Connecticut

Next Generation Science Standards (NGSS)

Assessments

Interpretive Guide

2022 Test Administration

Connecticut State Board of Education

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Purpose of the *NGSS Assessment Interpretive Guide*

The Next Generation Science Standards (NGSS) Assessments are Connecticut's statewide mastery examinations for science in grades 5, 8, and 11. They provide an efficient and reliable estimate of a student's overall performance in science relative to grade-appropriate standards that enables valid interpretations of student achievement and progress. The NGSS Assessments include both the standard tests (often referred to as the NGSS assessments) taken by the majority of students, as well as the Connecticut Alternate Science (CTAS) Assessment, administered to a small population of eligible students with a significant cognitive disability.

This *NGSS Assessment Interpretive Guide* is designed to help educators, parents, students, and members of both the public and the media understand and properly explain the results of the NGSS Assessments. This guide provides general rules to consider when analyzing the data to ensure their proper interpretation and use to inform decisions around classroom instruction, curricula, and professional development. Information about the Connecticut Alternate Assessment in Science (CTAS) results and reports are included separately in the *CTAS Interpretive Guide.*

The following section describes general principles to consider when interpreting and using results from any assessments and was excerpted from L. Hammond, et al., (2015)[1]

General Principles of Test Interpretation and Use

Educational assessments can offer valuable information to students, parents, educators, and policymakers regarding what students know and are able to do. When used appropriately, they can provide an objective and efficient way to gauge some aspects of student learning and achievement and can inform the decision-making process about future instruction. All assessments have limitations; for example, a single assessment cannot measure all the aspects of an individual's knowledge, skills, and abilities, and no assessment can measure learning perfectly. The following general principles of test-score interpretation and use are generally accepted by measurement experts and are articulated in the newly revised *Standards for Educational and Psychological Testing.*

Tests are imprecise. Even a well-designed assessment may contain measurement error (AERA, APA, & NCME, 2014; NRC, 2007), which is the degree of imprecision or uncertainty in the assessment procedure. Measurement error occurs due to factors unrelated to student learning. For example, student performance on an assessment may be affected by mood, health, testing conditions, and motivation, as well as potential variability related to human scoring. Furthermore, the questions on a given test are only a sample of all the knowledge and skills that pertain to the subject being tested. If a different sample of questions had been chosen, or the questions had been posed in a different form, the student could have scored differently. Therefore, a test score is not an exact measure of a student's competencies since measurement error is inherent in all tests.

Tests provide only partial evidence about performance; thus, they should be combined with other sources of evidence for decision-making. In drawing any conclusion or making any decision, test scores should always be used in conjunction with multiple sources of evidence about performance (AERA, APA, & NCME, 2014; NRC, 2007). Consequential decisions about a student, educator, or a school should not be made only or primarily based on a single test score. Because a test score is not perfect and only tells part of the story, other relevant information (i.e., student work samples, course grades, course-taking

[1] L. Hammond, E. Haertel, J. Pelligrino. (2015). *Making Good Use of New Assessment: Interpreting and Using Scores from the Smarter Balanced Assessment Consortium.*

records, teacher observations, other measures) should be included to place test scores in context and allow for a broader view of performance.

The extent and nature of evidence needed may depend on characteristics of the learner (e.g., age, prior schooling, native language, learning differences), as well as the interpretation to be made (e.g., next steps for instruction, program placement, readiness for a specific experience, etc.). A range of appropriate measures about an individual's competencies will enhance the validity of the overall interpretation of the test score and the appropriateness of decisions that rely in part on test data.

The more consequential the test use, the stronger the evidence must be to support that use (AERA, APA, & NCME, 2014; NRC, 2007). High stakes demand that a stronger body of additional supporting evidence is provided in order to "minimize errors of measurement or errors in classifying individuals into categories such as 'pass,' 'fail,' 'admit,' or 'reject'" (AERA, APA, & NCME, 2014, p. 188). When multiple sources of evidence agree, we can have greater confidence that the inferences on which we base test scores are sound.

Validity depends on test design and use. An assessment is valid only when used with the intended population of test takers for the specific purposes and under the conditions (including prior preparation, motivation, and other administration conditions) for which it was designed and validated (AERA, APA, & NCME, 2014; NRC, 2007). Test validity refers to the extent to which inferences about individuals based on their scores on a particular test are defensible. When used as designed, test data can provide useful information. However, any test may function poorly or have unintended consequences if used outside the specific purposes and populations for which it was designed and validated.

Test score interpretations or judgments are validated for specific purposes, and validity does not automatically transfer to new uses. Each different purpose must be justified and validated in its own right. No assessment is valid for all possible purposes.

Opportunities to learn influence valid inferences, as well as fairness. In educational contexts, valid inferences about student ability derived from tests depend on students having been provided opportunities to learn the tested material prior to the assessment being administered. The degree to which students are afforded high-quality instruction, and are supported to perform to their full potential, affects the degree to which test scores can appropriately support consequential decisions about their knowledge, skills, and abilities (NRC, 2007).

In addition to the principles of interpretation and use, the Connecticut State Department of Education (CSDE) also created a document that outlines the types and purposes of assessment as it relates to the summative assessment system. The Types and Purposes of Student Assessment was created to help educators, parents/guardians, and the public understand the different assessments available in education today.

Accessing the Standard NGSS Assessment Results Online

NGSS Assessment non-confidential aggregate results are publicly reported through EdSight, an interactive website that integrates important school and district information collected by the Connecticut State Department of Education (CSDE) that serves as a single source for all data-driven analyses and reporting. Information can be sorted, filtered, and compared across schools and districts, and across various subgroups of students (e.g., gender, race/ethnicity).

