the NECAP states. Each identified standard accommodation was chosen to support best educational practice as it is currently understood.

Examples of the impact on accommodations design resulting from consultation with the American Printing House for the Blind experts in accessible test development included the addition to our standard accommodations of the use of an abacus in place of scrap paper for students with severe visual impairment. Recent research from the American Printing House for the Blind also indicated that 20 pt. font was producing better outcomes for students using large print accommodations (Personal communication, October, 2004). Based on this input, the NECAP team decided to provide a minimum of 20 pt. instead of 18 point font for large print editions of the NECAP assessment. This, in turn, led to improved production and type setting for large print NECAP tests. Consultation with advocacy groups for the deaf and hard of hearing led to improved item design, in particular helping item developers avoid the unnecessary use of rhyming words and homophones, supporting a decreased need for sign language accommodations with this group.

Impact of WIDA Partnership on development of Accommodations for LEP students. An important relationship exists between NECAP assessment and the NECAP partner states' active membership in WIDA/ACCESS for ELL's Assessment Consortium. New understandings in the area of accommodations policy and practice are beginning to emerge. For example, we have learned that word-to-word dictionary accommodations are most effective when used by LEP students at an intermediate level of proficiency and are not advised for beginning LEP students. The NECAP Accommodations Manual reflects this. Community learning opportunities created through the WIDA partnership have set a strong and supportive context for long term benefit and mutual growth potential. A wise investment has been made by the NECAP group in this effort.

During the last 2 years, assessment leaders from all three NECAP states, as active partners in the WIDA consortium developing the new ACCESS for ELLs Test of English Language Proficiency, have collaborated in a cross-disciplinary team process to establish accommodations policy for this English language proficiency assessment. The ACCESS for ELLs accommodations team was composed of ESOL teachers, special educators, measurement specialists, and SEA assessment leaders. All three NECAP states took an active role and learned much from this process. This joint development effort opened dialog across ELL and special education accommodation groups and continues to support the ongoing review and improvement of both ACCESS and NECAP accommodations. The states are learning from each other, and with each new development cycle, are improving the accommodations system. The community of professional practice in this area is growing. Best practice understandings are expanding with our increasing experience and communication about the needs of LEP student groups. Specifically, we are learning about the importance of academic language to English Language Learners who are attempting to take the state-level general content assessments. Accommodations specific to this academic language support issue are being explored and considered. We are finding that vocabulary lists, practice tests, computer-based read-alouds and other supports and accommodations are eliciting positive responses from our LEP students who take the state content assessments. This will be addressed in more detail in a later section.

C. How are NECAP Accommodations Structured?

Standard Accommodations: NECAP sorts standard accommodations into 4 categories (labeled A-D), which include: A) Alternative Settings, B) Scheduling and Timing, C) Presentation Formats, and D) Response Formats. School teams may choose any combination of standard (A-D) accommodations to use with any student so long as proper accommodation selection and usage procedure is followed and properly documented (see following subsection). Students who use standard accommodations on NECAP tests receive full performance credit as earned for the test items taken under these standard conditions. NECAP standard accommodations are treated as fully comparable to test conditions where no accommodation is used.

In addition, NECAP lists 2 additional categories of altered test conditions which require formal state level review and approval on a student by student basis. These special test conditions are: E) Other Accommodations and F) Modifications. (See: NECAP Accommodations, Guidelines and Procedures Training Manual, (2005), p 5, Available on state websites listed following references.)

Non-Standard Test Conditions – Review, Monitoring and Documentation of Preservation of the Intended Construct: "Other (E type) Accommodations" are accommodations without long or wide history of use that are not listed under the standard (A-D) categories. If schools wish to use accommodations that are not listed in A-D as standard, then they must send a formal written *Request for Use of Other Accommodations* to the State Department for review and approval for usage with an individual student. This request documents the team decision and describes fully the procedure to be used. Upon receipt by the SEA, these requests are thoroughly reviewed by state assessment content specialists together with special educators to determine if the accommodation proposed will allow

performance of the essential constructs intended by the impacted test items. If the requested "other" accommodation is found to allow performance that will *not alter* the intended construct or criterion referenced standard to be assessed, then the school is issued a written receipt giving permission for use of this other accommodation as a standard accommodation for one test cycle. Schools are instructed on how to document the use of this approved "E) Other Accommodation" and the SEA monitors the process, ensuring that both school test booklets and state records accurately reflect the final test data. All "E) Other Accommodations" are approved in this way by the Department and, *if approved*, are treated as standard accommodations. Item responses completed under approved "E) Other" test conditions receive full credit as earned by the student.

If a requested "other" accommodation is found by the state review team to NOT preserve the intended construct, then the review team sends the school a receipt and notice that the requested change in test condition will be considered to be a test modification "F) Modification". All items completed under these test conditions will NOT receive performance credit. An example of a non-credited "F) Modification" would be any test condition where reading test passages, items, or response options are read to a student. State reading content specialists have determined that this change in a reading test condition does, in fact, alter the decoding construct being tested in all reading items. Therefore, reading items completed under this test condition would not be credited.

Use and approval of "E) Other Accommodations" are carefully monitored by the state. If any school claims use of an "E) Other Accommodation" that has not received prior state review and documented approval, then the test data documentation is similarly flagged to reflect that an F) Modification was instead provided. This flagged situation is treated as a non-credited test modification and the items impacted are invalidated. Further, any sections of the test completed under "F) Modification" conditions are later documented in student reports as not credited due to the non-standard and non-comparable test administration conditions used.

D. How does the NECAP Structure Guide Appropriate Use of Accommodations by Schools?

In 2005, New Hampshire, Rhode Island, and Vermont collaborated on the *NECAP Accommodations Guidelines and Procedures Training Manual*. The guide was disseminated through a series of regional test coordinator's workshops, as well as additional professional development opportunities provided by the individual states, and was also posted on each states website. This tool was designed to provide schools with a structured and valid process for decision making regarding the selection and use of accommodations for students on statewide assessment. Prior studies have outlined assessment guidelines that maximize the participation of students with disabilities in large-scale assessment. The National Center on Educational Outcomes (NCEO), in Synthesis Report 25 (1996), presented a set of criteria that states should meet in providing guidelines to schools for using accommodations (pp. 13-14, and 25). The NCEO recommendations figured prominently in preparation of the NECAP accommodations guide.

The *NECAP Accommodations Guidelines and Procedures Training Manual* (2005) meets all seven of the criteria established by NCEO as follows:

1. The decision about accommodations is made by a team of educators who know the student's instructional needs. NECAP goes beyond this recommendation and requires that the student's parent or guardian also be part of this decision team, (NECAP Accommodations Manual, pp. 2-3, and 20-22).
2. The decision about accommodations is based on the student's current level of functioning and learning characteristics. (Manual, pp. 20-22).
3. A form is used that lists the variables to consider in making the accommodations decisions, and that documents for each student the decision and reasons for it. (Manual, pp. 20-22).

4. Accommodation guidelines require alignment of instructional accommodations and assessment accommodations. (Manual, pp. 2 and 20-22).
5. Decisions about accommodations are not based on program setting, category of disability, percent time in the mainstream classroom (Manual, pp.15 and 20-22).
6. Decisions about accommodations are documented on the student's IEP or on an additional form that is attached to the IEP. (Manual, pp. 2, 15, and 20-22).
7. Parents are informed about accommodation options and about the implications for their child (1) not being allowed to use the needed accommodations, or (2) being excluded from the accountability system when certain accommodations are used, (Manual pp. 3 and 20-22).

As described above**,** NECAP states use a highly structured process for the review, approval, and monitoring of requests by schools for the use of other (non-standard) accommodations for individual students. As described in section B, above, the NECAP Accommodations Manual provides a Table of Standard Accommodations each year. The manual provides two structured decision making worksheets (pp. 20-22) to guide the decision process of educational teams. One worksheet guides the selection of standard accommodations; the second provides guidance on the selection of other accommodations. The manual contains information on the entire decision making process. In addition, the manual provides detailed descriptions and research-based information on many specific accommodations.

Ongoing Teacher Training and Support: Throughout each academic year, several teacher workshops on planning and implementing accommodations are offered at multiple locations regionally in each of the three states to teams of educators. In the spring of 2005, prior to the launch of the first NECAP assessment, a series of introductory statewide 2-hour workshops in accommodations administration was offered in multiple locations. Each year thereafter, in late summer prior to the administration of the NECAP tests, a series of accommodations usage updates is offered as part of the NECAP Test Administration Workshop series; five regional workshops are offered in each state. Additionally, each state's Department of Education has consultants who are available to provide individualized support and problem solving, as well as small and large group in-service for schools. Finally, the DOE assessment consultants work directly with a variety of statewide groups and organizations to promote the use of effective accommodations, and to gather feedback on the efficacy of the NECAP accommodation policies and procedures. These include University-based Disability Centers, statewide parent advocacy organizations, organizations representing individuals with vision and hearing disabilities. Finally, each state has systems in place to provide schools with individualized support and consultation: New Hampshire employs two distinguished special field educators who, by appointment and free of charge, provide onsite training and support in alternate assessment and accommodations strategies. Rhode Island has an IEP Network that provides on-site consultation with schools on a variety of special services topics including planning and implementing assessment accommodations. Vermont has a cadre of district-level alternate assessment mentors who provide a point of contact for disseminating information, and who are also available in schools and school districts for intensive consultation related to the assessment needs of individual students.

Monitoring of the Use of Accommodations in the Field: Each year during the NECAP test window, the DOE content specialists schedule a limited number of on-site visitations to observe test administration as it is occurring in the schools**.** State capacity to provide such direct monitoring during the test window is limited, but such monitoring is conducted during each test window and observers report observations directly to the state assessment team. Additional on-site accommodations monitoring is provided by district special education directors and the NECAP test coordinators. Both of these groups also receive training each year. Throughout each school year, program review teams from the DOEs' special education divisions conduct on-site focused monitoring of all special education programs. These comprehensive visits include on-site monitoring of the use of accommodations for students who have Individualized Educational Programs (IEPs).

E. Are NECAP Accommodations Consistent with Recent Research Findings?

The NECAP development team has attempted to learn from the research on accommodations, but this has not been a simple matter. In 2002, Thompson, Johnstone, and Thurlow concluded in their report on universal design in large scale assessments that research validating the use of standard and non-standard accommodations has yet to provide conclusive evidence about the influence of many accommodations on test scores. In 2006, Johnstone, Altman, Thurlow, & Thompson published an updated review of 49 research studies conducted between 2002 and 2004 on the use of accommodations and again found accommodations research to be inconclusive. They noted the similarity to past findings from NCEO summaries of research (Thompson, Blount & Thurlow, 2002). The authors of the 2006 review state:

> "Although accommodations research has been part of educational research for decades, it appears that it is still in its nascence. There is still much scientific disagreement on the effects, validity, and decision-making surrounding accommodations." (p. 12)

However, a frequently cited research review by Sireci, Li, & Scarpati, (2005) documented evidence of support for the accommodation of providing extended time. This accommodation is one of the most frequently used standard NECAP accommodations. Extended time accommodations appeared to hold up best under the interaction hypothesis for judging the validity of an accommodation. In a 2006 presentation addressing lessons learned from the research on assessment accommodations to date, Sireci and Pitoniak, (2006), concluded that, in general, "accommodations being used are sensible and defensible." They replicated their prior finding that the extended time accommodation seems to be a valid accommodation and noted that many other accommodations have produced less convincing results. They noted that oral or read-aloud accommodation for math appears to be valid, but that a similar read-aloud accommodation for *reading* involves consideration of specific construct changes which threaten score comparability. These findings are also consistent with and support the NECAP accommodation policy of allowing the read-aloud accommodation for mathematics, but not allowing this accommodation for reading tests. Despite the inconclusive and conflicting current state of accommodations research, findings seem to be emerging that do, in fact, provide validation for some of the most frequently used NECAP accommodations: the extended time and mathematics read-aloud accommodations.

Accommodations for English language learners. In a presentation on the validity and effectiveness of accommodations for English language learners with disabilities, Abedi (2006) reported that students who use an English or bilingual dictionary accommodation (word meanings allowed) may be advantaged over those without access to dictionaries and that this may jeopardize the validity of the assessment. Abedi argues persuasively that linguistic accommodations for English language learners should *not* be allowed to alter the construct being tested. He also argues that the language of assessment should be the same language as that used in instruction in the classroom – otherwise student performance is hindered. NECAP assessment policy is consistent with both of these findings: ELL students may use word-to-word translations as linguistic accommodation support, but may not use dictionaries with definitions provided. Abedi's research supports this decision. Also NECAP assessment items are not translated into primary languages for ELL students. This, too, is consistent with classroom practice in the NECAP states and is supported by the current literature.

At the same conference referenced just above, Frances (2006), presented findings from a meta-analysis in which he compared the results of eleven studies of the use of linguistic accommodations provided for ELL students in large scale assessments. In his presentation, given at the LEP Partnership Meeting in Washington, DC, he noted that *no significant differences in student performance were observed for 7 of the 8 most commonly provided linguistic accommodations.* Although Frances was not recommending its use, the *only* linguistic accommodation that showed any significant positive effect on the performance of ELL students was an accommodation allowing the use of an English dictionary or glossary during statewide assessment. This is the very same accommodation that Abedi (2006) recommends *against* using because it violates intended test constructs. As noted above, in NECAP assessment, the use of word-to-word translations is an allowed standard linguistic accommodation. However, the use of an

English dictionary with glossary *meanings is not* an allowable standard accommodation. It is the position of the NECAP reading content team that allowing *any* student to use a dictionary with definitions or a glossary of meanings violates the vocabulary and comprehension constructs intended in the NECAP reading test and would invalidate test results. For this reason, NECAP does not allow this linguistic accommodation.

As reported by Frances, analysis of the remaining 7 linguistic accommodations typically allowed for ELL students showed *no significant positive effect* on test performance. These included: bilingual dictionary use, dual language booklets, dual language questions and read-aloud in Spanish, extra time to test, simplified English, and offering a Spanish version of a test. Despite the lack of positive effects observed for these other linguistic accommodations to date, NECAP does provide a number of linguistic supports for ELL students. One of these linguistic supports includes: employing the universal design technique of simplifying the English in *all* test items. Review and editing of test items for language simplicity and clarity has been a formal part of the annual process of test item development and review since the inception of the NECAP. In addition to word-to-word translations, a number of other standard linguistic accommodations are allowed in NECAP testing to provide a path of access for ELL students to show what they know and can do in reading and mathematics. Standard linguistic accommodations permitted by NECAP include: allowing mathematics test items to be read aloud to the student, allowing students to read aloud to themselves (if bundled with an individual test setting), translation of test directions into primary language, underlining key information in written directions and dictation/ scribing of reading and math test responses. NECAP assessments provide linguistic access for students who are English language learners.

As noted earlier, a number of studies have shown some positive effect of the use of the extended time and read-aloud accommodations for students in general. As ELL students continue to gain proficiency in English, they may also increasingly benefit from these accommodations. More research is needed to clarify how states can most appropriately support ELL students to show us what they know and can do.

NECAP Supported Research Studies: Through the New England Compact Enhanced Assessment Project (2007), the NECAP states have completed a number of accommodations and universal design research studies. These studies have shed additional light on the appropriateness of existing standard accommodations and have helped to inform the development of new accommodations and improved universal design of assessment. Under the Enhanced Assessment Grant, in joint partnership with: the inTASC group of Boston College, the Center for Applied Special Technologies (CAST), the state of Maine, and the Educational Development Center, Inc., the NECAP states supported research studies on accommodations and universal design in four distinct areas. These studies, summarized below, are described more fully in the appendix to this report:

- **Use of computer-based read-aloud tools.** NECAP supported a study of 274 students in New Hampshire high schools. This study, Miranda, H., Russell, M., Seeley, K., Hoffman, T., (2004), provided evidence that computer–based read aloud accommodations led to improved content access and performance of students with disabilities when taking mathematics tests.

  As direct result of this study, New Hampshire was able to build and pilot a new computer-based read aloud tool that is now under development for use with NECAP assessments for all three NECAP states. Following this New Hampshire pilot of the new computer-based read aloud tool on the state high school assessment, the New Hampshire Department of Education conducted a focus group study with participating students from Nashua North High School. The results of this focus group (May 17, 2006) are available from the New Hampshire Department of Education. One of the primary findings from this focus group was the strong impact of having experienced the read-aloud in practice test format prior to actual testing. Experience with this tool *prior to testing* appeared to be very important for student performance. High school students indicated a *very strong* preference for computer-based read aloud over the same accommodation provided by a person. Both groups of students, those with

limited English proficiency and those with disabilities consistently reported that they were able to focus much more clearly on the math content (not just the words) than in prior math tests they had taken without this accommodation. Based on student report, use of this read-aloud seemed to improve content access for these students. The ability to benefit from the individual work of each of the three NECAP states is a major benefit of the tri-state partnership.

- **Use of computers to improve student writing performance on tests.** Another research study conducted by Higgins, J., Russell, M., & Hoffmann, T., (2004), studied 1000 students from the three states to examine how the use of computers for writing tests affected student performance. The study found that minority girls tended to perform about the same whether using a computer or pencil-and-paper to provide written responses. However, *all other groups*, on average, tended to perform better when using a computer to produce written responses. A minimum degree of keyboarding skill correlated with improved performance. Lack of keyboarding skill produced results that did not significantly differ from pencil-and–paper responding and therefore, appeared to 'do no harm'. As a result, NECAP states entered into talks to determine how a computer based response might be more fully supported in future versions of the assessment. The study suggested that a minimum number of words typed accurately per minute of 18-20 was the recommended threshold to obtain benefit from this accommodation. This finding has been incorporated into NECAP training and support activities. At the present time, NECAP allows use of a word processor to produce written test responses as a standard accommodation on all NECAP content tests. The research supports this practice.
- **Use of Computers for Reading Tests**. A third study conducted by Miranda, H., Russell, M., & Hoffmann, T., (2004), examined how the presentation of reading passages via computer screen impacted the test performance of 219 fourth grade students from eight schools in Vermont. This study found no significant differences in reading comprehension scores across the 3 (silent) presentation modes studied: 1. Standard presentation on paper, 2. On computer screen with use of a scrolling feature, and 3. On computer with passages divided into sections presented as whole pages without the scrolling feature. Results from this study were not conclusive, but some trend data suggested that the scrolling presentation feature may disadvantage many students, especially those with weaker computer skills. The majority of students indicated an overall preference for computer-based presentation over pencil-and-paper. As other research studies, previously cited, continue to show that read-aloud accommodations are generally effective, it can be expected that pressure to offer computer-based read-alouds involving text presentation will increase. Additional research in this area may help shed important light on the most effective ways to provide this useful accommodation. (See also: Higgins, J., Russell, M., & Hoffmann, T., (2004).)

- **Use of Computer-Based Speak-Aloud Responses to Short Answer Items**. The states' enhanced assessment grant also supported a study by Miranda, H., Russell, M., Seeley, K., Hoffman, T., (2004) that looked at the feasibility and effectiveness of using a computer to transcribe spoken responses into written text in response to short answer test items. This was considered as a possible linguistic accommodation for use with English language learners in reading and mathematics tests. Unfortunately, this study found that it is not yet feasible to use computers to record student's verbal responses to short-answer items. A variety of technical problems occurred and students were not comfortable in speaking to the computer. The researchers concluded that, with existing technology limitations, use of this kind of computer based accommodation may not be feasible for some years.

F. What evidence has the state gathered on the impact and comparability of accommodations allowed on NECAP test scores?

Direct and Immediate Score Impact. First, as a matter of policy, there is a direct and immediate impact on NECAP test scores for students when standard accommodations (accepted *and credited* as comparable) vs. non-standard accommodations (not accepted *and not credited* as comparable) are used during test administration. The student performance score is significantly reduced for each subtest where

test items and the constructs they were designed to measure have been modified by use of a non-standard accommodation. Sessions with modified items receive no credit in the student total score for that content area. If the entire reading test is read to a student, the student will earn 0 points in that content area. If only certain sessions of the reading test are read to the student, then only the score of those sessions will be impacted, but this will result in a lower overall reading content score.

Empirical bases for Comparability of NECAP Test Scores Obtained from Accommodated vs. Non-Accommodated Test Conditions: During the NECAP Pilot Test in 2004, differential item functioning (DIF) analyses were conducted on the use of accommodations by various student subgroups. In December 2006, the NECAP Technical Advisory Committee (TAC) reviewed the use of these DIF analyses and discussed long range planning for ongoing review of the use of accommodations in NECAP assessment. There was consensus among TAC members that the current use of DIF analyses for evaluation of accommodation use allows very limited inferences to be made therefore is of minimal practical value to the states. Other general methods of organizing and reviewing accommodations data and performance outcomes should be developed for states to employ.

A NECAP TAC subgroup was formed to consider and respond to the following question: What should NECAP states be doing at this stage in our development to review use, appropriateness, design, etc, of the NECAP Accommodations and related policy & guidelines? What information and processes will help us learn, clarify & communicate how, why, and when to use what accommodations? The results of this December 2006 TAC accommodations workgroup are available on each of the three states' websites. In summary, the TAC workgroup recommended 5 categories of activity for the NECAP states:

1. Given what states have learned from initial implementation and recent research, they should review, revise, describe and more fully document NECAP Accommodations Policies and Guidelines. This should be part of an ongoing review process.

2. Explore available research on questionable or controversial accommodations. Document this review and revise where indicated.

3. Transparency of reporting should be examined. There was group consensus that the use of accommodations during assessment should be fully disclosed, and thereby made transparent in the reporting process. NECAP states should work to sort out this aspect of reporting policy and determine where and how to report what aspects of accommodation usage to parents and to the public at large.

4. States need to further address monitoring of accommodation usage. Find ways to improve the quality of district/school choices in the selection and use of accommodations for students. Strategies that take limited state resource capacity into account must be considered. The issue is fundamentally one of putting improved quality control processes in place in the most efficient, cost effective ways. Several resources currently under development may assist the states in this effort. One of these resources in already being developed in the OSEP funded General Supervision Grant to one of the NECAP states. This grant will develop digitized video clips illustrating proper ways to provide certain accommodations, especially for students with severe disabilities. Creation of this video tool may enhance state capacity to provide and distribute effective training to districts and improved local monitoring of day to day use of accommodations for both instruction and assessment.

5. Available data needs to be mined and organized on the current use of accommodations in NECAP testing. Usage and outcomes for various subgroups should be examined. DIF analyses may not be as useful in this regard as other types of carefully planned descriptive comparisons.

Some research concerns were also identified. How do states differentiate between an access issue for a student – where the student has skills they cannot show as opposed to a lack of opportunity to learn or lack of skill development? This issue appears repeatedly in a number of research studies reviewed. It is not a simple matter to differentiate between these situations. One indicates a need for an assessment

design change. The other indicates a need for instructional change. Research to help sort this out should be supported.

Test Access Fairness as One Kind of Evidence for Comparability:

NECAP states have made a commitment to work with stakeholders representing various groups of students who typically use accommodations or who may benefit from improved universal assessment design. The feedback received from these stakeholder groups is a valuable source of information and ideas for continued improvement of our assessment program.

NECAP consults regularly with experts in accessible test design at the American Printing House for the Blind in Lexington, KY (Allman (2004), and Personal Communications: (October 2004), (September 2006)). This group has informed NECAP management about the recent research in the use of larger print fonts and the abacus as standard accommodations for students with severe visual impairments. This consultation has directly impacted test development and has resulted in positive feedback from the stakeholders who represent students with visual impairment in our states.

In addition, all three states work closely with stakeholders representing students with hearing impairment and deafness to help inform test item development and improved access to test items for students with vision or hearing impairments. An example of this commitment is contained in two focus group reports prepared by the New Hampshire Department of Education; a February 2006 focus group report from NH Teachers of the Visually Impaired (TVI) on NECAP Test Accessibility for Students with Severe Visual Impairment and a May 2006 report on the performance of English language learners and students with disabilities for the on the Grade 10 New Hampshire Educational Improvement & Assessment Program (NHEIAP). The latter of these two reports addressed computer-based read aloud accommodation for mathematics assessment. *(Both Focus Group Reports are available from the New Hampshire Department of Education).*

NECAP states are also pursuing other grant–funded research to support and explore development of new comparable accommodations that might provide meaningful access to general assessment at grade level for students who currently take only alternate assessments based on alternate achievement standards.

G. Summary of the Evidence - Are NECAP Accommodations Appropriate and Do They Yield Reasonably Comparable Results?

- Yes, it is clear from the evidence cited in sections 2 A, B, C and D above, that NECAP accommodations are highly consistent with established best practice.

