District of Columbia
Office of the State Superintendent of Education

DC CAPE

DC COMPREHENSIVE ASSESSMENTS OF PROGRESS IN EDUCATION

# DC Science Performance Level Descriptors - Grade 8

## Grade 8 Level 2: Approaching Expectations

An eighth-grade student performing at Level 2 demonstrates a basic understanding and draws connections between and among science dimensions when applying grades 6-8 Disciplinary Core Ideas, using middle school Science and Engineering Practices, and using middle school Crosscutting Concepts to make sense of phenomena or address solutions in the natural or designed world. A complete list of Science and Engineering Practices and Crosscutting Concepts is provided in Table 1.

A student performing at Level 2 can do things like:

### Physical Science

● propose the design of an object, a tool, a process, or a system aimed at affecting the average kinetic energy of the particles in a system in a desired way, and the object, tool, process, or system will be evaluated using criteria and constraints including temperature (MS-PS3-3)
● describe the regular and repeating patterns of a wave by analyzing data sets and/or identifying and constructing a graph (MS-PS4-1)
● read and describe appropriate sources related to the design of a structure that encodes and transmits digitized signals that are comprised of a pattern of 1s and 0s (MS-PS4-3)
● use processes for evaluating design solutions with respect to how well they meet the criteria and constraints of a problem and then make an oral or written argument that supports or refutes the advertised performance of a device, process, or system based on empirical evidence concerning whether the technology meets relevant criteria and constraints (MS-ETS1-2)

### Life Science

● make a claim, citing evidence, that tissues and organs are composed of cells and that these cells are specialized for particular body functions (MS-LS1-3)
● read and understand appropriate sources, assesses the credibility, accuracy, and bias in each, and then communicates that animals change their behavior in response to a sensory input (MS-LS1-8)
● make an oral or written argument that supports or refutes the advertised performance of a device, process, or system designed to affect biodiversity; a key point of the argument involves the student's understanding of the fact that changes to one part of an ecosystem may cause changes in another part of the ecosystem (MS-LS2-5)
● construct and use graphical displays of data and large data sets to compare findings and uses this information to identify criteria and constraints (characteristics) that should be used in the evaluation of a design solution (MS-ETS1-3)

### Earth and Space Science

● make a claim, citing evidence, related to the effect of human consumption of resources on Earth (MS-ESS3-4)

● identify that the movement of water affects weather, identify that weather patterns cannot be predicted with exact certainty, and is able to make measurements related to weather (MS-ESS2-5)

**Grade 8 Level 3: Meets Expectations**

An eighth-grade student performing at Level 2 demonstrates substantial understanding and relevant reasoning when applying grades 6-8 Disciplinary Core Ideas, using middle school Science and Engineering Practices, and using middle school Crosscutting Concepts to make sense of phenomena or address solutions in the natural or designed world. A complete list of Science and Engineering Practices and Crosscutting Concepts is provided in Table 1.

In addition to the scientific knowledge and practices demonstrated at Level 2, a student performing at Level 3 can do things like:

**Physical Science**

● use the relationship between temperature and total energy of a system to test a designed object, tool, process, or system intended to affect the flow of energy in a system in a particular way; the test the student uses requires that the student track the energy flow in the system and that the design meets precisely defined design criteria and constraints (MS-PS3-3)
● apply mathematical concepts and/or processes (e.g., interpreting graphs, ratio, rate, percent, basic operations, simple algebra) to determine wavelength, frequency, and amplitude of a wave and/or identify cause and effect relationships in relation to the explanation of a phenomenon (MS-PS4-1)
● synthesize information from at least two credible sources in relation to the explanation of a phenomenon or design problem and use that information in relation to a phenomenon or design problem that relies on the fact that digitized signals, sent as wave pulses, are a more reliable way to encode and transmit information (MS-PS4-3)
● develop systematic processes for evaluating design solutions with respect to how well they meet the criteria and constraints of a problem and then use these processes to evaluate competing design solutions (MS-ETS1-2)

**Life Science**

● use arguments supported by evidence to support or refute an explanation or a model for a phenomenon related to the fact that body systems are made of organs that work together and that the body is a system of interacting subsystems (MS-LS1-3)
● synthesize information from at least two credible sources to communicate that the response of sensory receptors to various inputs results in the transmission of signals that travel along nerve cells to the brain, where signals are processed; understand that this results in immediate behaviors or memories; and describe how the information is supported or not supported by evidence (MS-LS1-8)
● evaluate competing design solutions regarding a problem related to biodiversity based on jointly developed and agreed-upon design criteria, using systematic processes. The student uses an understanding of the fact that small changes in one part of the ecosystem may cause large changes in another part of the ecosystem, together with an understanding of changes in biodiversity and its influence on human resources (MS-LS2-5)