Confidential NGSS Assessment data is available to authorized school and district personnel through Cambium Assessment's Centralized Reporting System (CRS) that can be accessed through the CSDE Comprehensive Assessment Program Portal (https://ct.portal.cambiumast.com/). The CRS is a web-based system that provides school district users access to individual student performance results. Users can also compare score data between individual students and the school or district. The CRS also provides information in the aggregate about performance on the NGSS assessment claims (by science discipline and by science and engineering practice) as well as target Disciplinary Core Ideas (DCIs). Additionally, standard NGSS data can be disaggregated by gender, special education status, race/ethnicity, and English learner (EL) status. The CRS Video Series consists of 12 video tutorials that help guide the user through the system.

Additional information about the NGSS Assessments are available through the Student Assessment link on the CSDE web site (https://portal.ct.gov/SDE/Services/K-12-Education/Accountability-Assessment-Data/Student-Assessment) and on the CSDE Comprehensive Assessment Program Portal.

General questions about the NGSS Assessments should be directed to the Student Assessment Bureau, Performance Office, at 860-713-6860 or ctstudentassessment@ct.gov. Specific questions about individual student results should be directed to local school personnel.

Important Considerations for Reviewing and Interpreting Student Results

When reviewing and interpreting ***individual*** student results, consider factors such as the following:

- How was the student's attendance and engagement in learning during the 2021-22 school year?
- Did the student experience any challenges this year (e.g., financial instability, loss of a loved one, food insecurity, or health issues)?
- Did the student suffer from anxiety, depression, or other mental health issues that were caused or worsened by recent events?

When reviewing and interpreting ***group results***, consider the following:

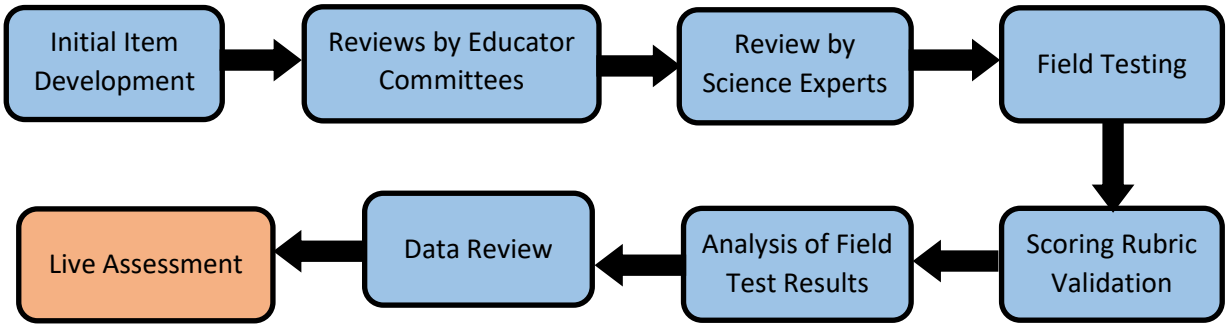
- What challenges were faced by the school or district during the 2021-22 school year?
- When comparing to the spring 2021 test results, what issues occurred during the pandemic that may have effected student performance?
- What learning losses during may have occurred over the last couple of years and how are these being met?

Development Process for the Standard NGSS Assessments

Connecticut mandates that all public-school students enrolled in grades 5, 8, and 11 participate in statewide testing approved by the State Board of Education that measures essential and grade-appropriate knowledge and skills in science.

> "Connecticut General Statute (Section 10-14n) (3) provision that for the school year commencing July 1, 2018, and each school year thereafter, each student enrolled in grades five, eight and eleven in any public school shall annually take a state-wide mastery examination during the regular school day."

The Next Generation Science Standards were adopted by the Connecticut State Board of Education in November 2015. Committees of Connecticut educators assisted in the design of the NGSS Assessments and have reviewed all test items for content alignment, accuracy, grade-appropriateness, wording, scoring, as well as for issues related to fairness and accessibility. University-level science experts have provided an additional review of Connecticut-owned items for content accuracy.



Following item review, all NGSS assessment items are field tested with a representative sample of students. The scoring of student responses is thoroughly validated, and results from the field test are analyzed and reviewed carefully by educators. All items must pass through this rigorous process before inclusion on a live test.

STANDARD NGSS ASSESSMENT

Overview of the NGSS Assessments

Each NGSS assessment item begins with a real-world phenomenon that engages students in an authentic science experience or engineering design challenge. Information in the form of pictures, diagrams, data, charts, graphs, maps, etc., related to the phenomena are presented. Students must use this information along with their own science knowledge and skills to respond to questions that include a variety of item interaction types including:

- Multiple-choice
- Edit-task choice
- Multi-select
- Table match
- Graphing
- Equation editor
- Experiment simulation
- Design simulation

Each item is aligned to a single NGSS Performance Expectation. Some items include only one or two interactions and are called stand-alone items. Others are more complex, having several interactions, and are called item clusters. Each item interaction assesses at least two dimensions (i.e., science and engineering practice, disciplinary core idea, crosscutting concept) from the aligned NGSS Performance Expectation.