- For accommodations with a consistent research basis available, research evidence suggests that continued use of the following accommodations in NECAP testing is valid:
    - Extended time accommodation
    - Mathematics Read-Aloud Accommodation
    - Word-to-word translation for ELL students
    - Use of Computer-Based Read-Aloud Tools (for mathematics)
    - Use of Computers to write extended test item responses (NECAP accommodation -D1)

- Preliminary research evidence from The New England Compact Enhanced Assessment Project, presented above (2004), does not appear to support improved student performance with NECAP accommodation D6- Using assistive technology (specifically speech-to-text technology) to dictate open responses via computer. However, if consistently used in classroom settings for students with severe access limitations, sufficient familiarity may be gained to make this a viable accommodation for certain students. Further review of this accommodation by the NECAP management team is recommended.

- Early focus group results (NHDOE, May 17, 2006) and trial experience with computer-based read aloud testing is very promising and merits further research.

- NECAP Focus group responses (NHDOE, February 22, 2006) from Teachers of the Visually Impaired support existing NECAP accommodations and are helping inform improvement in other aspects of universal design of items, test booklets and materials.

- Structured DIF analysis of the performance of NECAP accommodations is in an early and inconclusive phase. Currently, development of other increasingly useful accommodations data analysis designs is going forward and is supported by all NECAP states. The NECAP Technical Advisory Committee (TAC) will continue to explore this line of inquiry in the future.

- As each yearly cycle of large scale NECAP DIF item analysis allows the group to gain insight and to clarify questions, the design of future DIF data collection may be refined to more fully inform item selection to improve the fairness and accessibility of NECAP assessment items. This exploration is highly valued by the NECAP management group and will continue to be supported. Limitations in this kind of statistical analysis will continue to occur when sample sizes are too small to draw reliable or useful conclusions.

- NECAP states are developing an ongoing review and improvement process for the NECAP accommodations policy and procedures.

Concluding Comment:

NECAP Commitment to Universal Design and Continuous Improvement. The NECAP management group has made a solid commitment to continuously improve and strengthen the universal design of our assessment instruments. As the quality of universal design elements of the NECAP assessment continues to improve, it is conceivable that the number of students who need to use accommodations may decline. In fact, this is a worthy goal. Although this would cause diminishing sample sizes and challenges for accommodations analysis, declining use of accommodations due to improved universal accessibility in overall test design would be viewed as a very positive outcome.

Since its inception in 2003, the NECAP group has supported and funded research and development in accommodations policy and procedures. This is evidenced by the many research activities generated through the multiple Enhanced Assessment Grants of the three participating states referenced earlier in this report.

The NECAP group has shown leadership in obtaining funding and actively supporting accommodations and related research in a number of areas:

1. Describing the performance of students in the assessment gap and exploring alternate ways of assessing students performing below proficient levels (see: *New England Compact Enhanced Assessment Project: Task Module Assessment System- Closing the Gap in Assessments*),
2. Research in the design and use of accommodations *(New England Compact Enhanced Assessment Project: Using Computers to Improve Test Design and Support Students with Disabilities and English-Language Learners),*
3. The relationships among and between elements of English language proficiency test scores, academic language competency scores, and performance on NECAP academic content tests *(Parker, C. (2007)),*
4. Defining and developing technical adequacy in alternate assessments *(NHEAI Grant),*
5. Developing improved accommodations that will foster increased participation in general assessment for students currently alternately assessed *(Jorgensen & McSheehan, (2006)), and*

6. All three NECAP states are partners in the ongoing development of the new *ACCESS for ELLs™* Test of English Language Proficiency. The Vermont Test Director is a member of the Technical Advisory Committee

The NECAP Development Team has been very busy. These efforts are ongoing and will continue. We are committed to the long-term development of a well validated and highly accessible assessment program that meets the highest possible standards of quality. More importantly, we are committed to the establishment of an assessment system that effectively supports *the growth of each and every one* of our students.

References

Abedi, J. (2006) *Validity, effectiveness and feasibility of accommodations for English language learners with disabilities (ELLWD).* Paper presented at the Accommodating Students with Disabilities on State Assessments: What Works Conference, Savannah, GA.

Allman, C.B., (Ed.). (2004) *Test Access: Making Tests Accessible for Students with Visual Impairments.* Louisville, KY: American Printing House for the Blind, Inc.

American Printing House for the Blind, Inc., Accessible Tests Division Staff, (personal communication, October 2004)

American Printing House for the Blind, Inc., Accessible Tests Division Staff, (personal communication, September 2006)

Dolan, R. (2004) *Computer Accommodations Must Begin As Classroom Accommodation: The New England Compact Enhanced Assessment Project: Using Computers to Improve Test Design and Support Students with Disabilities and English-Language Learners.* ©1994-2007 by Education Development Center, Inc. All Rights Reserved. www.necompact.org/research.asp

Elbaum, B., Aguelles, M.E., Campbell, Y., & Saleh, M.B. (2004). Effects of a student-reads-aloud accommodation on the performance of students with and without learning disabilities on a test of reading comprehension. *Exceptionality, 12(2), 71-87.*

Elliott, J., Thurlow, M., & Ysseldyke, J. (1996) *Assessment guidelines that maximize the participation of students with disabilities in large-scale assessments: Characteristics and considerations, Synthesis report 25.* Minneapolis, MN: University of Minnesota, National Center on Educational Outcomes.

Frances, D.J. (2006). *Practical guidelines for the education of English language learners*. Paper presented at the 2006 LEP Partnership Meeting. Washington, DC. Presentation retrieved December 21, 2006, from www.centeroninstruction.org.

Higgins, J., Russell, M., & Hoffmann, T., (2004) *Examining the Effect of Computer-Based Passage Presentation on Reading Test Performance: Part of the New England Compact Enhanced Assessment Project.* Boston, MA, in Technology Assessment Study Collaborative (inTASC), Boston College

Higgins, J., Russell, M., & Hoffmann, T., (2004) *Examining the Effect of Text Editor and Robust Word Processor on Student Writing Test Performance: Part of the New England Compact Enhanced Assessment Project*. Boston, MA, in Technology Assessment Study Collaborative (inTASC), Boston College (http://www.bc.edu/research/intasc/publications.shtml)

Johnstone, C.J, Altman, J., Thurlow, M.L., & Thompson, S.J. (2006): *A summary of research on the effects of test accommodations: 2002-2004: Synthesis Report 45.* Minneapolis, MN: University of Minnesota, National Center on Educational Outcomes.

Jorgensen, C. & McSheehan, M. (2006) *Beyond Access for Assessment Accommodations*, General Supervision Enhancement Grant Research (in progress) supported by the US Education Department, Office of Special Education Research, Washington, DC.

Miranda, H., Russell, M., & Hoffmann, T., (2004) *Examining the Feasibility and Effect of a Computer-Based Read-Aloud Accommodation on Mathematics Test Performance: Part of the New England Compact Enhanced Assessment Project*. Boston, MA, in Technology Assessment Study Collaborative (inTASC), Boston College (http://www.bc.edu/research/intasc/publications.shtml)

Miranda, H., Russell, M., Seeley, K., Hoffman, T., (2004) *Examining the Feasibility and Effect of Computer-Based Verbal Response to Open-Ended Reading Comprehension Test Items: Part of the New England Compact Enhanced Assessment Project.* Boston, MA, in Technology Assessment Study Collaborative (inTASC), Boston College (http://www.bc.edu/research/intasc/publications.shtml)

Parker, C. *Deepening Analysis of Large-Scale Assessment Data: Understanding the results for English language learners*, Study in progress (2007). Project funded by the U.S. Department of Education, Office of Educational Research and Improvement. **www.relnei.org**

Quenemoen, R. (2007). *New Hampshire Enhanced Assessment Initiative (NHEAI): Knowing What Students with Severe Cognitive Disabilities Know...* Research (in progress) supported by the US Education Department, Office of Elementary and Secondary Education, Washington, DC.

Sireci, S.G., Li, S., & Scarpati, S. (2005). Test accommodations for students with disabilities: An analysis of the interaction hypothesis. *Review of Educational Research*, 75 (4), 457-490.

Sireci, S.G. and Pitoniak, M.J. (2006). Assessment accommodations: What have we learned from research? Paper presented at the Accommodating Students with Disabilities on State Assessments: What Works Conference, Savannah, GA.

The New England Compact Enhanced Assessment Project: Using Computers to Improve Test Design and Support Students with Disabilities and English-Language Learners. ©1994-2007 by Education Development Center, Inc. All Rights Reserved. www.necompact.org/research.asp

The New England Compact Enhanced Assessment Project: Task Module Assessment System. ©1994-2007 by Education Development Center, Inc. All Rights Reserved. www.necompact.org/research.asp

Thompson, S.J., Blount, A., & Thurlow, M.L. (2002): *A summary of research on the effects of test accommodations 1999-2001, Technical Report 34.* Minneapolis, MN: University of Minnesota, National Center on Educational Outcomes.

Thompson, S.J., Johnstone, C.J., & Thurlow, M.L. (2002): *Universal design applied to large-scale assessments: Synthesis Report 44.* Minneapolis, MN: University of Minnesota, National Center on Educational Outcomes.

Additional Resources:

Rhode Island Department of Education, NECAP Assessment Website:
www.ride.ri.gov/assessment/NECAP.aspx

Vermont Department of Education, NECAP Assessment Website:
http://education.vermont.gov/new/html/pgm_assessment.html

New Hampshire Department of Education, NECAP Assessment Website:
www.ed.state.nh.us/NECAP

Appendix F—Item Response Theory Calibration Results

Table F-1. 2008–09 NECAP Science: IRT
Item Parameters for Multiple-Choice Items, Grade 4

Item Number	*Parameters*		
	a	*b*	*c*
47997	0.78	-1.71	0.19
60342	0.89	-0.36	0.40
60381	0.58	-0.63	0.20
60292	0.77	-0.68	0.15
61936	0.81	-0.23	0.17
50391	1.26	-0.72	0.27
48013	0.72	0.94	0.22
47614	0.90	-0.32	0.25
60373	0.47	0.21	0.11
49875	0.65	-0.03	0.21
60389	0.61	-0.33	0.18
46525	0.69	-1.95	0.00
59429	0.67	-1.32	0.08
46416	0.67	-0.17	0.21
61931	0.72	-0.95	0.15
46310	0.36	-2.70	0.12
59423	0.64	-1.95	0.13
135360	0.55	-1.85	0.00
59267	0.43	-0.78	0.10
59430	0.44	-0.43	0.09
46274	0.53	-0.60	0.11
46463	0.87	0.38	0.25
51273	0.77	-1.95	0.11
47490	0.64	-0.68	0.16
59919	0.37	-2.47	0.00
47357	0.63	1.54	0.21
49894	0.83	-0.24	0.16
59915	0.82	-0.89	0.14
49861	0.45	-2.28	0.00
47471	0.49	-0.15	0.13
59940	0.82	-0.79	0.19
50449	0.73	0.14	0.21
47346	0.81	0.11	0.14

a = discrimination; b = difficulty; c = guessing

Table F-2. 2008–09 NECAP Science: IRT
Item Parameters for Open-Response Items, Grade 4

Item Number	*Parameters*					
	a	*b*	*D1*	*D2*	*D3*	*D4*
60403	0.61	0.12	2.62	0.90	-0.74	-2.78
72768	0.60	-0.82	2.12	1.06	-0.75	-2.43
135358	0.86	-0.36	2.72	0.74	-0.85	-2.61

a = discrimination; b = difficulty; D1 = 1st category step parameter; D2 = 2nd category step parameter; D3 = 3rd category step parameter; D4 = 4th category step parameter

Figure F-1 2008–09 NECAP Science: Test Characteristic Curve (TCC), Grade 4

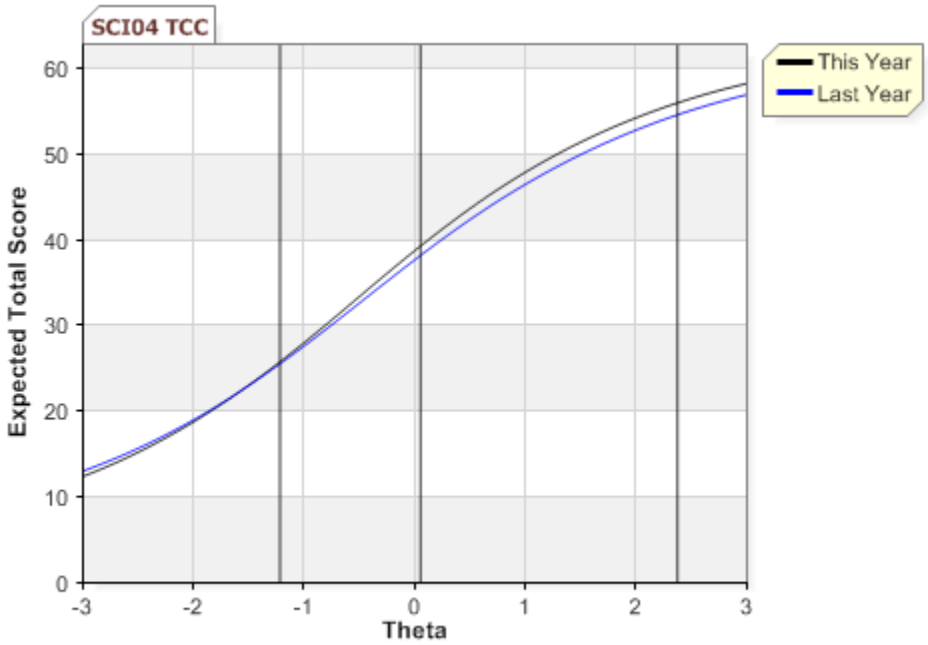


Figure F-2 2008–09 NECAP Science: Test Information Function (TIF), Grade 4

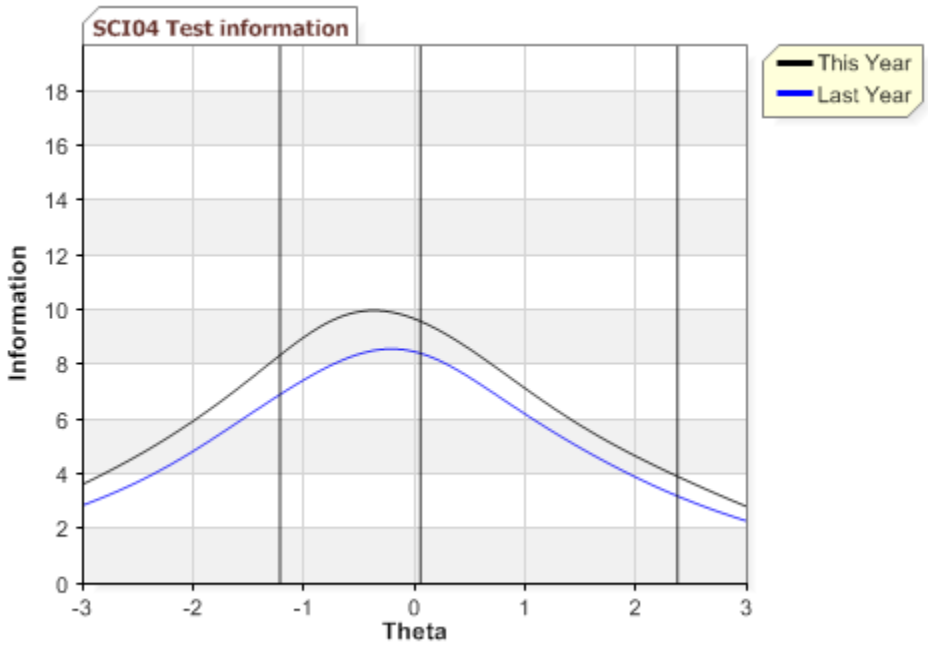


Table F-3. 2008–09 NECAP Science: IRT Item Parameters for Multiple-Choice Items, Grade 8

Item Number	*Parameters*		
	a	*b*	*c*
59722	0.66	0.72	0.20
50133	0.47	-1.98	0.00
59952	0.65	1.04	0.21
60320	0.65	-1.24	0.10
47870	0.62	-0.46	0.06
47903	0.97	0.91	0.17
59736	1.24	0.94	0.18
59965	1.08	0.59	0.27
59813	0.93	0.34	0.23
48343	0.74	0.23	0.16
59731	1.07	0.29	0.22
60033	0.67	-0.47	0.23
60114	0.64	-0.78	0.14
50151	1.20	-0.17	0.20
60019	1.11	1.22	0.26
60034	0.80	1.11	0.29
46090	0.41	-0.04	0.11
46045	0.74	0.88	0.12
46085	0.87	-0.55	0.21
60047	0.72	-0.04	0.21
46056	0.67	1.87	0.24
60048	0.98	-0.62	0.18
58385	1.23	-0.82	0.26
48269	0.91	0.65	0.28
58402	0.84	-0.04	0.21
58357	0.82	-0.23	0.13
58347	0.87	0.67	0.14
58373	0.88	0.58	0.21
58375	1.30	-0.19	0.20
58392	0.66	1.78	0.26
58316	1.69	0.13	0.23
58374	0.58	-0.52	0.13
48317	0.96	1.09	0.17

a = discrimination; b = difficulty; c = guessing

Table F-4. 2008–09 NECAP Science: IRT Item Parameters for Open-Response Items, Grade 8

Item Number	*Parameters*					
	a	*b*	*D1*	*D2*	*D3*	*D4*
135348	0.97	0.74	0.95	0.16	-0.27	-0.84
60009	0.81	0.77	2.18	0.67	-0.82	-2.02
48319	0.93	0.86	1.61	0.53	-0.45	-1.69

a = discrimination; b = difficulty; D1 = 1st category step parameter; D2 = 2nd category step parameter; D3 = 3rd category step parameter; D4 = 4th category step parameter

Figure F-3 2008–09 NECAP Science: Test Characteristic Curve (TCC), Grade 8

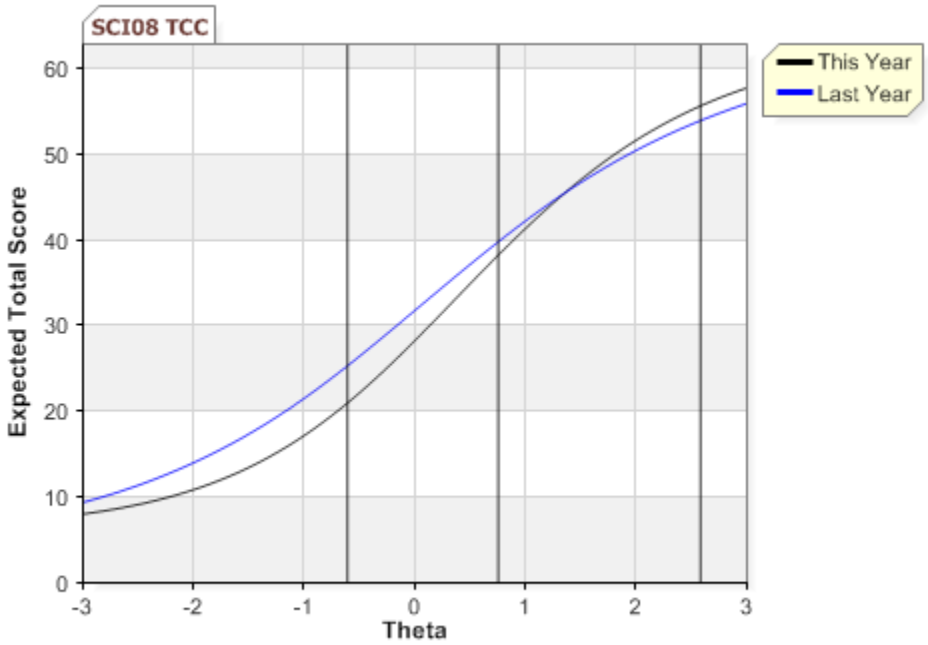


Figure F-4 2008–09 NECAP Science: Test Information Function (TIF), Grade 8

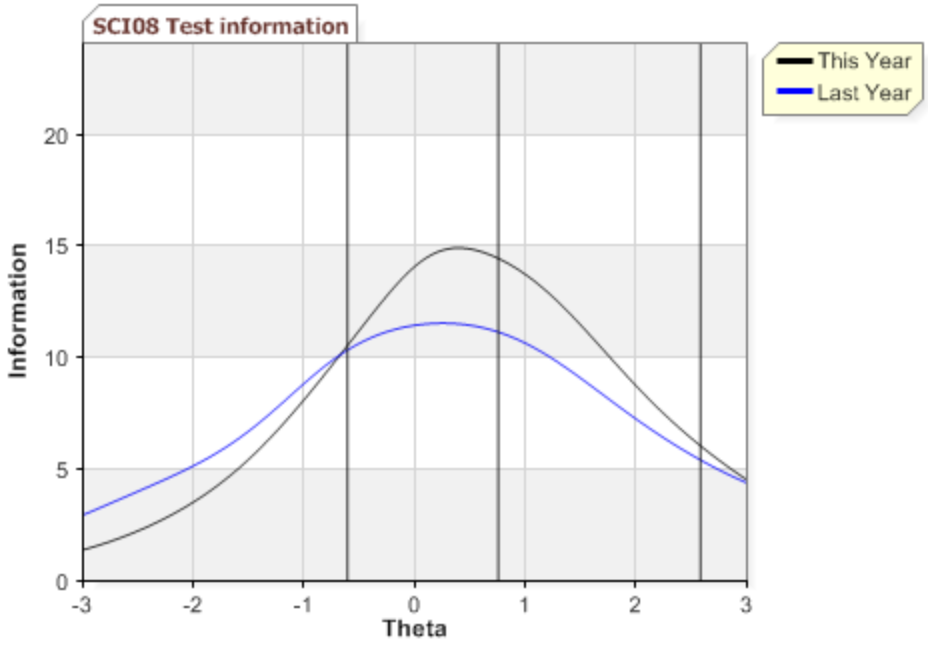


Table F-5. 2008–09 NECAP Science: IRT Item Parameters for Multiple-Choice Items, Grade 11

Item Number	*Parameters*		
	a	*b*	*c*
49914	1.04	-1.01	0.16
60181	0.25	-1.31	0.00
60116	0.94	0.39	0.23
60199	0.31	0.60	0.16
60135	1.54	0.47	0.27
47937	0.54	1.69	0.31
61807	0.48	0.56	0.20
48911	1.73	0.69	0.31
48002	0.58	-0.17	0.20
67694	0.84	-0.12	0.23
49916	1.27	1.09	0.24
146733	0.64	0.18	0.18
59666	1.01	1.75	0.30
46161	0.49	0.09	0.11
46139	0.45	-1.32	0.00
46040	0.80	1.25	0.32
46173	0.82	0.62	0.18
46187	0.58	0.98	0.23
59605	0.70	-1.29	0.14
135344	0.21	-0.84	0.00
61836	0.59	0.08	0.21
59662	1.02	0.83	0.19
48409	0.82	0.19	0.27
48147	0.56	0.13	0.15
49908	0.61	0.50	0.15
48425	0.48	1.25	0.16
61126	1.46	-0.67	0.23
59038	0.68	0.97	0.24
62083	1.11	0.09	0.23
60696	0.64	0.37	0.18
48406	1.46	0.87	0.31
61150	0.67	-0.93	0.00
135357	0.94	0.35	0.18

a = discrimination; b = difficulty; c = guessing

Table F-6. 2008–09 NECAP Science: IRT Item Parameters for Open-Response Items, Grade 11

Item Number	*Parameters*					
	a	*b*	*D1*	*D2*	*D3*	*D4*
47986	0.98	-0.16	2.08	0.79	-0.68	-2.19
59987	1.08	0.75	1.14	0.42	-0.27	-1.29
135340	0.99	1.38	2.05	0.69	-0.72	-2.02

a = discrimination; b = difficulty; D1 = 1st category step parameter; D2 = 2nd category step parameter; D3 = 3rd category step parameter; D4 = 4th category step parameter