● use systematic processes that measure important characteristics to provide evidence for phenomena, to determine similarities and differences in findings, and/or to evaluate design solutions in order to determine similarities and differences between various design solutions; use these results to identify the characteristics of the design that performed the best in each test and to make recommendations about which characteristics to incorporate in a new design (MS-ETS1-3)

**Earth and Space Science**

● construct arguments based on empirical evidence and scientific reasoning to support or refute an explanation that, unless the activities and technologies involved are engineered otherwise, an increase in human populations and per capita consumption of natural resources may result in negative environmental impacts (MS-ESS3-4)
● use the relationship between cause and effect to show that the complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. The student uses this information to determine which data are needed as the basis for evidence to answer scientific questions or test design solutions under a range of conditions. (MS-ESS2-5)

**Grade 8 Level 4: Exceeds Expectations**

An eighth-grade student performing at Level 2 demonstrates thorough understanding and sophisticated reasoning when applying grades 6-8 Disciplinary Core Ideas, using middle school Science and Engineering Practices, and using middle school Crosscutting Concepts to make sense of phenomena or address solutions in the natural or designed world. A complete list of Science and Engineering Practices and Crosscutting Concepts is provided in Table 1.

In addition to the scientific knowledge and practices demonstrated at Level 3, a student performing at Level 4 can do things like:

**Physical Science**

● use the relationship between temperature and the total energy of a system to design an object, tool, process, or system aimed at affecting the flow of energy in a particular way; the proposed design should involve a prediction of the flow of energy in the system over time and/or optimize the performance of a design by prioritizing criteria, making tradeoffs, testing, revising, and re-testing (MS-PS3-3)
● interpret graphs and charts to determine the energy in a single wave and/or place waves in order of relative energy in order to test or support the explanation of a phenomenon (MS-PS4-1)
● synthesize qualitative and/or quantitative information from text and graphics to clarify claims related to why digitized signals are more reliable than analog signals and then uses the synthesized information to encode and decode information contained in simple digitized signals and/or to evaluate/modify the design of structures to improve their functions (MS-PS4-3)
● evaluate and/or revise systematic processes for evaluating design solutions with respect to how well they meet the criteria and constraints of a problem and then revise a design solution so that it is more favorably evaluated using those processes (MS-ETS1-2)

**Life Science**

● evaluate and/or revise an argument and/or compare and critique two arguments using evidence to support or refute the explanation or the model of a phenomenon. In doing so, the student predicts the ways in which problems or difficulties with one body system may affect other body systems. (MS-LS1-3)
● synthesize qualitative and/or quantitative information from text and graphics to clarify claims using three or more credible sources and use the information to predict the way in which the response to a stimulus (the cause) changes an animal's behavior (the effect) (MS-LS1-8)
● revise a design solution regarding a problem related to biodiversity. In the process of revision of the design solution, the student can predict the ways in which changes to an ecosystem will affect biodiversity and human resources, describing how small changes in one part of the ecosystem can result in large changes in another part. (MS-LS2-5)
● develop systematic processes using statistics and probability to analyze and compare data in the

evaluation of a design solution. The student evaluates the design solutions with respect to how well they meet the criteria and constraints of a problem and incorporates characteristics that performed the best into the redesign process (MS-ETS1-3)

**Earth and Space Science**

● evaluate and/or revise oral and/or written arguments based on empirical evidence and scientific reasoning to support or refute an explanation to predict the effect of changes of human populations and per capita consumption of resources in an area, given changes to activities and technologies (MS-ESS3-4)
● apply scientific reasoning, ideas, or principles to show why the data or evidence are adequate for an explanation or conclusion and/or to predict weather patterns, and/or construct, revise, or use an explanation for real-world phenomena, examples, or events. (MS-ESS2-5)

**Table 1. NGSS Science and Engineering Practices and Crosscutting Concepts**

| Science and Engineering Practices | Crosscutting Concepts |
|---|---|
| Analyzing and Interpreting Data | Cause and Effect |
| Asking Questions and Defining Problems | Energy and Matter |
| Constructing Explanations and Designing Solutions | Patterns |
| Developing and Using Models | Scale, Proportion, and Quantity |
| Engaging in Argument from Evidence | Stability and Change |
| Planning and Carrying Out Investigations | Structure and Function |
| Obtaining, Evaluating, and Communicating Information | Systems and System Models |
| Using Mathematics and Computational Thinking | |