On a live test, there are four operational stand-alone items and two operational item clusters in each of the three major science discipline Claims (see Table 1). Within a discipline, items are spread across the various Targets (Disciplinary Core Ideas or DCIs, see Table 2). Students are assigned at least one item in each of the target areas with no more than one item for each Performance Expectation. For the spring 2019, 2021 and 2022 administrations, a linear-on-the-fly (LOFT) test design was used. Contrary to a fixed-form design, every student potentially sees a different set of items. This design allows for broader coverage of the science standards, as well as more detailed reporting of results for schools and districts.

Items are selected from the item bank using an algorithm so that the test blueprint is met whenever possible. In addition to the 18 operational items on the live test, every student is assigned either one cluster or a few stand-alone items that are being field tested. Note: Students taking special test forms (i.e., Braille, printed version) are administered a fixed-form test with the same number and distribution of items as the standard online test.

Table 1: Claims: Number of Operational Items by Science Discipline Assessed on the standard NGSS Assessments

Using Science and Engineering Practices and Crosscutting Concepts in:	Stand-Alone Items	Item Clusters
Life Science	4	2
Physical Science	4	2
Earth and Space Science	4	2
Totals	**12**	**6**

Table 2: Targets (Disciplinary Core Ideas) Assessed on the standard NGSS Assessments

Science Discipline	Targets (Disciplinary Core Ideas)
Life Science	• LS1: From Molecules to Organisms: Structures and Processes • LS2: Ecosystems: Interactions, Energy, and Dynamics • LS3: Heredity: Inheritance and Variation of Traits • LS4: Biological Evolution: Unity and Diversity
Physical Science	• PS1: Matter and Its Interactions • PS2: Motion and Stability: Forces and Interactions • PS3: Energy • PS4: Waves and the Applications in Technologies for Information Transfer
Earth and Space Science	• ESS1: Earth's Place in the Universe • ESS2: Earth's Systems • ESS3: Earth and Human Activity

The standard NGSS Assessments are administered to students through an online test delivery system. Students have access to a variety of embedded tools including zoom, highlighter, notepad, line reader, grade-specific calculator, and periodic table in grades 8 and 11. A variety of supports and accommodations are available to qualifying students, including text-to-speech, Spanish translation, and Braille test forms. Detailed information about these supports and accommodations is described in the *Assessment Guidelines*.

NGSS Practice Tests are available at each of the tested grades for students to become familiar with the test delivery system and the various item interaction types that they will see on the live tests. In addition, optional NGSS Interim Assessments may be administered to students.

Reporting Claims and Targets

Results from the standard NGSS Assessments are reported at the student, school, district, and state levels for science overall, as well as for the three disciplines of science.

Table 3: NGSS Assessment Reporting Claims: Overall and Science Disciplines

Overall Claim for Science	The student is able to use the science and engineering practices to demonstrate understanding of the disciplinary core ideas and crosscutting concepts in science.
Claim 1: Practices and Concepts in Life Sciences*	The student is able to use the science and engineering practices to demonstrate understanding of the disciplinary core ideas and cross-cutting concepts in Life Science.
Claim 2: Practices and Concepts in Physical Sciences*	The student is able to use the science and engineering practices to demonstrate understanding of the disciplinary core ideas and crosscutting concepts in Physical Science.
Claim 3: Practices and Concepts in Earth and Space Sciences*	The student is able to use the science and engineering practices to demonstrate understanding of the disciplinary core ideas and crosscutting concepts in Earth and Space Science.

*Each claim includes students using the science and engineering practices to demonstrate understanding of the disciplinary core ideas and cross-cutting concepts in a content area.

In addition to the claims, targets based on the disciplinary core ideas are used to report results to schools and districts in the CRS. The list of these reporting targets is shown in Table 2.

Starting with the spring 2022 test administration, a new set of reporting claims that focus on the science and engineering practices are available at aggregate levels (i.e., school and districts). Note that these claims results are based on the same items as the science discipline claims, but instead focus on a different dimension of the science standards. These new claims may assist districts and schools in monitoring their instructional programs and in identifying strengths and weaknesses in student performance.

Table 4: NGSS Assessment Reporting Claims: Science and Engineering Practices

Overall Claim for Science	The student is able to use the science and engineering practices to demonstrate understanding of the disciplinary core ideas and crosscutting concepts in science.
Claim 1: Gathering Data and Investigating Scientific Questions (GI)*	Includes performance expectations aligned to: • Asking questions and defining problems. • Planning and carrying out investigations • Obtaining, evaluating and communicating information
Claim 2: Developing and Using Models to Describe the Natural World (DM)*	Includes performance expectations aligned to: • Developing and using models
Claim 3: Using Mathematical Thinking to Analyze and Interpret Patterns in Data (UM)*	Includes performance expectations aligned to: • Analyzing and interpreting data • Using mathematics and computational thinking
Claim 4: Use Scientific Reasoning to Construct Explanations and Arguments and to Design Solutions (CE)*	Includes performance expectations aligned to: • Constructing explanations and designing solutions • Engaging in arguments from evidence

*Each claim includes students using the science and engineering practices to demonstrate understanding of the disciplinary core ideas and cross-cutting concepts in a content area.

The Scores

Each student who takes the standard NGSS Assessment receives a total scale score on the scale score range (see Table 5) that corresponds to one of four performance levels (see Table 6). Scale scores are the basic unit of reporting. A scale score is derived from how a student performed on the items of a test, statistically adjusted for the items assigned to the student. Scale scores are expressed on a standardized scale that permits direct and fair comparisons of scores from different sets of items assigned to students that make up a test, either within the same administration year or across years. The scale score ranges for each of the grades is shown below. It is important to note that this scale is not a vertical scale, like the Smarter Balanced Assessment, so cross-grade comparisons are not meaningful. Each overall scale score is indicated by a single number. An error band is described on the Individual Student Report (ISR) for each scale score. The error band indicates the range of scores that the student would be likely to achieve if he or she were to take the test multiple times.