Figure F-5 2008–09 NECAP Science: Test Characteristic Curve (TCC) Grade 11

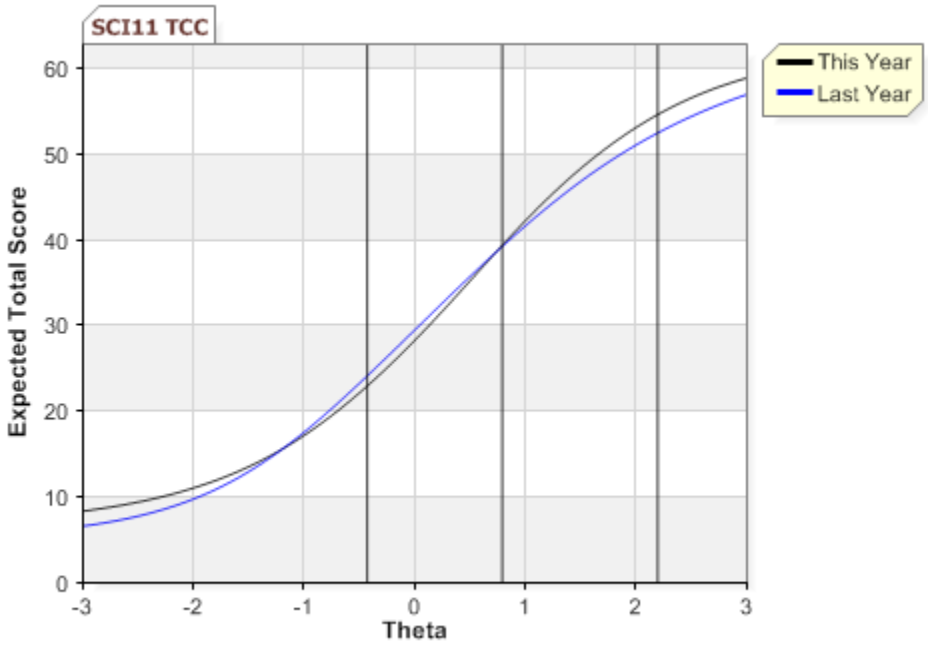
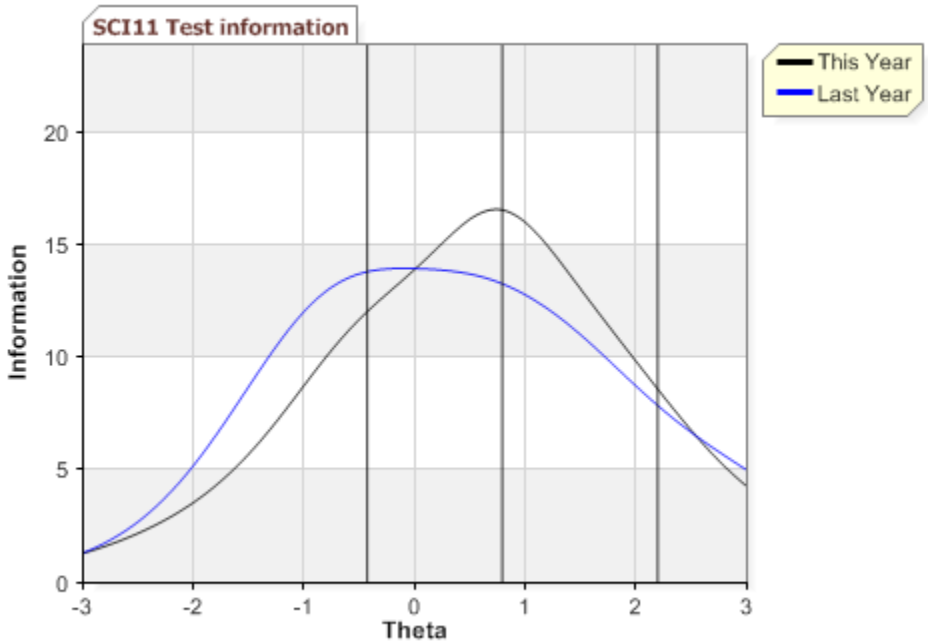


Figure F-6 2008–09 NECAP Science: Test Information Function (TIF), Grade 11



Appendix G—Delta and Rescore Analyses Results

Table G-1. 2008–09 NECAP Science: Delta Analyses Grade 4

IREF	*Old Mean p-value*	*New Mean p-value*	*Old Delta*	*New Delta*	*Line*	*Max*	*Discard*	*SD*
46245	0.72	0.75	10.67	10.30	10.41	1	No	-0.11
46263	0.68	0.64	11.13	11.57	11.67	1	No	1.05
46271	0.49	0.52	13.10	12.80	12.90	1	No	-0.39
46276	0.79	0.80	9.77	9.63	9.74	1	No	-1.07
46313	0.63	0.61	11.67	11.88	11.99	1	No	0.09
46316	0.77	0.78	10.04	9.91	10.01	1	No	-1.10
46402	0.68	0.70	11.13	10.90	11.01	1	No	-0.70
46438	0.43	0.41	13.76	13.94	14.04	4	No	-0.04
46457	0.75	0.77	10.30	10.04	10.15	1	No	-0.58
46508	0.85	0.86	8.85	8.68	8.78	1	No	-0.92
46513	0.66	0.67	11.35	11.24	11.34	1	No	-1.20
46519	0.81	0.84	9.49	9.02	9.13	1	No	0.30
47361	0.79	0.83	9.77	9.18	9.29	1	No	0.83
47384	0.56	0.55	12.40	12.50	12.60	1	No	-0.37
47386	0.87	0.88	8.49	8.30	8.40	1	No	-0.85
47408	0.72	0.76	10.67	10.17	10.28	1	No	0.42
47418	0.53	0.51	12.70	12.90	13.00	1	No	0.05
47448	0.75	0.77	10.30	10.04	10.15	1	No	-0.58
47493	0.65	0.63	11.46	11.67	11.78	1	No	0.11
47498	0.63	0.67	11.67	11.24	11.34	1	No	0.16
47508	0.81	0.78	9.49	9.91	10.01	1	No	1.00
47531	0.41	0.47	13.88	13.28	13.38	4	No	0.91
47551	0.72	0.70	10.67	10.90	11.01	1	No	0.20
47624	0.51	0.63	12.90	11.67	11.78	1	Yes	3.52
47644	0.84	0.82	9.02	9.34	9.44	1	No	0.55
47662	0.74	0.75	10.43	10.30	10.41	1	No	-1.14
47724	0.93	0.93	7.10	7.10	7.20	1	No	-0.78
47742	0.60	0.52	11.99	12.80	12.90	1	No	2.64
47760	0.65	0.64	11.46	11.57	11.67	1	No	-0.34
47991	0.50	0.56	13.00	12.40	12.50	1	No	0.89
47992	0.72	0.75	10.67	10.30	10.41	1	No	-0.11
48019	0.92	0.92	7.38	7.38	7.48	1	No	-0.78
48060	0.49	0.46	13.13	13.38	13.48	4	No	0.26
49850	0.71	0.73	10.79	10.55	10.65	1	No	-0.66
49866	0.85	0.83	8.85	9.18	9.29	1	No	0.60
49873	0.58	0.59	12.19	12.09	12.19	1	No	-1.23
49891	0.54	0.55	12.60	12.50	12.60	1	No	-1.22
49897	0.56	0.61	12.40	11.88	11.99	1	No	0.51
86940	0.48	0.46	13.20	13.40	13.50	1	No	0.05

Table G-2. 2008–09 NECAP Science: Delta Analyses Grade 8

IREF	*Old Mean p-value*	*New Mean p-value*	*Old Delta*	*New Delta*	*Line*	*Max*	*Discard*	*SD*
46016	0.70	0.68	10.90	11.13	11.22	1	No	0.83
46026	0.70	0.70	10.90	10.90	11.00	1	No	-0.55
46039	0.45	0.45	13.55	13.55	13.58	4	No	-0.97
46041	0.46	0.46	13.40	13.40	13.43	1	No	-0.94
46046	0.70	0.70	10.90	10.90	11.00	1	No	-0.55
46070	0.47	0.45	13.30	13.50	13.53	1	No	0.30
46072	0.65	0.71	11.46	10.79	10.89	1	No	2.43
46074	0.59	0.58	12.09	12.19	12.26	1	No	-0.11
46082	0.57	0.59	12.29	12.09	12.16	1	No	-0.28
46089	0.69	0.68	11.02	11.13	11.22	1	No	0.12
46106	0.51	0.51	12.90	12.90	12.95	1	No	-0.86
46109	0.39	0.40	14.12	14.01	14.03	1	No	-0.61
47790	0.81	0.81	9.49	9.49	9.62	1	No	-0.32
48184	0.68	0.70	11.13	10.90	11.00	1	No	-0.33
48228	0.64	0.66	11.57	11.35	11.44	1	No	-0.33
48245	0.73	0.74	10.55	10.43	10.54	1	No	-1.06
48267	0.62	0.65	11.78	11.46	11.54	1	No	0.33
48268	0.60	0.59	11.99	12.09	12.16	1	No	-0.09
48276	0.42	0.37	13.78	14.35	14.36	4	No	2.48
48297	0.48	0.52	13.20	12.80	12.85	1	No	1.06
48421	0.53	0.55	12.70	12.50	12.55	1	No	-0.24
48445	0.48	0.48	13.20	13.20	13.24	1	No	-0.91
48456	0.40	0.42	14.01	13.81	13.83	1	No	0.00
48472	0.83	0.84	9.18	9.02	9.17	1	No	-1.04
48563	0.69	0.72	11.02	10.67	10.77	1	No	0.39
49988	0.82	0.82	9.34	9.34	9.47	1	No	-0.30
49990	0.50	0.52	13.00	12.80	12.85	1	No	-0.20
50012	0.66	0.64	11.35	11.57	11.65	1	No	0.70
50016	0.83	0.84	9.18	9.02	9.17	1	No	-1.04
50026	0.67	0.62	11.24	11.78	11.85	1	No	2.67
50120	0.49	0.48	13.10	13.20	13.24	1	No	-0.28
50138	0.80	0.81	9.63	9.49	9.62	1	No	-1.07
50145	0.67	0.69	11.24	11.02	11.11	1	No	-0.33
50511	0.80	0.83	9.63	9.18	9.32	1	No	0.79
76623	0.48	0.49	13.20	13.10	13.14	1	No	-0.77
76626	0.64	0.66	11.57	11.35	11.44	1	No	-0.33
86817	0.28	0.28	15.33	15.33	15.32	1	No	-1.05
90278	0.37	0.42	14.35	13.83	13.86	4	No	1.97
90304	0.58	0.56	12.19	12.40	12.45	1	No	0.49

Table G-3. 2008–09 NECAP Science: Delta Analyses Grade 11

IREF	*Old Mean p-value*	*New Mean p-value*	*Old Delta*	*New Delta*	*Line*	*Max*	*Discard*	*SD*
46019	0.41	0.46	13.91	13.40	13.52	1	No	1.00
46094	0.53	0.50	12.70	13.00	13.10	1	No	1.10
46096	0.53	0.50	12.70	13.00	13.10	1	No	1.10
46099	0.29	0.35	15.21	14.60	14.76	4	No	1.38
46121	0.79	0.81	9.77	9.49	9.46	1	No	0.58
46148	0.58	0.61	12.19	11.88	11.94	1	No	0.17
46154	0.70	0.69	10.90	11.02	11.04	1	No	-0.47
46166	0.54	0.55	12.60	12.50	12.58	1	No	-1.22
46167	0.36	0.39	14.43	14.12	14.27	1	No	-0.31
46179	0.65	0.66	11.46	11.35	11.39	1	No	-0.91
47792	0.70	0.71	10.90	10.79	10.81	1	No	-0.73
47829	0.40	0.39	14.01	14.12	14.27	1	No	0.19
47884	0.70	0.65	10.90	11.46	11.50	1	No	2.26
47896	0.57	0.58	12.29	12.19	12.27	1	No	-1.14
47901	0.24	0.25	15.83	15.67	15.87	4	No	-1.02
47917	0.51	0.52	12.90	12.80	12.90	1	No	-1.29
47930	0.37	0.37	14.33	14.33	14.48	1	No	-0.38
48005	0.51	0.55	12.90	12.50	12.58	1	No	0.58
48071	0.60	0.58	11.99	12.19	12.27	1	No	0.35
48156	0.79	0.77	9.77	10.04	10.03	1	No	0.24
48175	0.73	0.72	10.55	10.67	10.68	1	No	-0.51
48216	0.46	0.48	13.40	13.20	13.31	1	No	-0.78
48357	0.36	0.35	14.43	14.54	14.71	1	No	0.31
48372	0.31	0.36	14.98	14.43	14.59	1	No	1.01
48415	0.30	0.30	15.10	15.10	15.28	1	No	-0.21
48416	0.73	0.73	10.55	10.55	10.56	1	No	-1.26
48543	0.48	0.50	13.20	13.00	13.10	1	No	-0.74
48908	0.61	0.58	11.88	12.19	12.27	1	No	0.97
48921	0.56	0.57	12.40	12.29	12.37	1	No	-1.17
49902	0.45	0.46	13.50	13.40	13.52	1	No	-1.20
49903	0.65	0.64	11.46	11.57	11.62	1	No	-0.38
49922	0.59	0.62	12.09	11.78	11.84	1	No	0.20
49925	0.59	0.61	12.09	11.88	11.94	1	No	-0.44
49930	0.31	0.28	14.98	15.33	15.53	1	No	1.92
49931	0.66	0.70	11.35	10.90	10.93	1	No	1.21
49934	0.83	0.83	9.18	9.18	9.14	1	No	-1.05
49935	0.65	0.65	11.46	11.46	11.50	1	No	-1.05
89507	0.39	0.45	14.17	13.50	13.63	4	No	1.92
89654	0.65	0.67	11.46	11.24	11.28	1	No	-0.23

Table G-4. 2008–09 NECAP Science: Rescore Analyses, Grade 4

IREF	*Maximum number of points*	*Old mean p-value*	*New mean p-value*	*Old SD*	*New SD*	*Effect size*	*Discard*
48060	4	2.12	2.08	1.20	1.20	-0.04	No
46438	4	1.70	1.60	1.22	1.29	-0.08	No
47531	4	1.96	1.95	1.16	1.15	-0.01	No

SD = standard deviation

Table G-5. 2008–09 NECAP Science: Rescore Analyses, Grade 8

IREF	*Maximum number of points*	*Old mean p-value*	*New mean p-value*	*Old SD*	*New SD*	*Effect size*	*Discard*
90278	4	1.38	1.37	1.42	1.42	-0.01	No
46039	4	1.76	1.69	1.01	1.05	-0.07	No
48276	4	1.58	1.43	1.15	1.14	-0.13	No

SD = standard deviation

Table G-6. 2008–09 NECAP Science: Rescore Analyses, Grade 11

IREF	*Maximum number of points*	*Old mean p-value*	*New mean p-value*	*Old SD*	*New SD*	*Effect size*	*Discard*
47901	4	1.19	1.14	1.13	1.07	-0.05	No
46099	4	1.22	1.07	0.82	0.78	-0.18	No
89507	4	1.72	1.89	1.03	1.02	0.17	No

SD = standard deviation

Appendix H—Raw to Scaled Score Lookup Tables

Table H-1. 2008–09 NECAP Science: Scaled Score Lookup, Grade 4

Raw score	*θ*	*Scaled score*	*Error band*		*Achievement level*
			Lower bound	*Upper bound*	
0	-6.98	400	400	410	1
1	-6.56	400	400	410	1
2	-6.13	400	400	410	1
3	-5.71	400	400	410	1
4	-5.29	400	400	410	1
5	-4.87	400	400	410	1
6	-4.45	400	400	408	1
7	-4.03	400	400	407	1
8	-3.52	400	405	411	1
9	-3.14	403	408	413	1
10	-2.83	407	412	417	1
11	-2.57	409	414	419	1
12	-2.34	412	416	420	1
13	-2.13	414	418	422	1
14	-1.94	416	420	424	1
15	-1.77	418	422	426	1
16	-1.60	420	424	428	1
17	-1.45	421	425	429	1
18	-1.30	423	426	430	1
19	-1.16	425	428	431	2
20	-1.02	426	429	432	2
21	-0.89	428	431	434	2
22	-0.75	429	432	435	2
23	-0.62	430	433	436	2
24	-0.49	432	435	438	2
25	-0.36	433	436	439	2
26	-0.23	434	437	440	2
27	-0.09	436	439	442	2
28	0.05	436	439	442	2
29	0.19	438	441	444	3
30	0.34	440	443	446	3
31	0.50	442	445	448	3
32	0.68	443	446	450	3
33	0.87	444	448	452	3
34	1.07	446	450	454	3
35	1.31	448	452	456	3
36	1.57	451	455	459	3
37	1.89	454	458	463	3
38	2.28	457	462	467	3
39	2.79	462	467	473	4
40	3.59	468	475	480	4
41	4.00	472	480	480	4

Table H-2. 2008–09 NECAP Science: Scaled Score Lookup, Grade 8

Raw score	*θ*	*Scaled score*	*Error band*		*Achievement level*
			Lower bound	*Upper bound*	
0	-10.06	800	800	810	1
1	-9.18	800	800	810	1
2	-8.31	800	800	810	1
3	-7.43	800	800	810	1
4	-6.56	800	800	810	1
5	-5.69	800	800	810	1
6	-4.81	800	800	810	1
7	-3.90	800	801	811	1
8	-3.04	801	808	815	1
9	-2.57	806	812	818	1
10	-2.24	810	815	820	1
11	-1.98	813	817	821	1
12	-1.77	815	819	823	1
13	-1.59	816	820	824	1
14	-1.43	819	822	826	1
15	-1.28	820	823	826	1
16	-1.15	821	824	827	1
17	-1.03	822	825	828	1
18	-0.92	823	826	829	1
19	-0.81	824	827	830	1
20	-0.71	825	828	831	1
21	-0.62	825	828	831	1
22	-0.53	827	829	832	2
23	-0.44	828	830	833	2
24	-0.35	829	831	833	2
25	-0.27	829	831	833	2
26	-0.19	830	832	834	2
27	-0.11	831	833	835	2
28	-0.03	831	833	835	2
29	0.05	832	834	836	2
30	0.12	833	835	837	2
31	0.20	833	835	837	2
32	0.27	834	836	838	2
33	0.35	835	837	839	2
34	0.42	835	837	839	2
35	0.50	836	838	840	2
36	0.57	836	838	840	2
37	0.65	837	839	841	2
38	0.72	837	839	841	2
39	0.80	838	840	842	3
40	0.88	839	841	843	3
41	0.96	840	842	844	3
42	1.04	840	842	844	3
43	1.12	841	843	845	3
44	1.21	842	844	846	3
45	1.30	843	845	847	3
46	1.39	843	845	847	3

continued

Raw score	θ	Scaled score	Error band		Achievement level
			Lower bound	Upper bound	
47	1.48	844	846	849	3
48	1.58	845	847	850	3
49	1.68	845	848	851	3
50	1.79	846	849	852	3
51	1.90	847	850	853	3
52	2.02	848	851	854	3
53	2.15	849	852	855	3
54	2.29	850	853	856	3
55	2.45	851	854	857	3
56	2.61	853	856	860	4
57	2.80	853	857	861	4
58	3.02	855	859	863	4
59	3.28	857	861	865	4
60	3.60	859	864	869	4
61	4.00	861	867	873	4
62	4.00	861	867	873	4
63	4.00	874	880	880	4

Table H-3. 2008–09 NECAP Science: Scaled Score Lookup, Grade 11

Raw score	*θ*	*Scaled score*	*Error band*		*Achievement level*
			Lower bound	*Upper bound*	
0	-10.69	1100	1100	1110	1
1	-9.64	1100	1100	1110	1
2	-8.59	1100	1100	1110	1
3	-7.55	1100	1100	1110	1
4	-6.50	1100	1100	1110	1
5	-5.46	1100	1100	1110	1
6	-4.41	1100	1100	1110	1
7	-3.27	1100	1106	1114	1
8	-2.64	1105	1111	1117	1
9	-2.24	1110	1115	1120	1
10	-1.95	1113	1117	1121	1
11	-1.71	1115	1119	1123	1
12	-1.51	1118	1121	1125	1
13	-1.34	1119	1122	1125	1
14	-1.18	1121	1124	1127	1
15	-1.04	1122	1125	1128	1
16	-0.91	1123	1126	1129	1
17	-0.79	1124	1127	1130	1
18	-0.68	1126	1128	1131	1
19	-0.57	1127	1129	1132	1
20	-0.47	1127	1129	1131	1
21	-0.37	1128	1130	1132	2
22	-0.27	1129	1131	1133	2
23	-0.18	1130	1132	1134	2
24	-0.09	1131	1133	1135	2
25	0.00	1131	1133	1135	2
26	0.09	1132	1134	1136	2
27	0.17	1133	1135	1137	2
28	0.26	1134	1136	1138	2
29	0.34	1134	1136	1138	2
30	0.42	1135	1137	1139	2
31	0.51	1136	1138	1140	2
32	0.59	1136	1138	1140	2
33	0.67	1137	1139	1141	2
34	0.75	1137	1139	1141	2
35	0.83	1138	1140	1142	3
36	0.92	1139	1141	1143	3
37	1.00	1140	1142	1144	3
38	1.09	1141	1143	1145	3
39	1.18	1141	1143	1145	3
40	1.28	1142	1144	1146	3
41	1.37	1143	1145	1147	3
42	1.47	1144	1146	1148	3
43	1.58	1145	1147	1149	3
44	1.69	1146	1148	1150	3
45	1.81	1147	1149	1152	3
46	1.94	1147	1150	1153	3

continued

Raw score	θ	Scaled score	Error band		Achievement level
			Lower bound	Upper bound	
47	2.08	1148	1151	1154	3
48	2.24	1149	1152	1155	4
49	2.42	1151	1154	1157	4
50	2.62	1152	1155	1158	4
51	2.87	1153	1157	1161	4
52	3.18	1156	1160	1164	4
53	3.60	1159	1164	1169	4
54	4.00	1160	1167	1174	4
55	4.00	1173	1180	1180	4

Appendix I—Scaled Score Percentages and Cumulative Percentages

Table I-1. 2008–09 NECAP Science: Scaled Score Percentages and Cumulative Percentages—Grade 4

Scaled score	*Percent*	*Cumulative percent*
400	0.2	0.2
401	0.1	0.4
404	0.2	0.6
407	0.2	0.7
409	0.3	1.0
411	0.3	1.3
413	0.4	1.8
414	0.5	2.2
416	0.5	2.7
417	0.6	3.3
419	0.7	4.1
420	0.9	4.9
421	1.0	5.9
422	1.0	7.0
423	1.2	8.2
425	1.2	9.4
426	3.0	12.4
428	1.7	14.2
429	1.9	16.1
430	4.5	20.6
431	2.4	23.0
432	2.5	25.6
433	2.6	28.2
434	2.8	31.0
435	3.1	34.1
436	3.2	37.3
437	3.3	40.6
438	3.5	44.2
439	7.1	51.2
441	3.9	55.1
442	3.9	59.1
443	3.9	63.0
444	4.1	67.1
445	3.9	71.0
446	3.9	74.9
447	3.6	78.5
448	3.6	82.1
449	3.3	85.3
450	0.0	85.3
451	3.0	88.4
452	2.7	91.0
453	2.4	93.4
455	2.0	95.4
457	1.7	97.1
458	1.2	98.3
460	0.8	99.0
462	0.5	99.6
465	0.3	99.8
468	0.1	99.9
471	0.0	100.0
475	0.0	100.0
479	0.0	100.0

Table I-2. 2008–09 NECAP Science: Scaled Score Percentages and Cumulative Percentages—Grade 8

Scaled score	*Percent*	*Cumulative percent*
800	0.9	0.9
801	0.7	1.6
808	0.9	2.5
812	1.1	3.6
815	1.4	5.0
817	1.5	6.5
819	1.7	8.2
820	1.8	10.0
822	2.0	12.0
823	2.1	14.1
824	2.1	16.2
825	2.3	18.5
826	2.3	20.9
827	2.5	23.3
828	5.3	28.6
829	2.8	31.4
830	2.9	34.4
831	5.7	40.0
832	3.0	43.0
833	5.9	48.9
834	3.1	52.0
835	6.2	58.2
836	2.9	61.2
837	6.1	67.3
838	5.6	72.9
839	5.2	78.1
840	2.3	80.3
841	2.3	82.6
842	4.2	86.8
843	1.8	88.7
844	1.7	90.4
845	3.0	93.4
846	1.2	94.6
847	1.1	95.7
848	0.9	96.6
849	0.8	97.4
850	0.7	98.0
851	0.5	98.6
852	0.4	99.0
853	0.3	99.3
854	0.2	99.6
856	0.2	99.7
857	0.1	99.9
859	0.1	99.9
861	0.0	100.0
864	0.0	100.0
867	0.0	100.0

Table I-3. 2008–09 NECAP Science: Scaled Score Percentages and Cumulative Percentages—Grade 11

Scaled score	*Percent*	*Cumulative percent*
1100	1.1	1.1
1106	0.7	1.9
1111	1.0	2.9
1114	1.2	4.0
1116	1.4	5.4
1118	1.5	6.9
1120	1.6	8.5
1121	2.0	10.5
1123	1.8	12.3
1124	2.0	14.4
1125	2.1	16.5
1126	2.2	18.7
1127	4.8	23.5
1128	2.4	25.9
1129	5.1	31.0
1130	2.7	33.7
1131	2.8	36.5
1132	5.6	42.1
1133	2.9	45.1
1134	5.8	50.8
1135	3.0	53.9
1136	5.8	59.7
1137	5.9	65.6
1138	3.0	68.6
1139	8.3	76.9
1140	2.5	79.4
1141	2.5	81.9
1142	4.5	86.4
1143	3.8	90.2
1144	1.7	91.9
1145	1.6	93.5
1146	2.4	95.9
1147	1.0	96.9
1148	0.7	97.7
1149	0.7	98.4
1150	0.5	98.9
1151	0.4	99.3
1152	0.3	99.5
1153	0.2	99.8
1155	0.1	99.9
1156	0.1	99.9
1158	0.0	100.0
1161	0.0	100.0
1164	0.0	100.0
1167	0.0	100.0

Appendix J—Decision Accuracy and Consistency Results

Table J-1. 2008–09 NECAP Science: Decision Accuracy—Crosstabulation of True and Observed achievement level Proportions, Grade 4

Observed achievement level	*True achievement level*				
	SBP	PP	P	PWD	Total
SBP	0.084	0.022	0.000	0.000	0.106
PP	0.028	0.349	0.062	0.000	0.439
P	0.000	0.044	0.386	0.013	0.443
PWD	0.000	0.000	0.002	0.009	0.012
Total	0.112	0.414	0.451	0.022	1.000

SBP = Substantially Below Proficient; PP = Partially Proficient; P = Proficient; PWD = Proficient With Distinction

Table J-2. 2008–09 NECAP Science: Decision Consistency—Crosstabulation of Observed achievement level Proportions for Two Parallel Forms, Grade 4

Form 2 achievement level	*Form 1 achievement level*				
	SBP	PP	P	PWD	Total
SBP	0.077	0.035	0.000	0.000	0.112
PP	0.035	0.306	0.073	0.000	0.414
P	0.000	0.073	0.367	0.011	0.451
PWD	0.000	0.000	0.011	0.011	0.022
Total	0.112	0.414	0.451	0.022	1.000

SBP = Substantially Below Proficient; PP = Partially Proficient; P = Proficient; PWD = Proficient With Distinction

Table J-3. 2008–09 NECAP Science: Summary of Overall Accuracy and Consistency Indices—Grade 4

Accuracy	0.828
Consistency	0.761
Kappa (k)	0.609

Table J-4. 2008–09 NECAP Science: Indices Conditional on achievement level—Grade 4

Achievement level	*Accuracy*	*Consistency*
SBP	0.793	0.686
PP	0.794	0.738
P	0.872	0.813
PWD	0.796	0.505

SBP = Substantially Below Proficient; PP = Partially Proficient; P = Proficient; PWD = Proficient With Distinction

Table J-5. 2008–09 NECAP Science: Accuracy and Consistency Indices at Cutpoints—Grade 4

Cutpoint	*Accuracy*	*False positive*	*False negative*	*Consistency*
SBP/PP	0.950	0.022	0.028	0.930
PP/P	0.894	0.062	0.044	0.853
P/PWD	0.985	0.013	0.002	0.978

SBP = Substantially Below Proficient; PP = Partially Proficient; P = Proficient; PWD = Proficient With Distinction
False positive = proportion of students with observed score above cutpoint and true score below cutpoint
False negative = proportion of students with observed score below cutpoint and true score above cutpoint

Table J-6. 2008–09 NECAP Science: Decision Accuracy—Crosstabulation of True and Observed achievement level Proportions—Grade 8

Observed achievement level	*True achievement level*				
	SBP	PP	P	PWD	Total
SBP	0.233	0.043	0.000	0.000	0.276
PP	0.040	0.423	0.050	0.000	0.513
P	0.000	0.027	0.179	0.004	0.211
PWD	0.000	0.000	0.000	0.000	0.000
Total	0.273	0.494	0.230	0.004	1.000

SBP = Substantially Below Proficient; PP = Partially Proficient; P = Proficient; PWD = Proficient With Distinction

Table J-7. 2008–09 NECAP Science: Decision Consistency—Crosstabulation of Observed achievement level Proportions for Two Parallel Forms—Grade 8

Form 2 achievement level	*Form 1 achievement level*				
	SBP	PP	P	PWD	Total
SBP	0.215	0.058	0.000	0.000	0.273
PP	0.058	0.382	0.054	0.000	0.494
P	0.000	0.054	0.172	0.003	0.230
PWD	0.000	0.000	0.003	0.001	0.004
Total	0.273	0.494	0.230	0.004	1.000

SBP = Substantially Below Proficient; PP = Partially Proficient; P = Proficient; PWD = Proficient With Distinction

Table J-8. 2008–09 NECAP Science: Summary of Overall Accuracy and Consistency Indices—Grade 8

Accuracy	0.836
Consistency	0.770
Kappa (k)	0.634

Table J-9. 2008–09 NECAP Science: Indices Conditional on achievement level—Grade 8

Achievement level	*Accuracy*	*Consistency*
SBP	0.844	0.787
PP	0.825	0.774
P	0.851	0.751
PWD	0.649	0.233

SBP = Substantially Below Proficient; PP = Partially Proficient; P = Proficient; PWD = Proficient With Distinction

Table J-10. 2008–09 NECAP Science: Accuracy and Consistency Indices at Cutpoints—Grade 8

Cutpoint	*Accuracy*	*False positive*	*False negative*	*Consistency*
SBP/PP	0.917	0.043	0.040	0.884
PP/P	0.923	0.050	0.027	0.892
P/PWD	0.996	0.004	0.000	0.994

SBP = Substantially Below Proficient; PP = Partially Proficient; P = Proficient; PWD = Proficient With Distinction
False positive = proportion of students with observed score above cutpoint and true score below cutpoint
False negative = proportion of students with observed score below cutpoint and true score above cutpoint

Table J-11. 2008–09 NECAP Science: Decision Accuracy—Crosstabulation of True and Observed achievement level Proportions—Grade 11

Observed achievement level	*True achievement level*				
	SBP	PP	P	PWD	Total
SBP	0.251	0.044	0.000	0.000	0.295
PP	0.040	0.396	0.053	0.000	0.489
P	0.000	0.029	0.178	0.008	0.214
PWD	0.000	0.000	0.001	0.001	0.002
Total	0.291	0.469	0.231	0.009	1.000

SBP = Substantially Below Proficient; PP = Partially Proficient; P = Proficient; PWD = Proficient With Distinction

Table J-12. 2008–09 NECAP Science: Decision Consistency—Crosstabulation of Observed achievement level Proportions for Two Parallel Forms—Grade 11

Form 2 achievement level	*Form 1 achievement level*				
	SBP	PP	P	PWD	Total
SBP	0.232	0.059	0.000	0.000	0.291
PP	0.059	0.354	0.056	0.000	0.469
P	0.000	0.056	0.168	0.006	0.231
PWD	0.000	0.000	0.006	0.003	0.009
Total	0.291	0.469	0.231	0.009	1.000

SBP = Substantially Below Proficient; PP = Partially Proficient; P = Proficient; PWD = Proficient With Distinction

Table J-13. 2008–09 NECAP Science: Summary of Overall Accuracy and Consistency Indices—Grade 11

Accuracy	0.826
Consistency	0.757
Kappa (k)	0.622

Table J-14. 2008–09 NECAP Science: Indices Conditional on achievement level—Grade 11

Achievement level	*Accuracy*	*Consistency*
SBP	0.851	0.798
PP	0.810	0.755
P	0.831	0.729
PWD	0.680	0.312

SBP = Substantially Below Proficient; PP = Partially Proficient; P = Proficient; PWD = Proficient With Distinction

Table J-15. 2008–09 NECAP Science: Accuracy and Consistency Indices at Cutpoints—Grade 11

Cutpoint	*Accuracy*	*False positive*	*False negative*	*Consistency*
SBP/PP	0.916	0.044	0.040	0.882
PP/P	0.919	0.053	0.029	0.887
P/PWD	0.992	0.008	0.001	0.988

SBP = Substantially Below Proficient; PP = Partially Proficient; P = Proficient; PWD = Proficient With Distinction
False positive = proportion of students with observed score above cutpoint and true score below cutpoint
False negative = proportion of students with observed score below cutpoint and true score above cutpoint

Appendix K—SAMPLE REPORTS

NECAP Student Report - Spring 2009

This report contains results from the Spring 2009 New England Common Assessment Program (NECAP) science tests. The NECAP tests are administered to students in New Hampshire, Rhode Island, and Vermont as part of each state's statewide assessment program. The NECAP tests are designed to measure student performance on standards developed and adopted by the three states. Specifically, the tests are designed to measure the content and skills that students are expected to have at the end of the K–4, 5–8, and 9–11 grade spans.

NECAP science test results are used primarily for program evaluation, school improvement, and public reporting. Detailed school and district results are used by schools to help improve curriculum and instruction. Individual student results are used to support information gathered through classroom instruction and assessments. Contact the school for more information on this student's overall achievement.

Achievement Levels and Corresponding Score Ranges

Student performance on the NECAP tests is classified into one of four achievement levels describing students' level of proficiency on the content and skills required through the end of the tested grade. Performance at Proficient or Proficient with Distinction indicates that the student has a level of proficiency necessary to begin working successfully on higher grade content and skills. Performance below Proficient suggests that additional instruction and student work may be needed as the student is introduced to new content and skills at the next grade. Refer to the Achievement Level Descriptions contained in this report for a more detailed description of the achievement levels.

There is a wide range of student proficiency within each achievement level. NECAP test results are also reported as scaled scores to provide additional information about the location of student performance within each achievement level. NECAP scores are reported as three-digit scores in which the first digit represents the grade level. The remaining digits range from 00 to 80. Scores of 40 and higher indicate a level of proficiency at or above the Proficient level. Scores below 40 indicate proficiency below the Proficient level. For example, scores of 440 at grade 4, 840 at grade 8, and 1140 at grade 11 each indicate Proficient performance at that grade level.

Comparisons to Other End of Grade Span Students

The tables in the middle section of the report provide the percentage of students performing at each achievement level in the student's school, district, and state. Note that one or two students can have a large impact on percentages in small schools and districts. Results are not reported for schools or districts with nine (9) or fewer students.

Performance in Science Domains

This section of the report provides information about student performance on sets of items measuring four science domains within the test. These results can provide a general idea of relative strengths and weaknesses in comparison to other students. However, results in this section are based on fewer test items and should be interpreted cautiously.

Students at Proficient Level

This column shows the average performance on these items of students who performed near the beginning of the Proficient achievement level on the overall test. Students whose performance in a category falls within the range shown performed similarly to those students. This comparison can provide some information about the level of performance needed to perform at the Proficient level.

Achievement Level Descriptions

Proficient with Distinction (Level 4) - Students performing at this level demonstrate the knowledge and skills as described in the content standards for this grade span. Errors made by these students are few and minor and do not reflect gaps in knowledge and skills.

Proficient (Level 3) - Students performing at this level demonstrate the knowledge and skills as described in the content standards for this grade span with only minor gaps. It is likely that any gaps in knowledge and skills demonstrated by these students can be addressed by the classroom teacher during the course of classroom instruction.

Partially Proficient (Level 2) - Students performing at this level demonstrate gaps in knowledge and skills as described in the content standards for this grade span. Additional instructional support may be necessary for these students to achieve proficiency on the content standards.

Substantially Below Proficient (Level 1) - Students performing at this level demonstrate extensive and significant gaps in knowledge and skills as described in the content standards for this grade span. Additional instructional support is necessary for these students to achieve proficiency on the content standards.

Student	Grade	School	District	State
Noah Barr	4	Demonstration School 1	Demonstration District A	NH

Spring 2009 - Grade 4 NECAP Science Test Results

Achievement Level	Scaled Score	This Student's Achievement Level and Score
Proficient	446	Below / Partial / Proficient / Distinction; 400, 427, 440, 463, 480

Interpretation of Graphic Display

The line (|) represents the student's score. The bar (▬) surrounding the score represents the probable range of scores for the student if he or she were to be tested many times. This statistic is called the standard error of measurement. See the reverse side for the achievement level descriptions.

This Student's Achievement Level Compared to Other End of Grade 4 Students by School, District, and State

	Student	School	District	State
Proficient with Distinction		0%	<1%	<1%
Proficient	✓	48%	48%	53%
Partially Proficient		40%	39%	38%
Substantially Below Proficient		12%	13%	9%

This Student's Performance in Science Domains

	Possible Points	Student	Average Points Earned			
			School	District	State	Students at Proficient Level
Physical Science	15	12	9.7	9.5	9.6	8.3-11.7
Earth Space Science	15	13	10.5	10.6	10.8	9.4-12.8
Life Science	15	11	9.6	9.6	9.9	8.5-11.7
Inquiry	18	9	8.6	8.4	8.8	6.9-10.7

Description of the Inquiry Task

There are many interesting and essential facts, formulas, and processes that students should know across the three content domains of science. But science is more than content. Inquiry skills are skills that all students should have in addition to the content. Inquiry skills are the ability to formulate questions and hypothesize, plan investigations and experiments, conduct their own investigations and experiments, and evaluate their results. These are the broad areas that encompass scientific inquiry. The NECAP Science Inquiry Tasks use content from Physical Science, Earth Space Science, and Life Science as the basis of the task. Student knowledge of the content is not measured in the inquiry tasks but rather the student's ability to make connections, express ideas, and provide evidence of scientific thinking.

The grade 4 inquiry task, *Sled Pull*, had students explore how increasing the weight of an object affected the amount of force needed to move it. Students used a small box attached to a string and a cup, small and large weights, and pennies to measure the amount of force needed to move the box. Students worked with partners to complete the task and then answered questions on their own.

DEM-DEMOA-DEMO1

Spring 2009 - Grade 8 NECAP Tests
Grade 8 Students in 2008-2009
Item Analysis Report
Science

School: Demonstration School 1
District: Demonstration District A
State: Rhode Island
Code: DEMOA-DEMO1

		Released Items										Released Inquiry Task								Total Test Results						
	Item Number	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	Domain Points Earned						
	Science Domain	PS	PS	PS	PS	ESS	ESS	ESS	LS	LS	LS	INQ	INQ	INQ	INQ	INQ	INQ	INQ	INQ	Physical Science	Earth Space Science	Life Science	Inquiry	Total Points Earned	Scaled Score	Achievement Level
	Assessment Target/Inquiry Construct	1-4	2-6	3-B	1-4	1-4	1-5	2-8	1-4	2-7	4-11	1	4	10	12	1	5	10	13							
	Depth of Knowledge Code	2	2	2	2	2	1	2	1	2	2	3	3	2	2	3	2	2	3							
	Item Type	MC	MC	MC	CR	MC	MC	MC	MC	MC	MC	SA	SA	SA	SA	SA	CR	CR	SA							
	Correct MC Response	D	A	B		A	B	C	B	C	B															
Name/Student ID	Total Possible Points	1	1	1	4	1	1	1	1	1	1	2	2	2	2	2	3	3	2	**15**	**15**	**15**	**18**	**63**		
Walker, Rachelle L	D066971000	A	B	C	0	+	D	B	A	A	D	1	0	0	2	1	0	1	1	3	6	3	6	18	826	1
Weakleybetts, Jordan M	D829301000	B	+	A	0	+	+	D	A	A	C									4	3	2	0	9	812§	1
Whitmore, Crysta J	D751281000	+	B	+	0	B	C	A	A	+	A	0	1	1	0	2	1	0	1	5	5	4	6	20	828	1
Wiles, Bobbi M	E511751000	B	+	D	1	D	D	B	D	D	+	2	1	1	2	2	0	3	1	5	4	3	12	24	831	2
Williams, Colton N	E179941000	+	B	+	0	D	A	B	+	B	D	2	1	1	0	2	0	1	1	9	2	4	8	23	830	2
Williams, Kaitlin	D642261000	+	+	A	3	+	A	+	+	B	D	2	2	2	2	2	1	3	2	12	14	9	16	51	850	3
Wilson, Connor W	E034971000	+	+	+	4	B	+	+	C	+	D	2	1	1	2	2	0	1	1	15	10	9	10	44	844	3
Wirth, Jacob E	F267381000	C	B	+	0	B	+	B	+	A	C	0	0	0	0	0	0	0	0	3	2	5	0	10	815	1
Wood, Stacey	D779091000	A	C	C	1	+	D	B	D	B	+	2	2	2	2	2	2	3	1	6	8	5	16	35	838	2
Woodward, Mark J	D194191000	C	B	C	1	C	D	D	D	B	C	2	1	1	2	2	0			7	4	3	8	22	829	2
Yorke, Rachel E	D959191000	A	+	C	0	B	D	+	A	+	C	1	1	1	1	1	0	1	1	4	5	5	7	21	828	1
Young, Claire	E675431000	B	B	C	2	B	+	+	C	B	+	2	1	1	0	2	0	2	0	6	10	9	8	33	837	2
Young, Dwight A	D863121000	+	+	C	4	+	+	+	+	A	D	2	1	0	2	2	0	1	1	12	12	10	9	43	843	3
Young, Joshua	D194741000	B	C	+	0	B	D	B	A	+	+	1	0	0	1	1	0	1	1	6	4	7	5	22	829	2
Zeledonsandoval, Alexander K	D776441000	C	C	D	1	B	C	+	C	A	+	1	0	0	0	0	0	0	0	1	5	2	1	9	812	1
Zell, Kelsey D	D216751000	B	B	D	0	+	D	A	A	+	+	2	0	0	2	1	0	1	0	2	7	6	6	21	828	1
	Item Number	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8							
	Percent Correct/Average Score: School	28	47	37	1.0	37	25	49	30	40	32	1.2	0.8	0.7	0.8	1.2	0.3	0.8	0.6	6.4	6.9	6.2	6.3			
	Percent Correct/Average Score: District	31	48	37	1.1	36	28	51	31	42	32	1.2	0.8	0.7	0.8	1.2	0.3	0.8	0.6	6.5	7.0	6.3	6.4			
	Percent Correct/Average Score: State	32	49	37	1.1	34	30	51	32	43	36	1.1	0.8	0.7	0.8	1.2	0.3	0.8	0.6	6.5	7.0	6.6	6.5			

§ This score should be viewed with caution because student did not complete all parts of the test.

DEMOA-DEMO1

LEGEND FOR THE ITEM ANALYSIS REPORT - SCIENCE

Released Sections

Item Number: This number corresponds to the item number in the released item documents. This report provides complete data on items that are being released, which are approximately 50% of the items used to calculate scores.

Science Domain: The letters indicate the science domain with which the item is aligned: Physical Science (**PS**), Earth Space Science (**ESS**), Life Science (**LS**), and Inquiry (**INQ**).

Assessment Target/Inquiry Construct:

- For the released items, the assessment target is listed—the first number indicates the Statement of Enduring Knowledge for that domain, and the second number indicates the assessment target measured by that item.
- For the released inquiry task, the numbers 1–13 indicate the construct within the Broad Areas of Inquiry: Formulating Questions & Hypothesizing (1–3), Planning and Critiquing of Investigations (4–6), Conducting Investigations (7–10), Developing and Evaluating Explanations (11–13).

Depth of Knowledge Code: This number indicates the Depth of Knowledge to which the item is coded.

Item Type: This indicates whether the question is multiple choice (**MC**), short answer (**SA**), or constructed response (**CR**).

Correct MC Response: This is the correct letter response for multiple-choice questions.

Total Possible Points: The number indicates the maximum points awarded for the item: 1 point for a multiple-choice question; 0-2 points for a short-answer question; and 0-4 points for a constructed-response question.

Student Item Results: Each student's name and state assigned student identification number are listed, followed by a score for each released item on the test included in this report.

- For multiple-choice (**MC**) questions only, a plus sign (+) indicates a correct response. If the student answered incorrectly, the letter of his or her response is indicated. An asterisk (*) indicates that the student selected more than one response.
- For all other item types, a number indicates how many points a student earned for that item.
- For all item types, a blank space indicates that the student left the question blank. A dash (–) means that the score was invalidated and that the student received no credit for parts of the test that were administered under non-standard conditions.

Total Test Results Section

Domain Points Earned: These columns show the points the student earned in each science domain. The science domain points earned are based on all common items in the test and not just the released items.

Total Points Earned: This column shows the total number of points the student earned on all common items.

Scaled Score: This column shows the scaled score reported as a 3-digit number. The first digit is the grade and the next two digits are a score of 00-80. If the row is blank in this column, it means that the student was classified as Not Tested. (See Achievement Level below.)

Achievement Level: For Tested students, this column shows the achievement level into which the student's scores fall: **4** = Proficient with Distinction, **3** = Proficient,

2 = Partially Proficient, and **1** = Substantially Below Proficient. For Not Tested students, there are five reasons why a student did not participate: **A** = student participated in an alternate assessment in 2008-09, **W** = student withdrew from school after May 11, 2009, **E** = student enrolled in school after May 11, 2009, **S** = state approved special consideration, and **N** = other reason.

School/District/State Percent Correct/Average Score:

- **Released Items/Released Inquiry Task**: Percent correct refers to the percent of tested students who answered a multiple-choice item correctly. Average score refers to the average number of points awarded to all tested students for that short-answer or constructed-response item.
- **Domain Points Earned**: Average score refers to the average number of points awarded to all tested students for that subcategory.

About The New England Common Assessment Program

This report highlights results from the Spring 2009 New England Common Assessment Program (NECAP) science tests. The NECAP tests are administered to students in New Hampshire, Rhode Island, and Vermont as part of each state's statewide assessment program. The NECAP science test results are used primarily for program evaluation, school improvement, and public reporting. Achievement level results are used in the state accountability system required under No Child Left Behind (NCLB). More detailed school and district results are used by schools to help improve curriculum and instruction. Individual student results are used to support information gathered through classroom instruction and assessments.

The NECAP science tests are administered to students in grades 4, 8, and 11. The tests are designed to measure student performance on standards developed and adopted by the three states. Specifically, the tests are designed to measure the content and skills that students are expected to have as they complete the K–4, 5–8, and 9–11 grade spans—in other words, the content and skills that students have learned through the end of the tested grade.

Each test contains a mix of multiple-choice and constructed-response questions. Constructed-response questions require students to develop their own answers to questions. The science test also includes an inquiry session that requires students to answer questions based on results of an actual scientific investigation.

This report contains a variety of school- and/or district-, and state-level assessment results for the NECAP science tests administered at a grade level. Achievement level distributions and mean scaled scores are provided for all students tested as well as for subgroups of students classified by demographics or program participation. The report also contains comparative information on school and district performance on four specific science domains.

In addition to this report of grade level results, schools and districts will also receive Item Analysis Reports, released item support materials, and student-level data files containing NECAP results. Districts will also receive a Summary Report that will show results for all district schools. Together, these reports and data constitute a rich source of information to support local decisions in curriculum, instruction, assessment, and professional development. Over time, this information can also strengthen the school's and district's evaluation of their ongoing improvement efforts.

Spring 2009
Grade 11
NECAP Science Test

School Results

School: Demonstration School 1
District: Demonstration District A
Code: DEMOA-DEMO1

DEMOA-DEMO1

Spring 2009 - Grade 11 NECAP Science Test

Grade Level Summary Report

School: Demonstration School 1
District: Demonstration District A
State: Vermont
Code: DEMOA-DEMO1

Schools and districts administered all NECAP tests to every enrolled student with the following exceptions: students who participated in the alternate assessment for the 2008-09 school year, students who withdrew from the school after May 11, 2009, students who enrolled in the school after May 11, 2009, students for whom a special consideration was granted through the state Department of Education, and other students for reasons not approved. On this page, and throughout this report, results are only reported for groups of students that are larger than nine (9).

PARTICIPATION in NECAP	Number			Percentage		
	School	District	State	School	District	State
Students enrolled on or after May 11	358	606	7,206	100	100	100
	Science			Science		
Students tested	338	579	7,010	94	96	97
Students not tested in NECAP						
State Approved	0	0	0	0	0	0
Alternate Assessment	0	0	0	0	0	0
Withdrew After May 11	0	0	0	0	0	0
Enrolled After May 11	0	0	0	0	0	0
Special Consideration	0	0	0	0	0	0
Other	20	27	196	6	4	3

NECAP RESULTS

	School													District						State					
	Enrolled	NT Approved	NT Other	Tested	Level 4		Level 3		Level 2		Level 1		Mean Scaled Score	Tested	Level 4	Level 3	Level 2	Level 1	Mean Scaled Score	Tested	Level 4	Level 3	Level 2	Level 1	Mean Scaled Score
	N	N	N	N	N	%	N	%	N	%	N	%		N	%	%	%	%		N	%	%	%	%	
SCIENCE	358	0	20	338	2	1	92	27	148	44	96	28	1134	579	1	27	44	29	1134	7,010	1	26	44	29	1134

Level 4 = Proficient with Distinction; Level 3 = Proficient; Level 2 = Partially Proficient; Level 1 = Substantially Below Proficient

Note: Throughout this report, percentages may not total 100 since each percentage is rounded to the nearest whole number.