Table 5: Scale Score Ranges for the NGSS Assessments

Grade	Scale Score Range
5	400–599
8	700–899
11	1000–1199

Achievement Levels

Achievement-Level Descriptors (ALDs) define the knowledge and skills that students demonstrate at four achievement levels. Defining these achievement levels is a reporting feature that has become familiar to many educators. However, characterizing a student's achievement solely in terms of falling in one of four categories is an oversimplification. Achievement levels should serve only as a starting point for discussion about the performance of students and of groups of students. That is, the achievement levels should never be interpreted as infallible predictors of a student's future learning. They must continuously be validated and should only be used in the context of the multiple sources of information that we have about students and schools. The ALDs do not equate directly to expectations for "on-grade" performance; rather, they represent differing levels of performance for students within a grade level.

Although ALDs are intended to aid interpretation of achievement levels, they will be less precise than scale scores for describing student gains over time or changes in achievement gaps among groups, since they do not reveal changes of student scores within the bands defined by the achievement levels. Furthermore, there is not a critical shift in student knowledge or understanding that occurs at a single cut-score point. Thus, achievement levels should be understood as representing approximations of levels at which students demonstrate mastery of a set of concepts and skills, and the scale scores just above and below an achievement level as within a general band of performance.

Table 6: Achievement-Level Descriptors for the NGSS Assessments

Achievement Level	Achievement-Level Descriptors for Science
Level 4	**Exceeds the Achievement Standard.** The student has exceeded the achievement standard for science expected for this grade. Students performing at this standard are demonstrating advanced progress toward mastery of science knowledge and skills. Students performing at this standard are on track for likely success in the next grade.

Achievement Level	Achievement-Level Descriptors for Science
Level 3	**Meets the Achievement Standard.** The student has met the achievement standard for science expected for this grade. Students performing at this standard are demonstrating progress toward mastery of science knowledge and skills. Students performing at this standard are on track for likely success in the next grade.
Level 2	**Approaching the Achievement Standard.** The student has nearly met the achievement standard for science expected for this grade. Students performing at this standard require further development toward mastery of science knowledge and skills. Students performing at this standard will likely need support to get on track for success in the next grade.
Level 1	**Does Not Meet the Achievement Standard.** The student has not yet met the achievement standard for science expected for this grade. Students performing at this standard require substantial improvement toward mastery of science knowledge and skills. Students performing at this standard will likely need substantial support to get on track for success in the next grade.

Each achievement level includes a range of scale scores. The achievement level ranges for the standard NGSS were established based on a standard-setting process that was entirely guided by Connecticut educators. The CSDE conducted this activity for the NGSS assessments in summer 2019. The standard-setting process utilized Connecticut student assessment data from the first operational administration of the test in the spring of 2019. The process was facilitated by the psychometrics teams from the CSDE and Cambium Assessment Inc., the CSDE's testing vendor.

Table 7: Standard NGSS Assessment Achievement Levels

Performance Level	Performance Level Scale Score Range		
	Grade 5	Grade 8	Grade 11
Level 4	535–599	842–899	1141–1199
Level 3	498–534	798–841	1099–1140
Level 2	468–497	772–797	1073–1098
Level 1	400–467	700–771	1000–1072

Claim-Level Results for the Standard NGSS

For each of the three disciplinary Claims, results are reported on the Individual Student Report. For each of the three disciplines, an indication of whether the student is Above, Approaching, or Below the standard is shown. There is also text describing various aspects of expected student performance. Results for the four science and engineering practices Claims are available only at school and district levels.

For schools and districts, results for the three disciplinary Claims are reported as scale scores (400–599 for grade 5; 700–899 for grade 8; and 1000–1199 for grade 11) and relative to the proficiency standard (Above, Approaching, or Below Standard). For schools and districts, the science and engineering practices Claims are only reported relative to the proficiency standard (Above, Approaching, or Below Standard).

Target-Level Results

Unlike an overall science score, the Disciplinary Core Ideas (DCI) target report does not present absolute performance; instead, it presents relative performance. The target report provides an indicator of relative strength or weakness in each DCI area. The DCI-level results are provided for a group of students, but not for an individual student.

To determine relative strength or weakness, the actual performance of the group of students on the items in a particular target is compared to their expected performance on those items. If actual performance is significantly better than expected performance, then the group receives a "+." If actual performance is significantly worse than expected performance, then the group receives a "-." If actual performance is statistically no different than expected performance, then the group receives an "=" for that target.

The following two statistical approaches are used to establish expected student performance.

Target Results: Relative to Overall Performance

The expected performance is determined based on the students' overall performance on the entire assessment. For example, if the students in the group are extremely high performing overall, those students will likely be expected to do well on items in each target. If, however, they do significantly worse than expected, then a minus sign must be displayed. This may not mean that the students are really low performing on that target; it may simply mean that their performance on that target was significantly lower than expected.

Table 8: Description of Target Disciplinary Core Idea (DCI) Level Performance Relative to Overall Performance

Icon	Target (DCI) Level	Description
+	Better than performance on the test as a whole	This target is a relative strength. The group of students performed better on items from this target than they did on the test as a whole.
=	Similar to performance on the test as a whole	This target is neither a relative strength nor a relative weakness. The group of students performed about as well on items from this target as they did on the test as a whole.
-	Worse than performance on the test as a whole	This target is a relative weakness. The group of students did not perform as well on items from this target as they did on the test as a whole.
*	Insufficient information	Not enough information is available to determine whether this target is a relative strength or weakness. This is due to having too few students in the group and/or insufficient assessment items for this target.