Spring 2009 - Grade 11 NECAP Science Test

Science Results

School: Demonstration School 1
District: Demonstration District A
State: Vermont
Code: DEMOA-DEMO1

Proficient with Distinction (Level 4)
Students performing at this level demonstrate the knowledge and skills as described in the content standards for this grade span. Errors made by these students are few and minor and do not reflect gaps in knowledge and skills.

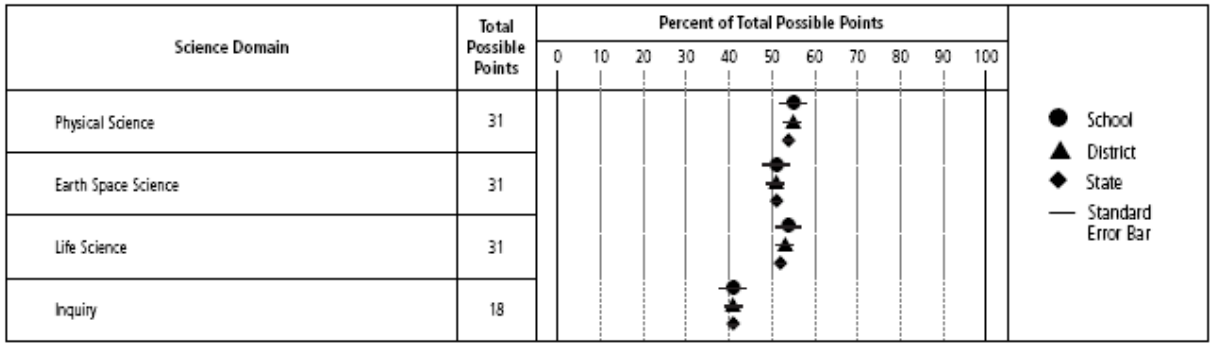
Proficient (Level 3)
Students performing at this level demonstrate the knowledge and skills as described in the content standards for this grade span with only minor gaps. It is likely that any gaps in knowledge and skills demonstrated by these students can be addressed by the classroom teacher during the course of classroom instruction.

Partially Proficient (Level 2)
Students performing at this level demonstrate gaps in knowledge and skills as described in the content standards for this grade span. Additional instructional support may be necessary for these students to achieve proficiency on the content standards.

Substantially Below Proficient (Level 1)
Students performing at this level demonstrate extensive and significant gaps in knowledge and skills as described in the content standards for this grade span. Additional instructional support is necessary for these students to achieve proficiency on the content standards.

	Enrolled	NT Approved	NT Other	Tested	Level 4		Level 3		Level 2		Level 1		Mean Scaled Score
	N	N	N	N	N	%	N	%	N	%	N	%	
SCHOOL													
2007-08													
2008-09	358	0	20	338	2	1	92	27	148	44	96	28	**1134**
2009-10													
Cumulative Total													
DISTRICT													
2007-08													
2008-09	606	0	27	579	4	1	155	27	253	44	167	29	**1134**
2009-10													
Cumulative Total													
STATE													
2007-08	7,201	50	210	6,941	143	2	1,604	23	3,297	48	1,897	27	1134
2008-09	7,206	0	196	7,010	77	1	1,792	26	3,113	44	2,028	29	**1134**
2009-10													
Cumulative Total	14,407	50	406	13,951	220	2	3,396	24	6,410	46	3,925	28	1134

Science Domain	Total Possible Points
Physical Science	31
Earth Space Science	31
Life Science	31
Inquiry	18



Spring 2009 - Grade 11 NECAP Science Test

Disaggregated Science Results

School: Demonstration School 1
District: Demonstration District A
State: Vermont
Code: DEMOA-DEMO1

REPORTING CATEGORIES	School													District						State					
	Enrolled	NT Approved	NT Other	Tested	Level 4		Level 3		Level 2		Level 1		Mean Scaled Score	Tested	Level 4	Level 3	Level 2	Level 1	Mean Scaled Score	Tested	Level 4	Level 3	Level 2	Level 1	Mean Scaled Score
	N	N	N	N	N	%	N	%	N	%	N	%		N	%	%	%	%		N	%	%	%	%	
All Students	**358**	**0**	**20**	**338**	**2**	**1**	**92**	**27**	**148**	**44**	**96**	**28**	**1134**	**579**	**1**	**27**	**44**	**29**	**1134**	**7,010**	**1**	**26**	**44**	**29**	**1134**
Gender																									
Male	190	0	8	182	2	1	46	25	78	43	56	31	1133	303	1	26	42	31	1134	3,544	1	25	41	34	1133
Female	168	0	12	156	0	0	46	29	70	45	40	26	1134	276	0	28	45	27	1134	3,466	1	26	48	24	1135
Not Reported	0	0	0	0										0						0					
Primary Race/Ethnicity																									
American Indian or Alaskan Native	2	0	0	2										3						38	3	8	42	47	1130
Asian	5	0	1	4										9						90	2	21	47	30	1133
Black or African American	5	0	0	5										6						88	0	10	36	53	1129
Hispanic or Latino	5	0	0	5										7						53	2	11	34	53	1130
Native Hawaiian or Pacific Islander	1	0	0	1										1						9					
White (non-Hispanic)	339	0	19	320	2	1	88	28	142	44	88	28	1134	552	1	27	44	28	1134	6,679	1	26	45	28	1134
No Primary Race/Ethnicity Reported	1	0	0	1										1						53	0	17	42	42	1131
LEP Status																									
Currently receiving LEP services	2	0	0	2										7						73	0	1	18	81	1124
Former LEP student - monitoring year 1	1	0	0	1										1						18	0	6	61	33	1129
Former LEP student - monitoring year 2	1	0	0	1										1						8					
All Other Students	354	0	20	334	2	1	92	28	147	44	93	28	1134	570	1	27	44	28	1134	6,911	1	26	45	28	1134
IEP																									
Students with an IEP	60	0	7	53	0	0	2	4	15	28	36	68	1122	84	0	2	25	73	1122	828	0	2	21	77	1124
All Other Students	298	0	13	285	2	1	90	32	133	47	60	21	1136	495	1	31	47	21	1136	6,182	1	29	48	23	1135
SES																									
Economically Disadvantaged Students	83	0	6	77	0	0	6	8	35	45	36	47	1129	136	0	10	40	50	1129	1,687	<1	11	42	47	1130
All Other Students	275	0	14	261	2	1	86	33	113	43	60	23	1135	443	1	32	45	22	1135	5,323	1	30	45	23	1135
Migrant																									
Migrant Students	1	0	0	1										1						3					
All Other Students	357	0	20	337	2	1	92	27	148	44	95	28	1134	578	1	27	44	29	1134	7,007	1	26	44	29	1134

Level 4 = Proficient with Distinction; Level 3 = Proficient; Level 2 = Partially Proficient; Level 1 = Substantially Below Proficient

NOTE: Some numbers may have been left blank because fewer than ten (10) students were tested.

About The New England Common Assessment Program

This report highlights results from the Spring 2009 New England Common Assessment Program (NECAP) science tests. The NECAP tests are administered to students in New Hampshire, Rhode Island, and Vermont as part of each state's statewide assessment program. The NECAP science test results are used primarily for program evaluation, school improvement, and public reporting. Achievement level results are used in the state accountability system required under No Child Left Behind (NCLB). More detailed school and district results are used by schools to help improve curriculum and instruction. Individual student results are used to support information gathered through classroom instruction and assessments.

The NECAP science tests are administered to students in grades 4, 8, and 11. The tests are designed to measure student performance on standards developed and adopted by the three states. Specifically, the tests are designed to measure the content and skills that students are expected to have as they complete the K–4, 5–8, and 9–11 grade spans—in other words, the content and skills that students have learned through the end of the tested grade.

Each test contains a mix of multiple-choice and constructed-response questions. Constructed-response questions require students to develop their own answers to questions. The science test also includes an inquiry session that requires students to answer questions based on results of an actual scientific investigation.

This report contains a variety of school- and/or district-, and state-level assessment results for the NECAP science tests administered at a grade level. Achievement level distributions and mean scaled scores are provided for all students tested as well as for subgroups of students classified by demographics or program participation. The report also contains comparative information on school and district performance on four specific science domains.

In addition to this report of grade level results, schools and districts will also receive Item Analysis Reports, released item support materials, and student-level data files containing NECAP results. Districts will also receive a Summary Report that will show results for all district schools. Together, these reports and data constitute a rich source of information to support local decisions in curriculum, instruction, assessment, and professional development. Over time, this information can also strengthen the school's and district's evaluation of their ongoing improvement efforts.

Spring 2009
Grade 4
NECAP Science Test

District Results

District: Demonstration District A
Code: DEM-DEMOA

DEM-DEMOA

Spring 2009 - Grade 4 NECAP Science Test

Grade Level Summary Report

District: Demonstration District A
State: New Hampshire
Code: DEM-DEMOA

Schools and districts administered all NECAP tests to every enrolled student with the following exceptions: students who participated in the alternate assessment for the 2008-09 school year, students who withdrew from the school after May 11, 2009, students who enrolled in the school after May 11, 2009, students for whom a special consideration was granted through the state Department of Education, and other students for reasons not approved. On this page, and throughout this report, results are only reported for groups of students that are larger than nine (9).

PARTICIPATION in NECAP	Number			Percentage		
	School	District	State	School	District	State
Students enrolled on or after May 11		346	14,641		100	100
	Science			Science		
Students tested		337	14,442		97	99
Students not tested in NECAP						
State Approved		8	172		2	1
Alternate Assessment		6	161		2	1
Withdrew After May 11		1	4		0	0
Enrolled After May 11		0	0		0	0
Special Consideration		1	7		0	0
Other		1	27		0	0

NECAP RESULTS

	District													State												
	Enrolled	NT Approved	NT Other	Tested	Level 4		Level 3		Level 2		Level 1		Mean Scaled Score	Tested	Level 4	Level 3	Level 2	Level 1	Mean Scaled Score	Tested	Level 4	Level 3	Level 2	Level 1	Mean Scaled Score
	N	N	N	N	N	%	N	%	N	%	N	%		N	%	%	%	%		N	%	%	%	%	
SCIENCE	346	8	1	337	1	<1	161	48	131	39	44	13	439	14,442	<1	53	38	9	441						

Level 4 = Proficient with Distinction; Level 3 = Proficient; Level 2 = Partially Proficient; Level 1 = Substantially Below Proficient

Note: Throughout this report, percentages may not total 100 since each percentage is rounded to the nearest whole number.

Page 2 of 4

Spring 2009 - Grade 4 NECAP Science Test

Science Results

District: Demonstration District A
State: New Hampshire
Code: DEM-DEMOA

Proficient with Distinction (Level 4)
Students performing at this level demonstrate the knowledge and skills as described in the content standards for this grade span. Errors made by these students are few and minor and do not reflect gaps in knowledge and skills.

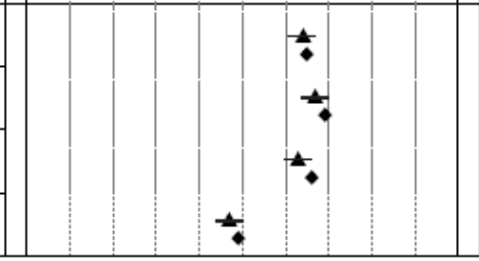
Proficient (Level 3)
Students performing at this level demonstrate the knowledge and skills as described in the content standards for this grade span with only minor gaps. It is likely that any gaps in knowledge and skills demonstrated by these students can be addressed by the classroom teacher during the course of classroom instruction.

Partially Proficient (Level 2)
Students performing at this level demonstrate gaps in knowledge and skills as described in the content standards for this grade span. Additional instructional support may be necessary for these students to achieve proficiency on the content standards.

Substantially Below Proficient (Level 1)
Students performing at this level demonstrate extensive and significant gaps in knowledge and skills as described in the content standards for this grade span. Additional instructional support is necessary for these students to achieve proficiency on the content standards.

	Enrolled	NT Approved	NT Other	Tested	Level 4		Level 3		Level 2		Level 1		Mean Scaled Score
	N	N	N	N	N	%	N	%	N	%	N	%	
SCHOOL													
2007-08													
2008-09													
2009-10													
Cumulative Total													
DISTRICT													
2007-08													
2008-09	346	8	1	337	1	<1	161	48	131	39	44	13	439
2009-10													
Cumulative Total													
STATE													
2007-08	14,967	117	20	14,830	254	2	7,325	49	5,877	40	1,374	9	440
2008-09	14,641	172	27	14,442	60	<1	7,614	53	5,537	38	1,231	9	441
2009-10													
Cumulative Total	29,608	289	47	29,272	314	1	14,939	51	11,414	39	2,605	9	440

Science Domain	Total Possible Points
Physical Science	31
Earth Space Science	31
Life Science	31
Inquiry	18



Spring 2009 - Grade 4 NECAP Science Test

Disaggregated Science Results

District: Demonstration District A
State: New Hampshire
Code: DEM-DEMOA

REPORTING CATEGORIES	District													State												
	Enrolled	NT Approved	NT Other	Tested	Level 4		Level 3		Level 2		Level 1		Mean Scaled Score	Tested	Level 4	Level 3	Level 2	Level 1	Mean Scaled Score	Tested	Level 4	Level 3	Level 2	Level 1	Mean Scaled Score
	N	N	N	N	N	%	N	%	N	%	N	%		N	%	%	%	%		N	%	%	%	%	
All Students	**346**	**8**	**1**	**337**	**1**	**<1**	**161**	**48**	**131**	**39**	**44**	**13**	**439**	**14,442**	**<1**	**53**	**38**	**9**	**441**						
Gender																									
Male	176	6	1	169	0	0	73	43	73	43	23	14	438	7,471	<1	52	39	9	440						
Female	170	2	0	168	1	1	88	52	58	35	21	13	440	6,971	1	54	37	8	441						
Not Reported	0	0	0	0										0											
Primary Race/Ethnicity																									
American Indian or Alaskan Native	1	0	0	1										47	0	38	45	17	436						
Asian	6	0	0	6										386	1	58	36	6	442						
Black or African American	5	0	0	5										299	0	29	47	24	434						
Hispanic or Latino	18	1	0	17	0	0	4	24	5	29	8	47	431	512	0	28	48	24	434						
Native Hawaiian or Pacific Islander	1	0	0	1										5											
White (non-Hispanic)	314	7	1	306	1	<1	151	49	121	40	33	11	440	13,157	<1	54	38	8	441						
No Primary Race/Ethnicity Reported	1	0	0	1										36	0	47	47	6	441						
LEP Status																									
Currently receiving LEP services	14	0	0	14	0	0	1	7	5	36	8	57	429	347	0	18	50	33	431						
Former LEP student - monitoring year 1	3	0	0	3										61	0	48	46	7	439						
Former LEP student - monitoring year 2	1	0	0	1										55	0	38	49	13	437						
All Other Students	328	8	1	319	1	<1	159	50	123	39	36	11	440	13,979	<1	54	38	8	441						
IEP																									
Students with an IEP	73	7	0	66	0	0	12	18	30	45	24	36	431	2,132	<1	26	49	25	434						
All Other Students	273	1	1	271	1	<1	149	55	101	37	20	7	441	12,310	<1	57	37	6	442						
SES																									
Economically Disadvantaged Students	91	4	1	86	0	0	27	31	35	41	24	28	434	3,375	0	33	49	18	436						
All Other Students	255	4	0	251	1	<1	134	53	96	38	20	8	441	11,067	1	59	35	6	442						
Migrant																									
Migrant Students	0	0	0	0										0											
All Other Students	346	8	1	337	1	<1	161	48	131	39	44	13	439	14,442	<1	53	38	9	441						

Level 4 = Proficient with Distinction; Level 3 = Proficient; Level 2 = Partially Proficient; Level 1 = Substantially Below Proficient

NOTE: Some numbers may have been left blank because fewer than ten (10) students were tested.

District Summary
2008-2009 Students

District: Demonstration District A
State: Rhode Island
Code: DEMOA

Science	Enrolled	NT Approved	NT Other	Tested	Achievement Level								
					Level 4		Level 3		Level 2		Level 1		Mean Scaled Score
	N	N	N	N	N	%	N	%	N	%	N	%	
Demonstration District A	**1928**	**38**	**41**	**1849**	**11**	**1**	**398**	**22**	**838**	**45**	**602**	**33**	
Grade 4	404	10	6	388	2	1	157	40	156	40	73	19	437
Grade 8	737	17	9	711	3	<1	104	15	333	47	271	38	831
Grade 11	787	11	26	750	6	1	137	18	349	47	258	34	1132

Level 4 = Proficient with Distinction; Level 3 = Proficient; Level 2 = Partially Proficient; Level 1 = Substantially Below Proficient

About The New England Common Assessment Program

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The NECAP science tests are administered to students in grades 4, 8, and 11. The tests are designed to measure student performance on standards developed and adopted by the three states. Specifically, the tests are designed to measure the content and skills that students are expected to have as they complete the K–4, 5–8, and 9–11 grade spans—in other words, the content and skills that students have learned through the end of the tested grade.

Each test contains a mix of multiple-choice and constructed-response questions. Constructed-response questions require students to develop their own answers to questions. The science test also includes an inquiry session that requires students to answer questions based on results of an actual scientific investigation.

This report contains a variety of school- and/or district-, and state-level assessment results for the NECAP science tests administered at a grade level. Achievement level distributions and mean scaled scores are provided for all students tested as well as for subgroups of students classified by demographics or program participation. The report also contains comparative information on school and district performance on four specific science domains.

In addition to this report of grade level results, schools and districts will also receive Item Analysis Reports, released item support materials, and student-level data files containing NECAP results. Districts will also receive a Summary Report that will show results for all district schools. Together, these reports and data constitute a rich source of information to support local decisions in curriculum, instruction, assessment, and professional development. Over time, this information can also strengthen the school's and district's evaluation of their ongoing improvement efforts.

Spring 2009
Grade 8
NECAP Science Test

State Results

State: Rhode Island

Rhode Island

Spring 2009 - Grade 8 NECAP Science Test

Grade Level Summary Report

State: Rhode Island

Schools and districts administered all NECAP tests to every enrolled student with the following exceptions: students who participated in the alternate assessment for the 2008-09 school year, students who withdrew from the school after May 11, 2009, students who enrolled in the school after May 11, 2009, students for whom a special consideration was granted through the state Department of Education, and other students for reasons not approved. On this page, and throughout this report, results are only reported for groups of students that are larger than nine (9).

PARTICIPATION in NECAP	Number			Percentage		
	School	District	State	School	District	State
Students enrolled on or after May 11			11,507			100
	Science			Science		
Students tested			11,246			98
Students not tested in NECAP						
State Approved			133			1
Alternate Assessment			97			1
Withdrew After May 11			8			0
Enrolled After May 11			4			0
Special Consideration			24			0
Other			128			1

NECAP RESULTS

	State																								
	Enrolled	NT Approved	NT Other	Tested	Level 4		Level 3		Level 2		Level 1		Mean Scaled Score	Tested	Level 4	Level 3	Level 2	Level 1	Mean Scaled Score	Tested	Level 4	Level 3	Level 2	Level 1	Mean Scaled Score
	N	N	N	N	N	%	N	%	N	%	N	%		N	%	%	%	%		N	%	%	%	%	
SCIENCE	11,507	133	128	11,246	48	<1	1,927	17	5,048	45	4,223	38	831												

Level 4 = Proficient with Distinction; Level 3 = Proficient; Level 2 = Partially Proficient; Level 1 = Substantially Below Proficient

Note: Throughout this report, percentages may not total 100 since each percentage is rounded to the nearest whole number.

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Spring 2009 - Grade 8 NECAP Science Test

Science Results

State: Rhode Island

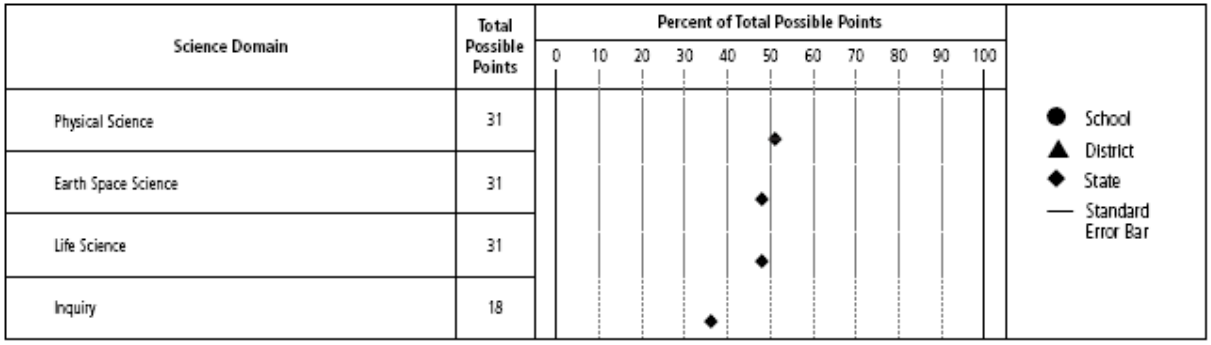
Proficient with Distinction (Level 4)
Students performing at this level demonstrate the knowledge and skills as described in the content standards for this grade span. Errors made by these students are few and minor and do not reflect gaps in knowledge and skills.

Proficient (Level 3)
Students performing at this level demonstrate the knowledge and skills as described in the content standards for this grade span with only minor gaps. It is likely that any gaps in knowledge and skills demonstrated by these students can be addressed by the classroom teacher during the course of classroom instruction.

Partially Proficient (Level 2)
Students performing at this level demonstrate gaps in knowledge and skills as described in the content standards for this grade span. Additional instructional support may be necessary for these students to achieve proficiency on the content standards.

Substantially Below Proficient (Level 1)
Students performing at this level demonstrate extensive and significant gaps in knowledge and skills as described in the content standards for this grade span. Additional instructional support is necessary for these students to achieve proficiency on the content standards.

	Enrolled	NT Approved	NT Other	Tested	Level 4		Level 3		Level 2		Level 1		Mean Scaled Score
	N	N	N	N	N	%	N	%	N	%	N	%	
SCHOOL													
2007-08													
2008-09													
2009-10													
Cumulative Total													
DISTRICT													
2007-08													
2008-09													
2009-10													
Cumulative Total													
STATE													
2007-08	12,127	121	116	11,890	53	<1	2,174	18	5,145	43	4,518	38	831
2008-09	**11,507**	**133**	**128**	**11,246**	**48**	**<1**	**1,927**	**17**	**5,048**	**45**	**4,223**	**38**	**831**
2009-10													
Cumulative Total	23,634	254	244	23,136	101	<1	4,101	18	10,193	44	8,741	38	831



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Spring 2009 - Grade 8 NECAP Science Test

Disaggregated Science Results

State: Rhode Island

REPORTING CATEGORIES	State																													
	Enrolled	NT Approved	NT Other	Tested	Level 4		Level 3		Level 2		Level 1		Mean Scaled Score	Tested	Level 4	Level 3	Level 2	Level 1	Mean Scaled Score	Tested	Level 4	Level 3	Level 2	Level 1	Mean Scaled Score
	N	N	N	N	N	%	N	%	N	%	N	%		N	%	%	%	%		N	%	%	%	%	
All Students	**11,507**	**133**	**128**	**11,246**	**48**	**<1**	**1,927**	**17**	**5,048**	**45**	**4,223**	**38**	**831**												
Gender																									
Male	5,994	84	83	5,827	20	<1	1,070	18	2,591	44	2,146	37	831												
Female	5,509	49	45	5,415	28	1	857	16	2,457	45	2,073	38	831												
Not Reported	4	0	0	4																					
Primary Race/Ethnicity																									
American Indian or Alaskan Native	72	1	2	69	0	0	3	4	27	39	39	57	826												
Asian	342	2	3	337	5	1	58	17	159	47	115	34	832												
Black or African American	989	9	15	965	0	0	36	4	319	33	610	63	825												
Hispanic or Latino	2,082	26	53	2,003	0	0	60	3	564	28	1,379	69	824												
Native Hawaiian or Pacific Islander	0	0	0	0																					
White (non-Hispanic)	8,017	94	55	7,868	43	1	1,770	22	3,979	51	2,076	26	833												
No Primary Race/Ethnicity Reported	5	1	0	4																					
LEP Status																									
Currently receiving LEP services	362	1	13	348	0	0	0	0	40	11	308	89	817												
Former LEP student - monitoring year 1	35	0	0	35	0	0	1	3	8	23	26	74	820												
Former LEP student - monitoring year 2	82	0	1	81	0	0	2	2	17	21	62	77	822												
All Other Students	11,028	132	114	10,782	48	<1	1,924	18	4,983	46	3,827	35	831												
IEP																									
Students with an IEP	2,120	112	55	1,953	1	<1	70	4	488	25	1,394	71	823												
All Other Students	9,387	21	73	9,293	47	1	1,857	20	4,560	49	2,829	30	833												
SES																									
Economically Disadvantaged Students	4,657	70	82	4,505	1	<1	253	6	1,574	35	2,677	59	826												
All Other Students	6,850	63	46	6,741	47	1	1,674	25	3,474	52	1,546	23	834												
Migrant																									
Migrant Students	0	0	0	0																					
All Other Students	11,507	133	128	11,246	48	<1	1,927	17	5,048	45	4,223	38	831												
Title I																									
Students Receiving Title I Services	3,033	35	66	2,932	1	<1	152	5	891	30	1,888	64	825												
All Other Students	8,474	98	62	8,314	47	1	1,775	21	4,157	50	2,335	28	833												
504 Plan																									
Students with a 504 Plan	358	0	2	356	1	<1	82	23	202	57	71	20	835												
All Other Students	11,149	133	126	10,890	47	<1	1,845	17	4,846	44	4,152	38	831												

Level 4 = Proficient with Distinction; Level 3 = Proficient; Level 2 = Partially Proficient; Level 1 = Substantially Below Proficient

NOTE: Some numbers may have been left blank because fewer than ten (10) students were tested.