Target Results: Relative to (Minimum Overall) Proficiency

The expected performance is determined based on a hypothetical student with minimum overall proficiency – one who is performing at the cut score separating Levels 2 and 3 (i.e., the lowest score in Level 3). Continuing the above example, the extremely high-performing group may have done worse than expected on a target with somewhat challenging items but still better than the minimum overall proficiency would have done on those items. These students may earn a "check" to mean that their "Performance is above the Proficiency Standard."

Table 9: Description of Target Disciplinary Core Idea (DCI) Level Performance Relative to (Minimum Overall) Proficiency

Icon	Target Level	Description
✓	Performance is above the Proficiency Standard	The target performance is above the proficiency standard. The group of students performed above the proficiency standard on this target.
◓	Performance is near the Proficiency Standard	The target performance is near the proficiency standard. The group of students performed near the proficiency standard on this target.
X	Performance is below the Proficiency Standard	The target performance is below the proficiency standard. The group of students performed below the proficiency standard on this target.
*	Insufficient information	Not enough information is available to determine performance on this target. This is due to having too few students in the group and/or insufficient assessment items for this target.

When used together, the two methods can provide greater insight into a group of students' strengths and weaknesses. The following table illustrates how to interpret the results for a target, based on the results of the two approaches.

Table 10: Interpretation of Target Disciplinary Core Idea (DCI) Reports

		Relative to Overall Performance		
		-	=	+
Relative to (Minimum Overall) Proficiency	X	Worse than expected and below the proficiency standard	As expected, but below the proficiency standard	Better than expected but below the proficiency standard
	◓	Worse than expected but near the proficiency standard	As expected, and near the proficiency standard	Better than expected but near the proficiency standard
	✓	Worse than expected but above the proficiency standard	As expected, but above the proficiency standard	Better than expected and above the proficiency standard

Interpreting Results in the Early Years of Implementation

The NGSS is designed as a series of learning progressions that builds on student learning that has occurred in prior grade levels. In the early years of implementation, this is important to keep in mind, especially for students at higher grade levels that may have received instruction on NGSS for only a few years. Furthermore, summative assessment results should always be viewed as one indicator among multiple sources of evidence such as classroom-based assessments, course grades, and samples of student work, when making decisions about student performance.

With regard to interpreting the NGSS Assessments at aggregate levels (i.e., school, district, state), one must also use caution. The first year of assessment results (2019) establish a baseline of performance to which future assessment results will be compared. There was no test administration in spring 2020 due to the COVID health crisis. The spring 2021 and 2022 test administrations occurred as schools were still faced with many challenges due to the pandemic. Trends over time provide a better evaluation of group performance than any one year's results. This is true of performance not only for overall results in science, but also for the Claims and Targets. Any adjustments to curriculum and instruction should be made only after consistent results have been shown over time.

Standard NGSS Assessment Individual Student Reports

The Individual Student Report (ISR) provides a summary of the student's performance on the standard NGSS Assessment. Two paper copies of ISRs are shipped to local school districts. One copy is provided to parents or guardians and the other is retained by the district for the student's cumulative record. A sample ISR for grade 8 is provided on the pages that follow.

On Page 1 of the ISR, an overview of the assessment is provided followed by the student's total scale score along with a chart indicating the corresponding performance level. A brief description of that performance level is shown below the chart. A measurement error band is described, indicating the range of scores the student would likely receive if the test were taken several times. Information is also provided about the student's performance on three areas of knowledge and skills: Practices and Concepts in Life Sciences, Practices and Concepts in Physical Sciences, and Practices and Concepts in Earth/Space Sciences. These results are reported as Above Standard, Approaching Standard, or Below Standard.

On Page 2 of the ISR, scale scores and performance levels are shown for the student in comparison to the school and district averages on the assessment. Below these results are ideas for parents to support their child's success in Science, Technology, Engineering, and Mathematics (STEM). Resources for parents and guardians to find additional information about the science standards and assessments is also provided.

Sample Grade 8 Standard NGSS Individual Student Report: Page 1

CONNECTICUT STATE DEPARTMENT OF EDUCATION CSDE

Student Name: **Jonathan Doe**
Grade: **8**
Date of Birth: **05/20/2008**
SASID: **1234567892**

School: **Demo Middle School**
District: **Demo District**
Test Year: **2022**

Connecticut Next Generation Science Standards Assessment Results

The Connecticut Next Generation Science Standards (NGSS) Assessments are administered to students in Grades 5, 8, and 11. This report shows Jonathan's achievement on the NGSS assessment aligned to science standards from Grades 6 through 8. Your child completed this assessment in spring 2022.

The NGSS are a new set of K–12 science standards that the Connecticut State Board of Education adopted in 2015. The NGSS challenge students to use science and engineering practices to show they understand core ideas and concepts in science. The standards encourage the use of real-world situations to help students think and act like scientists as they explore and make sense of the world around them.

Connecticut's comprehensive plan for college and career readiness includes challenging academic standards and assessments to measure student progress. The results below should be used along with other information, such as classwork and other tests, when making educational decisions. Specific questions about individual student results should be directed to local school personnel.