Appendix L—ANALYSIS AND REPORTING DECISION RULES

Analysis and Reporting Decision Rules
NECAP
Spring 08-09 Administration

This document details rules for analysis and reporting. The final student level data set used for analysis and reporting is described in the "Data Processing Specifications." This document is considered a draft until the NECAP State Departments of Education (DOE) signs off. If there are rules that need to be added or modified after said sign-off, DOE sign off will be obtained for each rule. Details of these additions and modifications will be in the Addendum section.

I. General Information

NECAP is administered in the fall and spring. This document incorporates fall and spring rules so that changes are carried to future administrations. In the fall, students are reported based on the current year fall school /district (referred to as testing school/district) and prior year spring school/district (referred to as teaching school/district). In the spring, students are reported based on the spring school/district (referred to as testing school/district). In the spring, students are not reported based on the teaching school. Rules pertaining to the teaching school/district can be ignored for spring administrations. For more information regarding discode, schcode, sprdiscode, sprschcode, senddiscode, and sprsenddiscode, please refer to the data processing specifications and demographic data specification.

This document is the official rules for the current reporting administration.

A. *Fall Tests Administered:*

Grade	Subject	Test items used for Scaling	IREF Reporting Categories (Subtopic and Subcategory IREF Source)
03	Reading	Common	Cat2
03	Math	Common	Cat1
04	Reading	Common	Cat2
04	Math	Common	Cat1
05	Reading	Common	Cat2
05	Math	Common	Cat1
05	Writing	Common	type
06	Reading	Common	Cat2
06	Math	Common	Cat1
07	Reading	Common	Cat2
07	Math	Common	Cat1
08	Reading	Common	Cat2
08	Math	Common	Cat1
08	Writing	Common	type
11	Reading	Common	Cat2
11	Math	Common	Cat1
11	Writing	Common	itemnumber

B. *Spring Tests Administered*

Grade	Subject	Test items used for Scaling	Item Reporting Categories (Subtopic and Subcategory Source)
04	Science	Common	Cat3
08	Science	Common	Cat3
11	Science	Common	Cat3

C. *Reports Produced*:

1. Student Report

   a. Testing School District

2. School Item Analysis Report by Grade and Subject
    a. Testing School District
    b. Teaching School District (Fall Only)
3. Grade Level School/District/State Results
    a. Testing School District
    b. Teaching School District – District and School Levels only (Fall Only)
4. School/District/State Summary (School Level is produced in the Fall Only)
    a. Testing School District
    b. Teaching School District – District and School Levels only (Fall Only)

D. *Files Produced:*

1. Preliminary State Results
2. State Student Released Item Data
3. State Student Raw Data
4. State Student Scored Data
5. District Student Data
6. Common Item Information
7. Grade Level Results Report Disaggregated and Historical Data
8. Grade Level Results Report Participation Category Data
9. Grade Level Results Report Subtopic Data
10. Summary Results Data
11. Released Item Percent Responses Data
12. Invalidated Students Original Score
13. Student Questionnaire Summary
14. TCTA Questionnaire Raw Data
15. TCTA Questionnaire Frequency Distribution
16. Scaled Score Lookup
17. Subtopic Average Points Earned (For Program Management)
18. Item Stats for Inquiry Task Items (For Program Management)
19. Memo Shipping files (For Program Management)
20. Report Shipment Table (Measured Progress Use Only)

E. *School Type:*

Testing School Type: SchType **Teaching School Type: sprSchType (Fall Only)**	**Source: ICORE SubTypeID**	**Description**
PUB	1,12,13	Public School
PRI	3	Private School
OOD	4	Out-of-District Private Providers
OUT	8	Out Placement
CHA	11	Charter School
INS	7	Institution
OTH	9	Other

School Type Impact on Data Analysis and Reporting				
Level	**Testing**		**Teaching (Fall Only)**	
	Impact on Analysis	**Impact on Reporting**	**Impact on Analysis**	**Impact on Reporting**
Student	n/a	Report students based on testing discode and schcode. District data will be blank for students tested at PRI, OOD, OUT, INS, or OTH schools. Always print tested year state data.	n/a	n/a
School	Do not exclude any students based on school type using testing school code for aggregations	Generate a report for each school with at least one student enrolled using the tested school aggregate denominator. District data will be blank for PRI, OOD, OUT, INS, or OTH schools. Always print tested year state data.	Exclude students who do not have a teaching school code.	Generate a report for each school with at least one student enrolled using the teaching school aggregate denominator. District data will be blank for PRI, OOD, OUT, INS, or OTH schools. Always print tested year state data.
District	For OUT and OOD schools, aggregate using the sending district. If OUT or OOD student does not have a sending district, do not include in aggregations. Do not include students tested at PRI, INS, or OTH schools	Generate a report for each district with at least one student enrolled using the tested district aggregate denominator. Always report tested year state data.	For OUT and OOD teaching schools, aggregate using the spring sending district. If OUT or OOD teaching school student does not have a teaching sending district, do not include in aggregations. Do not include students taught at PRI, INS, or OTH schools	Generate a report for each district with at least one student enrolled using the teaching district aggregate denominator. Always report tested year state data.
State	Do not include students tested at PRI schools for NH and RI. Include all students for VT.	Always report testing year state data.	n/a	n/a

F. Student Status

StuStatus	Description
1	Homeschooled
2	Privately Funded
3	Exchange Student
0	Publically Funded

StuStatus impact on Data Analysis and Reporting		
Level	**Impact on Analysis**	**Impact on Reporting**
Student	n/a	School and District data will be blank for students with a StuStatus value of 1,2 or 3. Always print tested year state data. For StuStatus values of 1,2 and 3 print the description from the table above for the school and district names.
School	Exclude all students with a StuStatus value of 1,2 or 3.	Students with a StuStatus value of 1,2 or 3 are not listed on the item analysis report.
District	Exclude all students with a StuStatus value of 1,2 or 3.	n/a
State	Exclude all students with a StuStatus value of 1,2 or 3.	n/a.

G. *Requirements To Report Aggregate Data(Minimum N)*

Calculation Description	Rule
Number and Percent at each achievement level, mean score by disaggregated category and aggregate level	If the number of tested students included in the denominator is less than 10, then do not report.
Content Area Subcategories Average Points Earned based on common items only by aggregate level	If the number of tested students included in the denominator is less than 10, then do not report.
Aggregate data on Item Analysis report	No required minimum number of students
Number and Percent of students in a participation category by aggregate level	No required minimum number of students
Content Area Subtopic Percent of Total Possible Points and Standard Error Bar and Grade 11 Writing Distribution of Score Points Across Prompts	If any item was not administered to at least one tested student included in the denominator or the number of tested students included in the denominator is less than 10, then do not report
Content Area Cumulative Total Enrollment, Not tested, Tested, Number and Percent at each achievement level, mean score	Suppress all cumulative total data if at least one reported year has fewer than 10 tested students. Fall: For grade 11, the reported years are 0708 and 0809. For grades 03-08, the reported years are 0607, 0708, and 0809. Spring: The reported years are 0708 and 0809

H. *Special Forms:*

1. Form 00 is created for students whose matrix scores will be ignored for analysis. Such students include Braille or administration issues resolved by program management.

I. *Other Information*

1. Off grade testing is not allowed; however, Grade 12 students are allowed to participate in the NECAP Grade 11 test under the following circumstances: RI students trying to improve prior NECAP score, and NH, RI, and VT students taking the NECAP Grade 11 test for the first time.
   - RI students trying to improve are identified as StuGrade=12 and Grade=11. They only receive a student report. They are not listed on a roster or included in any aggregations. Do not print tested school and district aggregate data on the student report.
   - For students taking NECAP for the first time the StuGrade in the student demographics file will be 11 and the remaining decision rules apply.
2. Plan504 data not available for NH and VT; therefore 504 Plan section will be suppressed for NH and VT.
3. To calculate Title1 data for writing using Title1rea variable.
4. Title 1 data are not available for VT; therefore Title 1 section will be suppressed for VT.
5. Title 1 Science data are not available for NH; therefore, Title 1 section will be suppressed for NH on Science specific reports. Title 1 Reading and Math data are available for NH and should not be suppressed.
6. Testing level is defined by the variables discode and schcode. Teaching level is defined by the variables sprdiscode and sprschcode. Every student will have testing district and school codes. In the fall, some students will have a teaching school code and some students will have a teaching district code. In the spring, no students will have a teaching school/district.
7. A non-public district code is a district code associated with a school that is type 'PRI','OOD','OUT','INS', or 'OTH'.
8. Only students with a testing school type of OUT or OOD are allowed to have a testing sending district code. Non-public testing sending district codes will be ignored. For example: For RI, senddiscode of 88 and 67 is ignored. For NH, senddiscode of 000 is ignored.
9. Only students with a teaching school type of OUT or OOD are allowed to have a spring sending district code. Non-public spring sending district codes will be ignored. For example: For RI, senddiscode of 88 and 67 is ignored. For NH, senddiscode of 000 is ignored.
10. If students have a teaching district code and no teaching school, then ignore teaching district codes that are associated with schools that are 'PRI','OOD','OUT','INS', or 'OTH'.

II. Student Participation / Exclusions

A. *Test Attempt Rules by content area*

1. Grade 11 writing was attempted if the common writing prompt is not scored blank ‘B’. For all other grades and content areas test attempt can be determined as follows. A content area was attempted if any multiple choice item or non-field test open response item has been answered. (Use original item responses – see special circumstances section II.F)
2. A multiple choice item has been answered by a student if the response is A, B, C, D, or * (*=multiple responses)
3. An open response item has been answered if it is not scored blank ‘B’

B. *Session Attempt Rules by content area*

1. A session was attempted if any multiple choice item or non-field test open response item has been answered in the session. (Use original item responses – see special circumstances section II.F)
2. Because of the test design for grade 11 writing, only determine if session 1 was attempted. Session 2 is ignored.

C. *Not Tested Reasons by content area*

1. Not Tested State Approved Alternate Assessment

   a. NH & RI: If the student is identified using "rptstudid" as receiving at least one alternate assessment achievement level regardless of content area and grade reported in alternate assessment reporting, then the student's not tested reason in the demographic data file will be updated to "Not Tested State Approved Alternate Assessment" for all content areas based on the demographic file grade.

   b. All States: If a student is identified as "Not Tested State Approved Alternate Assessment" for at least one content area, the student's Active status will be set to 1 in the demographic data file and included in reporting.

   c. If a student links to the demographic file has content area not tested status of "Not Tested State Approved Alternate Assessment" is identified as "Not Tested State Approved Alternate Assessment" for the content area.

2. Not Tested State Approved First Year LEP (reading and writing only)

   a. If a student links to the demographic file has content area not tested status of "Not Tested State Approved First Year LEP" or does not link to the demographic file has content area "First Year LEP blank or partially blank reason" marked, then the student is identified as "Not Tested State Approved First Year LEP".

3. Not Tested State Approved Special Consideration

   - If a student links to the demographic data file has content area "Not Tested State Approved Special Consideration" indicated or does not link to the demographic data file and has content area "Special Consideration blank or partially blank reason" marked, then the student is identified as "Not Tested State Approved Special Consideration".

4. Not Tested State Approved Withdrew After

   a. If a student links to the demographic data file has content area not tested status of "Not Tested Withdrew After" and at least one content area session was not attempted or does not link to the demographic file has content area "Withdrew After blank or partially blank reason" marked and at least one content area session was not attempted, then the student is identified as "Not Tested State Approved Withdrew After". For grade 11 writing, only use session 1 attempt status.

5. Not Tested State Approved Enrolled After

   - If a student links to the demographic data file has content area not tested status of "Not Tested Enrolled After" and at least one content area session was not attempted or does not link to the demographic file has content area "Enrolled After blank or partially blank reason" marked and at least one content area session was not attempted, then the student is identified as "Not Tested State Approved Enrolled After". For grade 11 writing, only use session 1 attempt status.

6. Not Tested Other

   - If content area test was not attempted, the student is identified as "Not Tested Other".

D. *Not Tested Reasons Hierarchy by content area: if more than one reason for not testing at a content area is identified then select the first category indicated in the order of the list below.*

1. Not Tested State Approved Alternate Assessment
2. Not Tested State Approved First Year LEP (reading and writing only)
3. Not Tested State Approved Special Consideration
4. Not Tested State Approved Withdrew After
5. Not Tested State Approved Enrolled After
6. Not Tested Other

E. *Special Circumstances by content area*

1. Item invalidation flags are provided to the DOE during data processing test clean up. The item invalidation flag variables are initially set using the rules below. The final values used for reporting are provided back to Measured Progress by the DOE and used in reporting..

   a. If reaaccomF02 or reaaccomF03 is marked, then mark reaInvSes1, reaInvSes2, and reaInvSes3

   b. If mataccomF03 is marked, then mark matInvSes1, matInvSes2, and matInvSes03.

   c. If mataccomF01 is marked, then mark matInvSes1NC.

   d. If wriaccomF03 is marked, then mark wriInvSes1 and wriInvSes2

   e. If sciaccomF01 is marked, then mark sciInvSes3.

   f. If sciaccomF03 is marked, then mark SciInvSes1, sciInvSes2, and sciInvSes3.

2. A student is identified as content area tested if the student does not have any content area not tested reasons identified. Tested students are categorized in one of the four tested participation statuses: "Tested Damaged SRB", "Tested with Non-Standard Accommodations", "Tested Incomplete", and "Tested".

   a. Students with an item response of 'X' are identified as "Tested Damaged SRB".

   b. Students identified as content area tested, are not identified as "Tested Damaged SRB", and have at least one of the content area invalidation session flags marked will be identified as "Tested with Non-Standard Accommodations". Grade 11 writing use only session 1 invalidation flag.

   c. Students identified as content area tested, are not identified as "Tested Damaged SRB", and not identified as "Tested with Non-Standard Accommodations" and did not attempt all sessions in the test are considered to be "Tested Incomplete."

   d. All other tested students are identified as "Tested".

3. For students identified as "Tested Damaged SRB", the content area subcategories with at least one damaged item will not be reported. The school, district and state averages will be suppressed for the impacted subcategories on the student report. These students are excluded from all raw score aggregations (item, subcategory, and total raw score). They are included in participation, achievement level, and scaled score aggregations.

4. For students identified as "Tested with Non-Standard Accommodations" the content area sessions item responses which are marked for invalidation will be treated as a non-response

5. Students identified as tested in a content area will receive released item scores, scaled score, scale score bounds, achievement level, raw total score, subcategory scores, and writing annotations (where applicable).

6. Students identified as not tested in a content area will not receive a scaled score, scaled score bounds, achievement level, writing annotations (where applicable). They will receive released item scores, raw total score, and subcategory scores.

7. Item scores for students with an invalidation flag marked and have a not tested status will be blanked out based on the invalidation flag. For example, if the student is identified as "Not Tested: State Approved Alternate Assessment" and has ReaInvSes1 marked, then all reading session 1 item responses will be reported as a blank.

F. *Student Participation Status Hierarchy by content area*

   1. Not Tested: State Approved Alternate Assessment

   2. Not Tested: State Approved First Year LEP (reading and writing only)

   3. Not Tested: State Approved Special Consideration

   4. Not Tested: State Approved Withdrew After

   5. Not Tested: State Approved Enrolled After

   6. Not Tested: Other

   7. Tested Damaged SRB

8. Tested with Non-Standard Accommodations
9. Tested Incomplete
10. Tested

G. *Student Participation Summary*

Participation Status	Description	Raw Score (*)	Scaled Score (&)	Ach. Level	Student Report Ach. Level Text	Roster Ach. Level Text
Z	Tested Damaged SRB(**)	✓	✓	✓	Substantially Below Proficient, Partially Proficient, Proficient, or Proficient with Distinction	1,2,3, or 4
A	Tested	✓	✓	✓	Substantially Below Proficient, Partially Proficient, Proficient, or Proficient with Distinction	1,2,3, or 4
B	Tested Incomplete(%)	✓	✓	✓	Substantially Below Proficient, Partially Proficient, Proficient, or Proficient with Distinction	1,2,3, or 4
C	Tested with Non-Standard Accommodations (%%)	✓	✓	✓	Substantially Below Proficient, Partially Proficient, Proficient, or Proficient with Distinction	1,2,3, or 4
D	Not Tested State Approved Alternate Assessment	✓			Alternate Assessment	A
E	Not Tested State Approved First Year LEP (Reading and Writing only)	✓			First Year LEP	L
F	Not Tested State Approved Enrolled After	✓			Fall: Enrolled After October 1 Spring: Enrolled After May 11	E
G	Not Tested State Approved Withdrew After	✓			Fall: Withdrew After October 1 Spring: Withdrew After May 11	W
H	Not Tested State Approved Special Consideration	✓			Special Consideration	S
I	Not Tested Other	✓			Not Tested	N

(*) Raw scores are not printed on student report for students with a not tested status.

(**) Raw scores for Tested damaged SRB students will be reported based on the set of non-damaged items. Subcategory scores will not be reported if it includes a damaged item. Items identified as damaged (response of ‘X’) will print as a blank on the item analysis report.

(%) Tested incomplete students will be identified on student and item analysis reports with a footnote.

(%%) Tested with Non-standard accommodations students will be identified on student and item analysis reports. The student report will have a footnote. The invalidated items will be reported with a ‘-‘ on the item analysis report.

(&) Grade 11 writing students do not receive a scaled score. The writing achievement level is determined by the total common writing prompt score.

III. Calculations

A. *Rounding*

1. All percents are rounded to the nearest whole number
2. All mean scaled scores are rounded to the nearest whole number
3. Grade 11 writing mean (raw) score is rounded to the nearest tenth.
4. Content Area Subcategories: Average Points Earned (student report): round to the nearest tenth.
5. Round non-multiple choice average item scores to the nearest tenth.

B. *Students included in calculations based on participation status*

1. For number and percent of students enrolled, tested, and not tested categories include all students not excluded by other decision rules.
2. For number and percent at each achievement level, average scaled score, subtopic percent of total possible points and standard error, subtopic distribution across writing prompts, subcategories average points earned, percent/correct average score for each released item include all tested students not excluded by other decision rules.

C. *Raw scores*

1. For all analyses, non-response for an item by a tested student is treated as a score of 0. Items identified as damaged (response of 'X') will be excluded for student identified as "Tested Damaged SRB".
2. Content Area Total Points: Sum the points earned by the student for the common items.

D. *Item Scores*

1. For all analysis, non-response for an item by a tested student is treated as a score of 0.
2. For multiple choice released item data store a '+' for correct response, or A,B,C,D,* or blank
3. For open response released items, store the student score. If the score is not numeric ('B'), then store it as blank.
4. For students identified as content area tested with non-standard accommodations, then store the released item score as '-' for invalidated items.
5. For common writing prompt score, the final score of record is the sum of scorer 1 and scorer 2. If both scorers give the student a B(F), then the final score is B(F). For calculation of grade level summary report subtopic display the mean of common writing prompt score 1 and scorer 2 is used for percent of total possible points. The individual scores of the common prompt for scorer 1 and scorer 2 are used for the subpoic score distribution.
6. For matrix writing prompt score, the final score of record is scorer 1.

E. *Scaling*

1. Scale Form creation

Scaling is accomplished by defining the unique set of test forms for the grade/subject. This is accomplished as follows:

- Translate each form and position into the unique item number assigned to the form/position.
- Order the items by

  I. Type – multiple-choice, short-answer, constructed- response, extended-response, writing prompt.

  II. Form – common, then by ascending form number.

  III. Position

- If an item number is on a form, then set the value for that item number to '1', otherwise set to '.'. Set the Exception field to '0' to indicate this is an original test form.
- If an item number contains an 'X' (item is not included in scaling) then set the item number to '.'. Set the Exception field to '1' to indicate this is not an original test form.

- Compress all of the item numbers together into one field in the order defined in step II to create the test for the student.
- Select the distinct set of tests from the student data and order them by the exception field and the descending test field.
- Check to see if the test has already been assigned a scale form by looking in the tblScaleForm table. If the test exists then assign the existing scale form. Otherwise assign the next available scale form number. All scale form numbering starts at 01 and increments by 1 up to 99.

2. Scaled Score assignment
   - Psychometrics provides data analysis with a lookup table for each scale form. The lookup table contains the raw score and the resulting scaled score.

F. *SubTopic Item Scores*

1. Identify the Subtopic
   a. Fall: A file provided by PM outlines the IREF variables and values for identifying the Content Strand, GLE code, Depth of Knowledge code, subtopics, and subcategories. The variable type in IREF is the source for the Item Type, except the writing prompt item type is reported as "ER".
   b. Spring: NECAP science item information is stored in IABS, except for inquiry items.
      I. Program management provided Data Analysis with "2008 NECAP Science Inquiry Task Reporting Categories.doc" which contains the item order, domain, assessment target, DOK, item type, and maximum possible points for the inquiry items. Inquiry items are administered in session 3.
      II. Program management provided Data Analysis with "IABS Export Codes for NECAP SCI Reporting.doc" which contains the crosswalk between IABS item information and reporting.
      III. Data analysis used both documents and IABS data export to create "IREF" data table. Cat3 contains the domain. Cat4 contains the assessment target. Cat5 contains DOK. The domain is used for the reporting category (subtopic) calculations.
      IV. Program management provided Data Analysis with "2009 IABS_Released ItemsSCI for Tara.xls" which contains released item order. Inquiry items are listed at the end in the order they are in the test booklet.
2. Student Content Area Subcategories (student report): Subtopic item scores at the student level is the sum of the points earned by the student for the common items in the subtopic. For grade 11 writing, the subtopic score is the final score of record for the common writing prompt.
3. Content Area Subtopic (grade level results report): Subtopic scores are based on all unique common and matrix items. For grade 11 common writing prompt use the average of scorer 1 and scorer 2. The itemnumber identifies each unique item.
   a. Percent of Total Possible Points:
      I. For each unique common and matrix item calculate the average student score as follows: (sum student item score/number of tested students administered the item).
      II. 100 * (Sum the average score for items in the subtopic)/(Total Possible Points for the subtopic) rounded to the nearest whole number.
   b. Standard Error Bar: Before multiplying by 100 and rounding the Percent of Total Possible points (ppe) calculate standard error for school,district and state: 100* (square root (((ppe)*(1-ppe)/number of tested students)) rounded to the nearest tenth. For the lower bound and upper bound round the Percent of Total Possible Points +/- Rounded Standard Error to the nearest hundredth.

G. *Grade 11 Writing: Distribution of Score Points Across Prompts*.

1. Each prompt is assigned a subtopic based on information provided by program management.

2. The set of items used to calculate the percent at each score point is defined as follows: scorer 1 common prompt score, scorer 2 common prompt score, scorer 1of each matrix prompt. (Note: scores of 'B' and 'F' are treated as a 0 score for tested students.)

3. Using the set of items do the following to calculate the percent at each score point.

   - Step1 A: For each item, calculate the number of students at each score point. Adjust the common item counts by multiplying the common items' number of students at each score point by 0.5.
   - Step 1 B: Calculate the total number of scores by summing up the number of students at each score point across the items in the subtopic
   - Step 2: For each score point, sum up the (adjusted) number of students at the score point across the items in the subtopic. Divide the sum by total number of scores for the subtopic. Multiply that by 100 and round to the nearest whole number.