Science Results — Jonathan's Total Scale Score=791

Overall scores from the NGSS assessment are reported in scale-score units with a range of 700–899. Within the scale-score range, four performance levels have been established for each content area. Scoring in the Level 3 or 4 range is a challenging yet reasonable expectation for Connecticut students.

A student's test score can vary if tests are taken several times. If Jonathan were tested again in science, the new scale score would probably fall between 776 and 806.

Jonathan scored at **Level 2** on the NGSS assessment.

Science		✓		
	Level 1 Does Not Meet (700–771)	**Level 2** Approaching (772–797)	**Level 3** Meets (798–841)	**Level 4** Exceeds (842–899)

Level 2: Approaching the Achievement Standard
Jonathan has nearly met the achievement standard for science expected for this grade. Students performing at this level require further development toward mastery of science knowledge and skills. Students performing at this level will likely need support to get on track for success in the next grade.

Areas of Knowledge and Skills

The results below show how Jonathan performed when using science and engineering practices to demonstrate understanding of the core ideas and concepts in life sciences, physical sciences, and Earth/space sciences. A description of what students are expected to know and be able to do is included.

Practices and Concepts in Life Sciences	Practices and Concepts in Physical Sciences	Practices and Concepts in Earth/Space Sciences
Approaching Standard	**Below Standard**	**Above Standard**
In life sciences, student performance includes: • Using evidence to argue that organisms are systems of cells and various factors affect their growth. • Using patterns to model the flow of energy and matter in organisms and through ecosystems. • Using models to describe how the structure and function of genes causes variations. • Using patterns in fossil data to compare organisms and infer evolutionary relationships. • Evaluating solutions that maintain biodiversity and stabilize ecosystems.	In physical sciences, student performance includes: • Developing models and analyzing data to describe atoms, molecules, and chemical changes. • Asking questions and investigating motion caused by contact and non-contact forces. • Using data and constructing arguments to describe kinetic and thermal energy changes in systems. • Developing and using models to describe how waves travel in patterns, transfer energy, and interact. • Designing devices to optimize collisions, forces, and energy transfers.	In Earth/space sciences, student performance includes: • Using evidence to model Earth and other objects as part of a universe with movements controlled by gravity. • Using rock strata evidence to explain Earth's geologic history. • Modeling the cycling of matter and energy to explain changes in Earth's surface features, weather, and climate. • Using evidence to describe how human activities are affected by Earth's resources. • Designing solutions to problems caused by using Earth's resources.

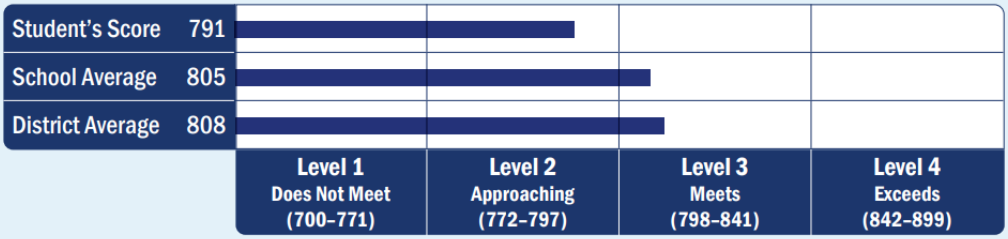
CONNECTICUT STATE DEPARTMENT OF EDUCATION CSDE

Student Name: **Jonathan Doe**
Grade: **8**
Date of Birth: **05/20/2008**
SASID: **1234567892**

School: **Demo Middle School**
District: **Demo District**
Test Year: **2022**

Comparison to Student's School and District

Results below show Jonathan's scores compared with the school and district averages on the NGSS assessment.



Supporting Your Child's Success in Science, Technology, Engineering, and Mathematics (STEM)

The NGSS enable teachers to offer interactive instruction that encourages all students to plan and conduct investigations, develop and use models, analyze data, and engage in critical thinking and problem solving as they learn about the world around them.

You can support this instruction by:

- Encouraging your child's interests and abilities in STEM learning.
- Being informed about the STEM educational programs and the specific instruction that your child is receiving in your school.
- Supporting your child's curiosity and learning opportunities through STEM-related books, television shows, museums, nature centers, and enrichment activities in your community.
- Encouraging your child to participate in extracurricular STEM activities such as clubs, field trips, after-school programs, and competitions.

Frequently Asked Questions

Where can I find more information about NGSS?

Parent Guides can be found at https://www.nextgenscience.org/parentguides.

Where can I find more information about NGSS test design and content?

For more information on the test design and content, go to https://ct.portal.cambiumast.com and click on NGSS Assessment.

Where can I find more information about school and district performance?

Further information about school and district academic performance can be found at http://edsight.ct.gov.

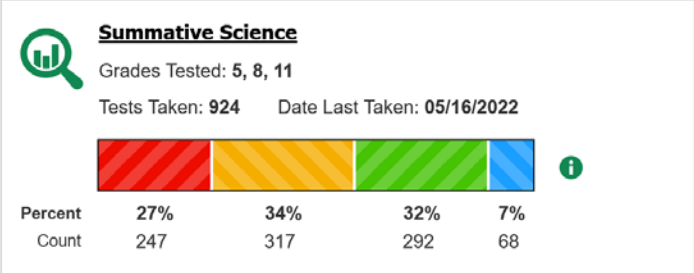
Reporting through the Centralized Reporting System (CRS)

The following reports are available through the CRS, located on the CSDE Comprehensive Assessment Program Portal (https://ct.portal.cambiumast.com/).

Standard NGSS Assessment Online Report: Overall Performance Distribution

The sample online report below shows the overall results in science for a sample district, with all tested grades combined and is the starting point for viewing results in CRS. Key features of the report include:

- Grades Tested
- Number of students tested (Tests Taken)
- Date Last Taken
- Percentage and number of students at each of the four performance levels



Standard NGSS Assessment Online Report: Performance Distribution by Grade

The sample online report below shows the overall results in science for a sample district for each tested grade. Key features of the report include:

- The number of students tested at each grade (Student Count)
- Average scale score with the standard error of measurement
- Percentage and number of students at each of the four performance levels

Assessment Name	Test Group	Test Grade	Test Reason	Student Count	Average Score	Performance Distribution
Summative Grade 5 Science	Summative	5	Spring 2022 (NGSS Summative)	157	495 ± 3	Percent 28% 22% 36% 14% Count 44 35 56 22
Summative Grade 8 Science	Summative	8	Spring 2022 (NGSS Summative)	437	794 ± 1	Percent 22% 36% 34% 7% Count 97 159 150 31
Summative Grade 11 Science	Summative	11	Spring 2022 (NGSS Summative)	330	1088 ± 1	Percent 32% 37% 26% 5% Count 106 123 86 15

Standard NGSS Assessment Online Report: Performance Distribution by School

The sample online report below shows the overall results in science for a district and two of the schools at a tested grade. Key features of the report include:

- The number of students tested at each grade (Student Count)
- Average scale score with the standard error of measurement
- Percentage and number of students at each of the four performance levels
- Percent of student achieving the Proficient level or above
- Results for the three disciplinary claim scores
- Results for the four science and engineering practices claim scores

Total				Practices and Concepts in Earth/Space Sciences	Practices and Concepts in Life Sciences	Practices and Concepts in Physical Sciences	Science and Engineering Practices (SEP)
Student Count	Average Scale Score	Performance Distribution	Percent Proficient				
1033	475 ± 1	Percent 44% 33% 18% 4% Count 452 344 191 46	23%				
45	469 ± 4	Percent 49% 38% 11% 2% Count 22 17 5 1	13%				
43	478 ± 5	Percent 35% 35% 28% 2% Count 15 15 12 1	30%				

The report below shows an example of results for a Disciplinary Area. Included are the average scale score and performance distribution (Percent Below Standard, Percent Approaching Standard and Percent Above Standard). For each DCI area, there is an indication of whether the group is Below, At/Near or Above the Proficient standard and whether the DCI is an area of relative strength, weakness or neither.

Practices and Concepts in Earth/Space Sciences							
		EarthAndSpaceScience					
Average Scale Score	Performance Distribution	DCI ESS1		DCI ESS2		DCI ESS3	
		Proficient?	Weak or Strong?	Proficient?	Weak or Strong?	Proficient?	Weak or Strong?
473 ± 1	Percent 47% 45% 8% Count 467 463 83	×	+	×	−	×	=

The report below shows an example of results for the four science and engineering practices Claims. For each, there is an indication of whether the group is Below, At/Near or Above the Proficient standard and whether the SEP is an area of relative strength, weakness or neither.

Science and Engineering Practices (SEP)							
SEP							
CE		DM		GI		UM	
Proficient?	Weak or Strong?	Proficient?	Weak or Strong?	Proficient?	Weak or Strong?	Proficient?	Weak or Strong?
×	=	×	=	×	−	×	−

Standard NGSS Assessment Online Report: Student Roster

The sample online report below shows the results for each student in a school or district. Key features of the report include:

- Name of the students along with their State Student Identification number (SSID) (not shown here)
- Each student's overall scale score for science (with the standard error of measurement)
- Each student's overall achievement level (1, 2, 3, or 4)
- Each student's achievement category for each of the three science disciplines (not shown here)

749 ± 12	Level 1
802 ± 10	Level 3
855 ± 11	Level 4
861 ± 11	Level 4
792 ± 10	Level 2

References

L. Hammond, E. Haertel, & J. Pellegrino. (2015). “Making Good Use of New Assessment: Interpreting and Using Scores from the Smarter Balanced Assessment Consortium.” (Working paper). Olympia, WA: Smarter Balanced Assessment Consortium.

The National Academies (2007). *Lessons learned about testing: Ten years of work at the National Research Council*. Washington, D.C.

Tan, X., & Michel, R. “Why do standardized testing programs report scaled scores?” *R & D Connections,* 16 (2011): 1-6.

Appendix A: NGSS Assessment Reporting Frequently Asked Questions

1. How are partially completed tests handled in participation and score reports?

Below are the rules for calculating participation and performance:

Participation Reports: Students are reported as having participated in the test if they logged in to the NGSS Assessment, even if they did not answer any items.

Score Reports: For a student's score to be reported, the student must have answered at least one item interaction.

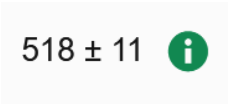
2. What is a scale score?

Scale scores are the basic units of reporting. These scores, which fall on a continuous scale, are used to illustrate students' level of achievement on the assessment. When aggregated, scale scores, unlike raw scores, can also describe school- or district-level changes in performance on the assessments and can measure gaps in achievement among different groups of students. Scaled scores are only provided on the NGSS assessments. Scale scores are not given on the CTAS.

3. What is the standard error of measurement (SEM)?

The standard error of measurement (SEM) allows users to estimate the score range that a student would likely fall within if the student took the same NGSS Assessment multiple times with exactly the same level of knowledge and preparation. For example, as seen in Figure 1, a scale score of 518 +/-11 indicates that if the student could take the same test multiple times, the score would likely fall between 507 and 529. Scale scores will vary based on the test and on the student.