4. *Example*

	Common Prompt		**Matrix Prompt 1**	**Matrix Prompt 2**	**Matrix Prompt 3**	**Matrix Prompt 4**	**Matrix Prompt 5**
Item	**C1**	**C2**	**M1**	**M2**	**M3**	**M4**	**M5**
Subtopic	***1***	***1***	***1***	***2***	***2***	***2***	***3***
Student	**Student Item Score**						
A	3	4	2				
B	4	4					
C	2	1	3				
D	5	2		4			
E	3	2		1			
F	0	0			2		
G	1	2	1				
H	6	5	5				
I	2	2				1	
J	3	2				2	
K	5	4					4

Score Point	**Step 1 Number at each score point**						
Item	**C1**	**C2**	**M1**	**M2**	**M3**	**M4**	**M5**
Subtopic	***1***	***1***	***1***	***2***	***2***	***2***	***3***
0	0.5	0.5	0	0	0	0	0
1	0.5	0.5	1	1	0	1	0
2	1	2.5	1	0	1	1	0
3	1.5	0	1	0	0	0	0
4	0.5	1.5	0	1	0	0	1
5	1	0.5	1	0	0	0	0
6	0.5	0	0	0	0	0	0
Total	15			5			1

Score Point	**Step 2 Percent at each score point**		
Subtopic	**1**	**2**	**3**
0	7	0	0
1	13	40	0
2	30	40	0
3	17	0	0
4	13	20	100
5	17	0	0
6	3	0	0

H. *Cumulative Total*

1. Include the yearly results where the number tested is greater than or equal to 10

2. Cumulative total N (Enrolled, Not Tested Approved, Not Tested Other, Tested, at each achievement level) is the sum of the yearly results for each category where the number tested is greater than or equal to 10.

3. Cumulative percent for each achievement level is 100*(Number of students at the achievement level cumulative total / number of students tested cumulative total) rounded to the nearest whole number.

4. Cumulative mean scaled score is a weighted average. For years where the number tested is greater than or equal to 10, (sum of (yearly number tested * yearly mean scaled score)) / (sum of yearly number tested) rounded to the nearest whole number.

I. *Average Points Earned Students at Proficient Level (Range)*

1. Select all students across the states with Y40 scaled score, where Y=grade. Average the content area subcategories across the students and round to the nearest tenth. Add and subtract one standard error of measurement to get the range.

2. Grade 11 writing Average Points Earned Students at Proficient Level will be reported as '7'.

J. Writing Annotations

Students with a writing prompt score of 2-12 receive at least one, but up to five statements based on decision rules for annotations as outlined in Final Statements & Decision Rules for NECAP Writing Annotations.doc. Grade 11 students with the common writing prompt score of F or 0 will also receive annotations of FF and 00 respectively.

IV. Report Specific Rules

A. *Student Report*

1. Student header Information

a. If "FNAME" or "LNAME" is not missing then print "FNAME MI LNAME". Otherwise, print "No Name Provided".

b. Print the student's tested grade

c. For school and district name do the following.

I. For students with a stustatus value of 0, print the abbreviated tested school and district ICORE name based on school type decision rules.

II. Otherwise, for the school and district names print the "Description" in the StuStatus table

d. Print "NH","RI", or "VT" for state.

2. Test Results by content area

a. For students identified as "Not Tested", print the not tested reason in the achievement level, leave scaled score and graphic display blank.

b. For students identified as tested for the content area then do the following

I. Print the complete achievement level name the student earned

II. Print the scaled score the student earned

III. Print a vertical black bar for the student scaled score with gray horizontal bounds in the graphic display

IV. For students identified as "Tested with a non-standard accommodation" for a content area, print '**' after the content area earned achievement level and after student points earned for each subcategory.

V. For students identified as "Tested Damaged SRB" do not report student and aggregate data for subcategories that have at least one damaged item.

VI. For students identified as "Tested Incomplete" for a content area, place a section symbol after content area earned scaled score.

3. Grade 11 writing graphic display will not have standard error bars. Also, if a student's total points earned is 0 for writing, do not print the graphic display.

4. Exclude students based on stugrade=12, student status, school type and participation status decision rules for aggregations.

5. Print aggregate data based on stugrade=12, student status, school type and minimum N-size rules.
6. This Student's Achievement Compared to Other Students by content area
    a. For tested students, print a check mark in the appropriate achievement level in the content area student column. For not tested students leave blank
    b. For percent of students with achievement level by school, district and state print aggregate data based on student status, school type and minimum N rules
7. This Student's Performance in Content Area Subcategories by content area
    a. Always print total possible points and students at proficient average points earned range.
    b. For students identified as not tested then leave student scores blank
    c. For students identified as tested do the following
        I. For students identified as "Tested Damaged SRB" do not report student and aggregate data for subcategories that have at least one damaged item.
        II. Otherwise, always print student subcategory scores

        If the student is identified as tested with a non-standard accommodation for the content area then place '**" after the student points earned for each subcategory.
8. Writing Annotations

    For students with writing prompt score of 2-12 print at least one, but up to five annotation statements. Grade 11 students with the common writing prompt score of F or 0 will also receive annotations of FF and 00 respectively.

B. *School Item Analysis Report by Grade and Subject*

1. Reports are created for testing school and teaching school (Fall Only) independently.
2. School Header Information
    a. Use abbreviated ICORE school and district name based on school type decision rules
    b. Print "New Hampshire", "Rhode Island", or "Vermont" for State.
    c. For NH, the code should print SAU code – district code – school code. For RI and VT, the code should print district code – school code.
3. For multiple choice items, print '+' for correct response, or A,B,C,D,* or blank
4. For open response items, print the student score. If the score is not numeric ('B'), then leave blank.
5. For students identified as content area tested with non-standard accommodations, print '-' for invalidated items.
6. All students receive subcategory points earned and total points earned, including grade 11 writing.
7. Leave scaled score blank for not tested students and print the not tested reason in the achievement level column.
8. Exclude students based on stugrade=12, student status, school type and participation status decision rules for aggregations.
9. Always print aggregated data regardless of N-size based on school type decision rules.
10. For students identified as not tested for the content area print a cross symbol next to students' name.
11. For students identified as tested incomplete for the content area print a section symbol next to the scaled score.
12. Students with StuStatus value of 1,2 or 3 are not listed on the report.
13. Students with StuGrade=12 are not listed on the report.

C. Grade Level School/District/State Results

1. Reports are run by testing state, testing district, testing school using the aggregate school and district codes described in the school type table.
2. Fall Only: Reports are also run by teaching district, and teaching school using the aggregate school and district codes described in the school type table.
3. Exclude students based on stugrade=12, student status, school type and participation status decision rules for aggregations.
4. Report Header Information
    a. Use abbreviated school and district name from ICORE based on school type decision rules.
    b. Print "New Hampshire", "Rhode Island", or "Vermont" to reference the state. The state graphic is printed on the first page.
5. Report Section: Participation in NECAP
    a. For testing level reports always print number and percent based on school type decision rules.
    b. For the teaching level reports leave the section blank.
6. Report Section: NECAP Results by content area
    a. For the testing level report always print based on minimum N-size and school type decision rules.
    b. For the teaching level report leave Enrolled, NT Approved, and NT Other blank. Print Tested, number and percent at each achievement level, mean scaled score based on minimum N-size and school type decision rules.
7. Report Section: Historical NECAP Results by content area
    a. For teaching level report always print current year, prior years, and cumulative total results based on minimum N-size and school type decision rules.
    b. For teaching level report leave Enrolled, NT Approved, and NT Other blank. Print Tested, number and percent at each achievement level, mean scaled score based on minimum N-size and school type decision rules.
8. Report Section: Subtopic Results by content area
    a. For testing and teaching level reports always print based on minimum N-size and school type decision rules
9. Report Section: Disaggregated Results by content area
    a. For testing level report always print based on minimum N-size and school type decision rules.
    b. For teaching level report leave Enrolled, NT Approved, and NT Other blank. Print Tested, number and percent at each achievement level, mean scaled score based on minimum N-size and school type decision rules.

D. *School/District/State Summary(School Level is run in the Fall Only)*

1. Reports are run by testing state, testing district, testing school (Fall Only) using the aggregate school and district codes described in the school type table
2. Fall Only: Reports are also run by teaching district, and teaching school using the aggregate school and district codes described in the school type table.
3. Exclude students based on stugrade=12, student status, school type and participation status decision rules for aggregations.
4. For testing level report print entire aggregate group across grades tested and list grades tested results based on minimum N-size and school type decision rules. Mean scaled score across the grades is not calculated.
5. For the teaching level report leave Enrolled, NT Approved, and NT Other blank. Print Tested, number and percent at each achievement level, mean scaled score based on minimum N-size and school type decision rules. Mean scaled score across the grades is not calculated.

V. Data File Rules

In the file names GR refers to the two digit grade (03-08,11) , YYYY refers to the year, DDDDD refers to the district code, and SS refers to two letter state code. Refer to the tables at the end of this section for filenames and layouts. Teaching level data files will be produced in the Fall Only.

A. Preliminary State Results

1. A PDF file will be created for each state containing preliminary state results for each grade and subject and will list historical state data for comparison.
2. The file name will be SSPreliminaryResultsDATE.pdf

B. State Student Released Item Data

1. A CSV file will be created for each state and grade.
2. Exclusion Rules
   - NH: If the student has a testing school type of 'PRI' or StuStatus is 1,2 or 3, then exclude the student
   - RI: If testing school type is PRI and teaching school type is PRI or blank, then exclude the student.
   - VT: Do not exclude any students

C. State Student Raw Data

1. A CSV file will be created for each state and grade.
2. Exclusion Rules
   - NH: If the student has a testing school type of 'PRI' or StuStatus is 1,2 or 3, then exclude the student
   - RI: If testing school type is PRI and teaching school type is PRI or blank, then exclude the student.
   - VT: Do not exclude any students

D. State Student Scored Data

1. A CSV file will be created for each state and grade.
2. Exclusion Rules
   - NH: If the student has a testing school type of 'PRI' or StuStatus is 1,2 or 3, then exclude the student
   - RI: If testing school type is PRI and teaching school type is PRI or blank, then exclude the student.
   - VT: Do not exclude any students

E. District Student Data

1. Testing and teaching CSV files will be created for each state and grade and district.
2. Students with the Discode or SendDiscode will be in the district grade specific CSV file for the testing year.
3. Fall Only: Students with a sprDiscode or sprSendDiscode will be in the district grade specific CSV file for the teaching year.
4. For NH and RI only public school districts will receive district data files. (Districts with at least one school with schoolsubtypeID=1 or 11 in ICORE)
5. Exclusion Rules
   - NH & RI: If the student has a StuStatus value of 1,2 or 3, then exclude the student
   - VT: If the student has a StuStatus value of 1, then exclude the student.

F. Common Item Information

1. An excel file will be created containing item information for common items: grade, subject, released item number, item analysis heading data, raw data item name, item type, key, and point value.

G. Grade Level Results Report Disaggregated and Historical Data

1. Teaching and testing CSV files will be created for each state and grade containing the grade level results disaggregated and historical data.
2. Data will be suppressed based on minimum N-size and report type decision rules.
3. Private schools are excluded from NH & RI files.

H. Grade Level Results Report Participation Category Data

1. Testing CSV file will be created for each state and grade containing the grade level results participation data.
2. Private schools are excluded from NH & RI files.

I. Grade Level Results Report Subtopic Data

1. Teaching and testing CSV files will be created for each state and grade containing the grade level results subtopic.
2. Data will be suppressed based on minimum N-size and report type decision rules.
3. Private schools are excluded from NH & RI files.

J. Summary Results Data

1. Teaching and testing CSV files will be created for each state containing the school, district and state summary data.
2. Data will be suppressed based on minimum N-size and report type decision rules.
3. Private schools are excluded from NH & RI files.

K. Released Item Percent Responses Data

1. The CSV files will only contain state level aggregation for released items.
2. CSV files will be created for each state and grade containing the released item analysis report state data.

L. Invalidated Students Original Score

1. A CSV file will be created for each state and grade
2. Original raw scores for students whose responses were invalidated for reporting will be provided.
3. Exclusion Rules
   - NH: If the student has a testing school type of ‘PRI’ or StuStatus is 1,2 or 3, then exclude the student
   - RI: If testing school type is PRI and teaching school type is PRI or blank, then exclude the student.
   - VT: Do not exclude any students

M. Student Questionnaire Summary

1. One CSV file will be created for each state containing percent of students at each response, percent of students at each achievement level, and average scaled score, by student questionnaire response.
2. Only include students who are included in state level aggregations.
3. Data will be suppressed based on minimum N-size and report type decision rules.

N. TCTA Questionnaire Raw Data

1. One CSV file will be created for each state containing raw TC Questionnaire data.
2. One CSV file will be created for each state containing raw TA Questionnaire data.

O. TCTA Questionnaire Frequency Distribution

1. One CSV file will be created for each state containing the distribution of responses of TC Questionnaire raw data.

2. One CSV file will be created for each state containing the distribution of responses of TA Questionnaire raw data.

P. Scaled Score Lookup

1. One CSV file and one excel file will be created containing the scaled score lookup data.

Q. Subtopic Average Points Earned (For Program Management)

1. One excel file will be created containing four worksheets. The first worksheet contains the total possible points for each subtopic as reported on the item analysis report and the range for students who are just proficient. The remaining three worksheets contain state average subtopic scores as reported on the item analysis report.
2. Program management uses this file to create a document which is provided to the schools.

R. Item Stats for Inquiry Task Items (For Program Management)

1. Since Inquiry Task Items are not stored in IABS, one CSV file will be created containing item stats for Inquiry Task items.
2. All three states are included in the calculations.

S. Memo Shipping Files (For Program Management)

1. Provide PM in excel list of schools and districts that tested regardless of grade.

T. Report Shipment Table (Measured Progress Use Only)

1. All shipped products are shipped directly to the schools (ReportFor=1 and BatchID=0)
2. The following products will be included for each school included in reporting
   - Student Report – School Copy (black and white)
     I. Student reports are class-packed by school and grade
     II. GradeNo=03,04,05,06,07,08,11 (for each grade included in reporting)
     III. ReportType=01
     IV. ContentCode=16 for Spring Reporting, 00 for Fall Reporting
     V. Quantity=1
   - Student Report – Parent Copy (color)
     I. Student reports are class-packed by school and grade
     II. GradeNo=03,04,05,06,07,08,11 (for each grade included in reporting)
     III. ReportType=02
     IV. ContentCode=16 for Spring Reporting, 00 for Fall Reporting
     V. Quantity=1

U. Fall Table Data File Deliverables

Data File	Layout	File Name
Preliminary State Results	N/A	Included in Equating Report
State Student Released Item Data	NECAP0809FallDistrictStudentLayout.xls(one worksheet for grade 11 and one worksheet for 03-08)	NECAP0809FallStateStudentReleasedItem[GR].csv
State Student Raw Data	NECAP0809FallStateStudentRawLayout.xls (one worksheet for each of the 4 unique test designs)	NECAP0809FallStateStudentRaw[GR].csv
State Student Scored Data	NECAP0809FallStateStudentScoredLayout.xls	NECAP0809FallStateStudentScored[GR].csv
District Student Data	NECAP0809FallDistrictStudentLayout.xls(one worksheet for grade 11 and one worksheet for 03-08)	NECAP0809FallTestingDistrictSlice[GR]_[District Code].csv NECAP0809FallTeachingDistrictSlice[GR]_[District Code].csv
Common Item Information	NECAP0809FallCommonItemInformationLayout.xls	NECAP0809FallCommonItemInformation.xls
Grade Level Results Report Disaggregated and Historical Data	NECAP0809FallResultsReport DisaggregatedandHistoricaLayout.xls	NECAP0809FallResultsReportTesting DisaggregatedandHistorical[GR].csv NECAP0809FallResultsReportTeaching DisaggregatedandHistorical[GR].csv
Grade Level Results Report Participation Category Data	NECAP0809FallResultsReportParticipationLayout.xls	NECAP0809FallResultsReportTestingParticipation[GR].csv
Grade Level Results Report Subtopic Data	NECAP0809FallResultsReport SubtopicLayout.xls	NECAP0809FallResultsReportTestingSubtopic[GR].csv NECAP0809FallResultsReportTeachingSubtopic[GR].csv
Summary Results Data	NECAP0809FallSummaryResultsLayout.xls	NECAP0809FallSummaryResultsTesting.csv NECAP0809FallSummaryResultsTeaching.csv
Released Item Percent Responses Data	NECAP0809FallReleasedItemPercentResponsesLayout.xls	NECAP0809FallReleasedItemPercentResponses.csv
Invalidated Students Original Score	NECAP0809FallStateInvalidatedStudent OriginalScoredLayout.xls	NECAP0809FallStateInvalidatedStudent OriginalScored[GR].csv
Student Questionnaire Summary	NECAP0809FallStudentQuestionnaireSummaryLayout.xls	NECAP0809FallStudentQuestionnaireSummary.csv
TCTA Questionnaire Raw Data	NECAP0809FallTCQuestionnaireRawLayout.xls NECAP0809FallTAQuestionnaireRawLayout.xls	NECAP0809FallTCQuestionnaireRaw.csv NECAP0809FallTAQuestionnaireRaw.csv
TCTA Questionnaire Frequency Distribution	NECAP0809FallTCTAQuestionnaireFreqLayout.xls	NECAP0809FallTCTAQuestionnaireFreq.csv
Scaled Score Lookup	NECAP0809FallScaleScoreLookupLayout.xls	NECAP0809FallScaleScoreLookup.xls NECAP0809FallScaleScoreLookup.csv
Subtopic Average Points Earned (For Project Management)	N/A	NECAP0809FallSubtopicAvgPointsEarned.xls
Memo Shipping Files (For Program Management)	N/A	TBD

V. Spring Table Data File Deliverables

Data File	Layout	File Name
Preliminary State Results	N/A	Included in Equating Report
State Student Released Item Data	NECAP0809SpringDistrictStudentLayout.xls	NECAP0809SpringStateStudentReleasedItem[GR].csv
State Student Raw Data	NECAP0809SpringStateStudentRawLayout.xls	NECAP0809SpringStateStudentRaw[GR].csv
State Student Scored Data	NECAP0809SpringStateStudentScoredLayout.xls	NECAP0809SpringStateStudentScored[GR].csv
District Student Data	NECAP0809SpringDistrictStudentLayout.xls	NECAP0809SpringDistrictSlice[GR]_[District Code].csv
Common Item Information	NECAP0809SpringCommonItemInformationLayout.xls	NECAP0809SpringCommonItemInformation.csv
Grade Level Results Report Disaggregated and Historical Data	NECAP0809SpringResultsReport DisaggregatedandHistoricaLayout.xls	NECAP0809SpringResultsReport DisaggregatedandHistorical[GR].csv
Grade Level Results Report Participation Category Data	NECAP0809SpringResultsReport ParticipationLayout.xls	NECAP0809SpringResultsReport Participation[GR].csv
Grade Level Results Report Subtopic Data	NECAP0809SpringResultsReport SubtopicLayout.xls	NECAP0809SpringResultsReport Subtopic[GR].csv
Summary Results Data	NECAP0809SpringSummaryResultsLayout.xls	NECAP0809SpringSummaryResults.csv
Released Item Percent Responses Data	NECAP0809SpringReleasedItemPercentResponsesLayout.xls	NECAP0809SpringReleasedItemPercentResponses.csv
Invalidated Students Original Score	NECAP0809SpringStateInvalidatedStudent OriginalScoredLayout.xls	NECAP0809SpringStateInvalidatedStudent OriginalScored.csv
Student Questionnaire Summary	NECAP0809SpringStudentQuestionnaireSummaryLayout.xls	NECAP0809SpringStudentQuestionnaireSummary.csv
TCTA Questionnaire Raw Data	NECAP0809SpringTCQuestionnaireRawLayout.xls NECAP0809SpringTAQuestionnaireRawLayout.xls	NECAP0809SpringTCQuestionnaireRaw.csv NECAP0809SpringTAQuestionnaireRaw.csv
TCTA Questionnaire Frequency Distribution	NECAP0809SpringTCTAQuestionnaireFreqLayout.xls	NECAP0809SpringTCTAQuestionnaireFreq.csv
Scaled Score Lookup	NECAP0809SpringScaleScoreLookupLayout.xls	NECAP0809SpringScaleScoreLookup.xls NECAP0809SpringScaleScoreLookup.csv
Subtopic Average Points Earned (For Project Management)	N/A	NECAP0809SpringSubtopicAvgPointsEarned.xls
Item Stats for Inquiry Task Items (For Program Management)	N/A	NECAP0809SpringInquiryItemStats.csv
Memo Shipping Files (For Program Management)	N/A	TBD

Appendix M—STUDENT QUESTIONNAIRE RESULTS

Table M-1. 2008–09 NECAP Science: Average Scaled Scores, and Counts and Percentages Within Achievement Levels, of Responses to Student Survey Questions 1–12—Grade 4

Question	*Resp*	*NResp*	*%Resp*	*AvgSS*	*NSBP*	*NPP*	*NP*	*NPWD*	*%SBP*	*%PP*	*%P*	*%PWD*
1	(Blank)	3,360	11	438	462	14	1,351	40	1,526	45	21	1
	A	10,608	35	439	1,412	13	4,286	40	4,872	46	38	0
	B	13,681	45	440	1,442	11	5,073	37	7,101	52	65	0
	C	2,836	9	438	476	17	1,120	39	1,234	44	6	0
2	(Blank)	3,423	11	438	468	14	1,374	40	1,560	46	21	1
	A	17,011	56	439	2,081	12	6,642	39	8,224	48	64	0
	B	9,572	31	440	1,082	11	3,630	38	4,815	50	45	0
	C	479	2	432	161	34	184	38	134	28	0	0
3	(Blank)	3,398	11	438	463	14	1,373	40	1,541	45	21	1
	A	17,379	57	441	1,568	9	5,906	34	9,814	56	91	1
	B	9,009	30	437	1,468	16	4,246	47	3,277	36	18	0
	C	699	2	428	293	42	305	44	101	14	0	0
4	(Blank)	3,420	11	438	469	14	1,376	40	1,554	45	21	1
	A	21,026	69	440	2,280	11	8,011	38	10,648	51	87	0
	B	4,052	13	438	602	15	1,661	41	1,773	44	16	0
	C	1,380	5	436	291	21	550	40	535	39	4	0
		607	2	435	150	25	232	38	223	37	2	0
5	(Blank)	3,421	11	438	489	14	1,371	40	1,540	45	21	1
	A	18,212	60	440	1,813	10	6,558	36	9,749	54	92	1
	B	8,176	27	437	1,254	15	3,615	44	3,290	40	17	0
	C	676	2	431	236	35	286	42	154	23	0	0
6	(Blank)	3,380	11	438	462	14	1,368	40	1,529	45	21	1
	A	20,472	67	440	2,294	11	7,768	38	10,324	50	86	0
	B	5,667	19	439	774	14	2,284	40	2,587	46	22	0
	C	811	3	435	195	24	348	43	267	33	1	0
	D	155	1	429	67	43	62	40	26	17	0	0
7	(Blank)	3,383	11	438	460	14	1,366	40	1,536	45	21	1
	A	17,821	58	440	1,925	11	6,734	38	9,087	51	75	0
	B	6,961	23	438	1,015	15	2,834	41	3,087	44	25	0
	C	1,647	5	438	264	16	652	40	724	44	7	0
	D	673	2	437	128	19	244	36	299	44	2	0
8	(Blank)	3,519	12	438	491	14	1,418	40	1,589	45	21	1
	A	9,253	30	439	1,247	13	3,537	38	4,432	48	37	0
	B	8,583	28	440	905	11	3,202	37	4,432	52	44	1
	C	6,434	21	439	792	12	2,526	39	3,094	48	22	0
	D	2,696	9	438	357	13	1,147	43	1,186	44	6	0
9	(Blank)	3,407	11	438	465	14	1,374	40	1,547	45	21	1
	A	6,105	20	440	778	13	2,096	34	3,195	52	36	1
	B	18,599	61	439	2,103	11	7,439	40	8,986	48	71	0
	C	959	3	435	204	21	395	41	360	38	0	0
	D	740	2	437	129	17	286	39	324	44	1	0
	E	675	2	438	113	17	240	36	321	48	1	0
10	(Blank)	3,432	11	438	475	14	1,382	40	1,554	45	21	1
	A	3,904	13	438	575	15	1,588	41	1,728	44	13	0
	B	7,939	26	440	870	11	2,854	36	4,170	53	45	1
	C	7,240	24	439	987	14	2,886	40	3,342	46	25	0
	D	7,590	25	440	791	10	2,958	39	3,816	50	25	0
	E	380	1	435	94	25	162	43	123	32	1	0
11	(Blank)	3,767	12	438	540	14	1,535	41	1,671	44	21	1
	A	550	2	433	181	33	207	38	160	29	2	0
	B	3,340	11	437	562	17	1,380	41	1,390	42	8	0
	C	5,695	19	440	578	10	2,144	38	2,943	52	30	1
	D	17,133	56	440	1,931	11	6,564	38	8,569	50	69	0
12	(Blank)	3,682	12	438	539	15	1,489	40	1,632	44	22	1
	A	16,104	53	439	2,194	14	6,167	38	7,675	48	68	0
	B	10,699	35	440	1,059	10	4,174	39	5,426	51	40	0