Figure 1: Example of a Student Listing in the Centralized Reporting System that Displays Both Scale Scores and SEM



Reporting the SEM is important because a student's score is best interpreted when recognizing that the student's knowledge and skills fall with a score range. All test results, including scores on tests and quizzes by classroom teachers, are subject to measurement error.

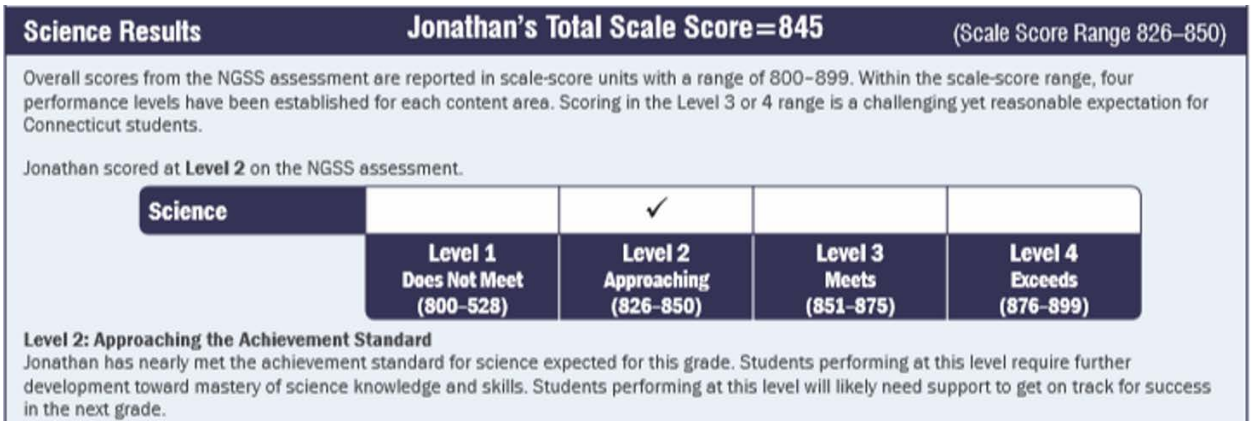
4. What do achievement levels represent and why are they useful?

Achievement levels are categories used to describe student performance based on scale scores. The achievement levels for the NGSS Assessments are Level 1 (Does Not Meet), Level 2 (Approaching), Level 3 (Meets), and Level 4 (Exceeds). A high score will place a student in a high achievement level. Generally, a higher score on the test reflects a greater accumulation of knowledge, skills, and processes when compared to students earning scores in lower achievement levels.

5. What are Achievement-Level Descriptors?

Achievement-Level Descriptors (ALDs) describe a student's overall content readiness in science for a specific grade level. The ALDs communicate the meaning of test scores by specifying, in content terms, the knowledge, skills, and processes that students generally display at four levels of achievement. For example, Figure 2 shows a student scale score of 845 on the grade 8 test. This places the student in Achievement Level 2 (out of 4). ALDs are cumulative, where the knowledge, skills, and processes of lower-level ALDs are assumed by the higher-level ALDs. For instance, the Level 4 student is assumed to possess the knowledge, skills, and processes described in Levels 1, 2, and 3.

Figure 2: Example of an Individual Student Report Showing an Achievement Level



Science Results **Jonathan's Total Scale Score=845** (Scale Score Range 826–850)

Overall scores from the NGSS assessment are reported in scale-score units with a range of 800–899. Within the scale-score range, four performance levels have been established for each content area. Scoring in the Level 3 or 4 range is a challenging yet reasonable expectation for Connecticut students.

Jonathan scored at **Level 2** on the NGSS assessment.

Science		✓		
	Level 1 Does Not Meet (800–528)	**Level 2** Approaching (826–850)	**Level 3** Meets (851–875)	**Level 4** Exceeds (876–899)

Level 2: Approaching the Achievement Standard
Jonathan has nearly met the achievement standard for science expected for this grade. Students performing at this level require further development toward mastery of science knowledge and skills. Students performing at this level will likely need support to get on track for success in the next grade.

6. Who determines where one achievement level ends and the next begins?

The scores that separate achievement levels from one another are called threshold scores. Threshold scores and achievement levels were developed by a committee of Connecticut educators through a process called standard setting.

7. What are the NGSS Assessment claim performance categories and how are they derived?

Assessment claims are broad, evidence-based statements about what students know and can do as demonstrated by their performance on the assessments. For the NGSS assessments, the claims state that, "The student is able to use the science and engineering practices to demonstrate understanding of the Target (DCI) and crosscutting concepts in Life Science, Physical, or Earth/Space Sciences." In addition to receiving scale scores and achievement levels for the NGSS Assessments, students are also placed into performance categories (i.e., Below Standard, Approaching Standard, Above Standard) relative to the proficiency standard on the overall test by assessment claim. A student's performance category for an assessment claim is derived from the student's performance on the items linked to that claim.

8. What are the NGSS Assessment target Disciplinary Core Idea?

Targets Disciplinary Core Idea (DCI) are more narrowly defined areas of learning defined by the standards. For the NGSS Assessment, targets are based on the major disciplinary core ideas of science (e.g., Matter and Its Interactions, Ecosystems, and Earth's Systems). Results for these targets (DCI) are reported only at the aggregate levels, rather than for the individual student.