SS = scaled score; SBP = Substantially Below Proficient; PP = Partially Proficient; P = Proficient; PWD = Proficient With Distinction

Table M-2. 2008–09 NECAP Science: Average Scaled Scores, and Counts and Percentages Within Achievement Levels, of Responses to Student Survey Questions 1–15—Grade 8

Question	*Resp*	*NResp*	*%Resp*	*AvgSS*	*NSBP*	*NPP*	*NP*	*NPWD*	*%SBP*	*%PP*	*%P*	*%PWD*
1	(Blank)	3,480	10	830	1,415	41	1,436	41	611	18	18	1
	A	17,339	51	832	5,361	31	8,701	50	3,222	19	55	0
	B	11,348	34	835	2,501	22	5,850	52	2,933	26	64	1
	C	1,565	5	835	386	25	681	44	488	31	10	1
2	(Blank)	3,529	10	830	1,451	41	1,455	41	604	17	19	1
	A	10,999	33	833	3,370	31	5,426	49	2,157	20	46	0
	B	16,532	49	834	3,707	22	8,620	52	4,128	25	77	0
	C	2,672	8	830	1,135	42	1,167	44	365	14	5	0
3	(Blank)	3,566	11	830	1,474	41	1,465	41	609	17	18	1
	A	25,145	75	835	5,351	21	13,321	53	6,346	25	127	1
	B	4,089	12	827	2,195	54	1,628	40	265	6	1	0
	C	932	3	823	643	69	254	27	34	4	1	0
4	(Blank)	3,584	11	830	1,471	41	1,480	41	615	17	18	1
	A	26,090	77	834	6,565	25	13,503	52	5,919	23	103	0
	B	2,872	9	831	1,048	36	1,268	44	537	19	19	1
	C	756	2	829	353	47	273	36	126	17	4	1
	D	430	1	827	226	53	144	33	57	13	3	1
5	(Blank)	3,487	10	830	1,411	40	1,442	41	616	18	18	1
	A	466	1	827	256	55	158	34	52	11	0	0
	B	1,868	6	831	702	38	836	45	324	17	6	0
	C	7,278	22	835	1,573	22	3,758	52	1,908	26	39	1
	D	1,386	4	830	544	39	639	46	198	14	5	0
	E	19,247	57	833	5,177	27	9,835	51	4,156	22	79	0
6	(Blank)	4,277	13	830	1,779	42	1,798	42	681	16	19	0
	A	4,351	13	835	791	18	2,216	51	1,313	30	31	1
	B	7,699	23	836	1,466	19	3,926	51	2,245	29	62	1
	C	8,642	26	832	2,646	31	4,452	52	1,524	18	20	0
	D	8,763	26	832	2,981	34	4,276	49	1,491	17	15	0
7	(Blank)	3,716	11	830	1,551	42	1,520	41	626	17	19	1
	A	25,244	75	834	5,774	23	13,217	52	6,134	24	119	0
	B	3,878	11	829	1,795	46	1,643	42	431	11	9	0
	C	894	3	825	543	61	288	32	63	7	0	0
8	(Blank)	3,580	11	830	1,466	41	1,479	41	615	17	20	1
	A	24,328	72	833	6,282	26	12,797	53	5,182	21	67	0
	B	3,991	12	833	1,272	32	1,746	44	947	24	26	1
	C	1,350	4	833	438	32	489	36	395	29	28	2
	D	483	1	831	205	42	157	33	115	24	6	1
9	(Blank)	3,692	11	830	1,515	41	1,528	41	631	17	18	0
	A	8,382	25	833	2,381	28	4,152	50	1,809	22	40	0
	B	15,932	47	834	3,793	24	8,304	52	3,773	24	62	0
	C	3,792	11	833	1,106	29	1,838	48	823	22	25	1
	D	1,934	6	829	868	45	846	44	218	11	2	0
10	(Blank)	3,542	11	830	1,441	41	1,467	41	616	17	18	1
	A	11,641	35	835	2,609	22	5,932	51	3,028	26	72	1
	B	16,347	48	833	4,583	28	8,337	51	3,371	21	56	0
	C	883	3	826	468	53	359	41	56	6	0	0
	D	681	2	830	270	40	306	45	104	15	1	0
	E	638	2	829	292	46	267	42	79	12	0	0
11	(Blank)	3,963	12	830	1,610	41	1,669	42	665	17	19	0
	A	10,362	31	838	1,135	11	4,697	45	4,409	43	121	1
	B	11,104	33	833	2,978	27	6,442	58	1,677	15	7	0
	C	5,418	16	829	2,426	45	2,622	48	370	7	0	0
	D	2,885	9	827	1,514	52	1,238	43	133	5	0	0

continued

Question	Resp	NResp	%Resp	AvgSS	NSBP	NPP	NP	NPWD	%SBP	%PP	%P	%PWD
12	(Blank)	3,579	11	830	1,450	41	1,486	42	625	17	18	1
	A	24,325	72	834	6,258	26	12,427	51	5,526	23	114	0
	B	4,562	14	833	1,251	27	2,296	50	1,002	22	13	0
	C	665	2	827	363	55	248	37	54	8	0	0
	D	422	1	827	223	53	157	37	40	9	2	0
	E	179	1	824	118	66	54	30	7	4	0	0
13	(Blank)	3,733	11	830	1,546	41	1,541	41	627	17	19	1
	A	5,325	16	833	1,518	29	2,693	51	1,088	20	26	0
	B	16,699	50	834	4,160	25	8,576	51	3,890	23	73	0
	C	4,686	14	834	1,194	25	2,333	50	1,138	24	21	0
	D	3,289	10	830	1,245	38	1,525	46	511	16	8	0
14	(Blank)	4,404	13	831	1,643	37	1,919	44	813	18	29	1
	A	8,730	26	834	2,185	25	4,541	52	1,981	23	23	0
	B	5,373	16	831	2,033	38	2,557	48	772	14	11	0
	C	7,175	21	834	1,825	25	3,442	48	1,856	26	52	1
	D	3,772	11	833	1,057	28	2,028	54	679	18	8	0
	E	4,278	13	835	920	22	2,181	51	1,153	27	24	1
15	(Blank)	4,438	13	830	1,834	41	1,854	42	730	16	20	0
	A	12,282	36	833	3,745	30	6,020	49	2,469	20	48	0
	B	17,012	50	834	4,084	24	8,794	52	4,055	24	79	0

SS = scaled score; SBP = Substantially Below Proficient; PP = Partially Proficient; P = Proficient; PWD = Proficient With Distinction

Table M-3. 2008–09 NECAP Science: Average Scaled Scores, and Counts and Percentages Within Achievement Levels, of Responses to Student Survey Questions 1–19—Grade 11

Question	*Resp*	*NResp*	*%Resp*	*AvgSS*	*NSBP*	*NPP*	*NP*	*NPWD*	*%SBP*	*%PP*	*%P*	*%PWD*
1	(Blank)	4,079	13	1,130	1,892	46	1,462	36	703	17	22	1
	A	16,189	50	1,131	6,133	38	7,964	49	2,071	13	21	0
	B	8,845	27	1,136	1,677	19	4,411	50	2,699	31	58	1
	C	3,483	11	1,140	400	11	1,112	32	1,841	53	130	4
2	(Blank)	4,102	13	1,130	1,923	47	1,481	36	678	17	20	0
	A	5,439	17	1,132	2,035	37	2,518	46	873	16	13	0
	B	15,817	49	1,135	3,482	22	7,822	49	4,366	28	147	1
	C	7,238	22	1,132	2,662	37	3,128	43	1,397	19	51	1
3	(Blank)	4,088	13	1,130	1,930	47	1,464	36	674	16	20	0
	A	24,298	75	1,135	5,616	23	12,098	50	6,378	26	206	1
	B	2,996	9	1,128	1,698	57	1,092	36	201	7	5	0
	C	1,214	4	1,125	858	71	295	24	61	5	0	0
4	(Blank)	4,013	12	1,130	1,857	46	1,458	36	678	17	20	0
	A	23,258	71	1,134	6,100	26	11,235	48	5,735	25	188	1
	B	3,577	11	1,132	1,273	36	1,639	46	651	18	14	0
	C	1,073	3	1,130	487	45	409	38	169	16	8	1
	D	675	2	1,128	385	57	208	31	81	12	1	0
5	(Blank)	4,184	13	1,130	1,972	47	1,508	36	684	16	20	0
	A	7,362	23	1,136	1,385	19	3,635	49	2,279	31	63	1
	B	10,212	31	1,135	2,376	23	5,091	50	2,646	26	99	1
	C	6,451	20	1,133	2,188	34	3,059	47	1,173	18	31	0
	D	4,387	13	1,129	2,181	50	1,656	38	532	12	18	0
6	(Blank)	3,928	12	1,130	1,812	46	1,424	36	672	17	20	1
	A	728	2	1,127	418	57	229	31	80	11	1	0
	B	2,856	9	1,133	858	30	1,299	45	676	24	23	1
	C	7,280	22	1,137	1,259	17	3,482	48	2,437	33	102	1
	D	3,042	9	1,131	1,158	38	1,390	46	484	16	10	0
	E	14,762	45	1,133	4,597	31	7,125	48	2,965	20	75	1
7	(Blank)	4,121	13	1,130	1,914	46	1,505	37	682	17	20	0
	A	21,183	65	1,135	5,380	25	10,257	48	5,365	25	181	1
	B	4,900	15	1,133	1,633	33	2,328	48	915	19	24	0
	C	1,629	5	1,130	718	44	640	39	267	16	4	0
	D	763	2	1,127	457	60	219	29	85	11	2	0
8	(Blank)	4,584	14	1,130	2,050	45	1,734	38	780	17	20	0
	A	2,650	8	1,133	916	35	1,106	42	608	23	20	1
	B	7,656	23	1,135	1,767	23	3,649	48	2,175	28	65	1
	C	8,089	25	1,134	2,046	25	4,042	50	1,940	24	61	1
	D	9,617	30	1,133	3,323	35	4,418	46	1,811	19	65	1
9	(Blank)	4,054	12	1,130	1,847	46	1,496	37	691	17	20	0
	A	7,647	23	1,136	1,559	20	3,543	46	2,451	32	94	1
	B	16,009	49	1,134	4,106	26	8,006	50	3,790	24	107	1
	C	2,755	8	1,128	1,472	53	1,066	39	212	8	5	0
	D	799	2	1,129	412	52	313	39	71	9	3	0
	E	1,332	4	1,128	706	53	525	39	99	7	2	0
10	(Blank)	4,250	13	1,130	1,870	44	1,565	37	787	19	28	1
	A	14,298	44	1,134	3,816	27	7,174	50	3,235	23	73	1
	B	5,665	17	1,134	1,672	30	2,488	44	1,439	25	66	1
	C	4,483	14	1,134	1,300	29	2,026	45	1,121	25	36	1
	D	3,186	10	1,134	927	29	1,524	48	707	22	28	1
	E	714	2	1,125	517	72	172	24	25	4	0	0
11	(Blank)	4,491	14	1,130	1,943	43	1,674	37	841	19	33	1
	A	17,622	54	1,134	4,412	25	8,969	51	4,142	24	99	1
	B	2,289	7	1,130	993	43	1,008	44	286	12	2	0
	C	5,810	18	1,135	1,412	24	2,464	42	1,842	32	92	2
	D	1,184	4	1,129	617	52	428	36	135	11	4	0
	E	1,200	4	1,127	725	60	406	34	68	6	1	0

continued

Question	Resp	NResp	%Resp	AvgSS	NSBP	NPP	NP	NPWD	%SBP	%PP	%P	%PWD
12	(Blank)	4,576	14	1,131	1,958	43	1,691	37	891	19	36	1
	A	4,594	14	1,132	1,671	36	2,015	44	877	19	31	1
	B	1,982	6	1,129	1,015	51	805	41	160	8	2	0
	C	13,436	41	1,136	2,446	18	7,054	53	3,836	29	100	1
	D	4,156	13	1,135	985	24	1,764	42	1,347	32	60	1
	E	3,852	12	1,129	2,027	53	1,620	42	203	5	2	0
13	(Blank)	4,622	14	1,131	1,937	42	1,734	38	915	20	36	1
	A	4,808	15	1,135	1,174	24	2,174	45	1,420	30	40	1
	B	2,461	8	1,131	953	39	1,163	47	342	14	3	0
	C	3,587	11	1,132	1,285	36	1,609	45	670	19	23	1
	D	8,445	26	1,137	1,216	14	4,052	48	3,060	36	117	1
	E	8,673	27	1,131	3,537	41	4,217	49	907	10	12	0
14	(Blank)	4,059	12	1,130	1,846	45	1,498	37	694	17	21	1
	A	11,558	35	1,135	2,667	23	5,524	48	3,232	28	135	1
	B	6,901	21	1,134	1,887	27	3,330	48	1,641	24	43	1
	C	984	3	1,128	569	58	328	33	86	9	1	0
	D	5,310	16	1,135	1,143	22	2,675	50	1,462	28	30	1
	E	3,784	12	1,129	1,990	53	1,594	42	199	5	1	0
15	(Blank)	4,038	12	1,130	1,855	46	1,478	37	685	17	20	0
	A	6,083	19	1,136	1,119	18	2,826	46	2,057	34	81	1
	B	12,854	39	1,135	2,832	22	6,449	50	3,466	27	107	1
	C	3,292	10	1,133	1,117	34	1,507	46	651	20	17	1
	D	2,707	8	1,130	1,300	48	1,140	42	262	10	5	0
	E	3,622	11	1,129	1,879	52	1,549	43	193	5	1	0
16	(Blank)	4,517	14	1,130	2,147	48	1,623	36	726	16	21	0
	A	7,676	24	1,138	1,188	15	3,107	40	3,216	42	165	2
	B	11,187	34	1,134	2,900	26	5,739	51	2,507	22	41	0
	C	6,137	19	1,131	2,349	38	3,136	51	650	11	2	0
	D	3,079	9	1,129	1,518	49	1,344	44	215	7	2	0
17	(Blank)	4,405	14	1,129	2,112	48	1,568	36	704	16	21	0
	A	8,568	26	1,136	1,824	21	4,006	47	2,647	31	91	1
	B	12,550	39	1,134	3,381	27	6,175	49	2,895	23	99	1
	C	5,192	16	1,133	1,733	33	2,511	48	929	18	19	0
	D	1,881	6	1,128	1,052	56	689	37	139	7	1	0
18	(Blank)	4,447	14	1,130	2,111	47	1,596	36	719	16	21	0
	A	8,646	27	1,135	1,793	21	4,352	50	2,437	28	64	1
	B	10,951	34	1,134	3,204	29	5,222	48	2,437	22	88	1
	C	5,743	18	1,134	1,768	31	2,602	45	1,325	23	48	1
	D	2,809	9	1,130	1,226	44	1,177	42	396	14	10	0
19	(Blank)	5,376	16	1,129	2,604	48	1,926	36	822	15	24	0
	A	7,185	22	1,133	2,365	33	3,389	47	1,400	19	31	0
	B	20,035	61	1,135	5,133	26	9,634	48	5,092	25	176	1

SS = scaled score; SBP = Substantially Below Proficient; PP = Partially Proficient; P = Proficient; PWD = Proficient With Distinction

Grade 4 NECAP Science Student Questionnaire

1. How difficult was this science test?

   a. It was harder than my regular science schoolwork.
   b. It was about the same as my regular science schoolwork.
   c. It was easier than my regular science schoolwork.

2. How hard did you try on this science test?

   a. I tried harder on this test than I do on my regular science schoolwork.
   b. I tried about the same as I do on my regular science schoolwork.
   c. I did not try as hard on this test as I do on my regular science schoolwork.

3. How well did you understand the directions your teacher gave you when you were taking sessions 1 and 2 of this science test?

   a. I understood the directions very well.
   b. I needed a little help understanding the directions.
   c. I needed a lot of help understanding the directions.

4. Did you have enough time to answer the questions on sessions 1 and 2?

   a. I had enough time to answer all of the questions and check my work.
   b. I had enough time to answer all of the questions, but I did not have time to check my work.
   c. I felt rushed, but I was able to finish answering the questions.
   d. I did not have enough time to finish answering the questions.

5. How well did you understand the directions your teacher gave you when you were taking the inquiry task?

   a. I understood the directions very well.
   b. I needed some help understanding the directions.
   c. I needed a lot of help understanding the directions.

6. Did you have enough time to complete the first part of the inquiry task with your partner(s)?

   a. I had plenty of time to finish.
   b. I had just the right amount of time to finish.
   c. I felt rushed, but I was able to finish.
   d. I did not have enough time to finish.

Please turn the page over for more questions.

7. Did you have enough time to answer the questions that you did on your own in the inquiry task?

   a. I had plenty of time to finish.
   b. I had just the right amount of time to finish.
   c. I felt rushed, but I was able to finish.
   d. I did not have enough time to finish.

8. How often do you do science experiments or inquiry tasks in your class like the one that you did on this science test?

   a. one or more times each week
   b. once a month
   c. a few times a year
   d. never or almost never

9. How often do you work with other students on science experiments or inquiry tasks?

   a. always
   b. sometimes
   c. never
   d. My teacher usually does the science experiment or inquiry task and we watch.
   e. We do not do science experiments or inquiry tasks in my class.

10. How often do you have science class this year?

    a. I have science every day.
    b. I have science 3 or 4 days a week.
    c. I have science 1 or 2 days a week.
    d. I have science some weeks but not others.
    e. I don't have science this year.

11. How often do you have science homework?

    a. every day
    b. a few times a week
    c. a few times a month
    d. I usually don't have homework in science.

12. Do you use a science journal or science notebook to write about your thoughts and experiences in science class?

    a. yes
    b. no

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Grade 8 NECAP Science Student Questionnaire

1. How difficult was this science test?
   a. It was harder than my regular science schoolwork.
   b. It was about the same as my regular science schoolwork.
   c. It was easier than my regular science schoolwork.

2. How hard did you try on this science test?
   a. I tried harder on this test than I do on my regular science schoolwork.
   b. I tried about the same as I do on my regular science schoolwork.
   c. I did not try as hard on this test as I do on my regular science schoolwork.

3. How well did you understand the directions your teacher gave you when you were taking sessions 1 and 2 of this science test?
   a. I understood the directions very well.
   b. I needed some help understanding the directions.
   c. I needed a lot of help understanding the directions.

4. Did you have enough time to answer the questions on sessions 1 and 2 of this science test?
   a. I had enough time to answer the questions and check my work.
   b. I had enough time to answer the questions, but I did not have time to check my work.
   c. I felt rushed, but I was able to finish answering the questions.
   d. I did not have enough time to finish answering the questions.

5. How much did you use a calculator on the test?
   a. I used it on most of the questions.
   b. I used it on some of the questions.
   c. I didn't use it on very many questions.
   d. I didn't use a calculator but wanted to.
   e. I didn't need a calculator.

6. How often did you use the reference sheet?
   a. I used it on all of the questions that suggested it and even for some questions that didn't.
   b. I used it on most of the questions that suggested it.
   c. I used it on some of the questions that suggested it.
   d. I didn't use it on very many questions.

7. How well did you understand the directions your teacher gave you when you were taking the inquiry task?
   a. I understood the directions very well.
   b. I needed some help understanding the directions.
   c. I needed a lot of help understanding the directions.

8. Did you have enough time to answer the questions on the inquiry task?
   a. I had plenty of time to finish.
   b. I had just the right amount of time to finish.
   c. I felt rushed, but I was able to finish.
   d. I did not have enough time to finish.

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9. How often do you do science experiments or inquiry tasks in your class?
   a. a few times a week
   b. a few times a month
   c. a few times a year
   d. never or almost never

10. How often do you work with other students on science experiments or inquiry tasks?
   a. always
   b. sometimes
   c. never
   d. My teacher usually does the science experiment or inquiry task and we watch.
   e. We do not do science experiments or inquiry tasks in my class.

11. What was your science grade on your most recent report card?
   a. A
   b. B
   c. C
   d. lower than C

12. How often do you have science class this year?
   a. I have science every day.
   b. I have science 3 or 4 days a week.
   c. I have science 1 or 2 days a week.
   d. I have science some weeks but not others.
   e. I don't have science this year.

13. How often do you have science homework?
   a. every day
   b. a few times a week
   c. a few times a month
   d. I usually don't have homework in science.

14. How would you best describe the content of your science class this year?
   a. Earth Space Science
   b. Life Science
   c. Physical Science
   d. Environmental Science
   e. General or Integrated Science

15. Do you use a science journal or science notebook to write about your thoughts and experiences in science class?
   a. yes
   b. no

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Grade 11 NECAP Science Student Questionnaire

1. How difficult was this science test?
   a. It was harder than my regular science schoolwork.
   b. It was about the same as my regular science schoolwork.
   c. It was easier than my regular science schoolwork.

2. How hard did you try on this science test?
   a. I tried harder on this test than I do on my regular science schoolwork.
   b. I tried about the same as I do on my regular science schoolwork.
   c. I did not try as hard on this test as I do on my regular science schoolwork.

3. How well did you understand the directions your teacher gave you when you were taking the science test?
   a. I understood the directions very well.
   b. I needed some help understanding the directions.
   c. I needed a lot of help understanding the directions.

4. Did you have enough time to answer the questions on sessions 1 and 2 of this science test?
   a. I had enough time to answer the questions and check my work.
   b. I had enough time to answer the questions, but I did not have time to check my work.
   c. I felt rushed, but I was able to finish answering the questions.
   d. I did not have enough time to finish answering the questions.

5. How often did you use the reference sheet?
   a. I used it on all of the questions that suggested it and even for some questions that didn't.
   b. I used it on most of the questions that suggested it.
   c. I used it on some of the questions that suggested it.
   d. I didn't use it on very many questions.

6. How much did you use a calculator on the test?
   a. I used it on most of the questions.
   b. I used it on some of the questions.
   c. I didn't use it on very many questions.
   d. I didn't use a calculator but wanted to.
   e. I didn't need a calculator.

7. Did you have enough time to answer the questions on the inquiry task?
   a. I had enough time to answer the questions and check my work.
   b. I had enough time to answer the questions, but I did not have time to check my work.
   c. I felt rushed, but I was able to finish answering the questions.
   d. I did not have enough time to finish answering the questions.

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8. How often do you do inquiry tasks like the one that you did on this science test?
   a. a few times a week
   b. a few times a month
   c. a few times a year
   d. never or almost never have inquiry tasks like this

9. How often do you work with other students on science experiments or inquiry tasks?
   a. always
   b. sometimes
   c. never
   d. My teacher usually does the science experiment or inquiry task and we watch.
   e. We do not do science experiments or inquiry tasks in my class.

10. Which of the following best describes the science class you took in grade 9?
   a. Physical Science
   b. Biological Science
   c. Earth Space Science
   d. General or Integrated Science
   e. I did not take a science class in grade 9.

11. Which of the following best describes the science class you took in grade 10?
   a. Biological Science
   b. Earth Space Science
   c. Chemistry
   d. Physics
   e. I did not take a science class in grade 10.

12. Which of the following best describes the science class you are taking in grade 11?
   a. Biological Science
   b. Earth Space Science
   c. Chemistry
   d. Physics
   e. I am not taking a science class this year.

13. Which of the following best describes the science class you plan to take in grade 12?
   a. Biological Science
   b. Earth Space Science
   c. Chemistry
   d. Physics
   e. I do not plan to take a science class in grade 12.

14. How often do you have science class this year?
    a. I have science class every day.
    b. I have science class on a rotating schedule (3–4 times per week).
    c. I have science class less than three times per week.
    d. I have science on a block schedule.
    e. I am not taking science this year.

15. How often do you have science homework this year?
    a. every day
    b. a few times a week
    c. a few times a month
    d. I usually don't have homework in science.
    e. I am not taking science this year.

16. What was your science grade on your most recent report card?
    a. A
    b. B
    c. C
    d. lower than C

17. In your most recent science class, how often do you create tables, diagrams, charts, or graphs to represent data?
    a. frequently
    b. sometimes
    c. hardly ever
    d. never

18. In your most recent science class, how often do you present the results of your investigations?
    a. frequently
    b. sometimes
    c. hardly ever
    d. never

19. Do you use a science journal or science notebook to write about your thoughts and experiences in science class?
    a. yes
    b. no

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