Grade 8
Performance Level Descriptions

Claim/Target	Level 2	Level 3	Level 4
Claim 1: Physical Science	Students in this range typically comprehend and **describe** scientific and engineering ideas, connecting concepts, and procedures or practices (targets A–E) and apply scientific and engineering knowledge **consistently** to problems of **low complexity** and **inconsistently** to problems of **moderate complexity** in the physical sciences (targets A–F).	Students in this range typically comprehend and **explain** scientific and engineering ideas, connecting concepts, and procedures or practices (targets A–E) and apply scientific and engineering knowledge **consistently** to problems of **moderate complexity** and **inconsistently** to problems of **high complexity** in the physical sciences (targets A–F).	Students in this range typically comprehend and **analyze** scientific and engineering ideas, connecting concepts, and procedures or practices (targets A–E) and apply scientific and engineering knowledge **consistently** to problems of **high complexity** in the physical sciences (targets A–F).
Target A: Structure and Properties of Matter	Students can identify the atoms in a molecular structure, organize information about chemical properties of substances, and observe the effects of changes in temperatures on substances.	Students can relate chemical properties to atomic or molecular structures, relate the properties of designed materials to their chemical properties, and predict changes to substances based upon changes in temperature.	Students can use models to predict chemical properties, synthesize chemical property data to evaluate impacts of designed materials, and use models to explain the chemical or physical changes that occur when the material's thermal energy changes.
Target B: Chemical Reactions	Students can organize substances by chemical properties, track the atoms involved in chemical reactions, and recognize different factors that cause changes in temperature.	Students can identify patterns from observable properties in reactants and products, relate the number and type of atoms in a chemical reaction to mass, and relate changes in temperature to chemical reactions.	Students can synthesize evidence to argue for or against the occurrence of chemical changes, use an atomic model to explain why mass is conserved in a chemical reaction, and use a device design to explain how changes in chemical energy relate to changes in thermal energy.

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Target C: Forces and Interactions	Students can observe and record the masses and velocities of moving objects, recognize that gravity is an attractive force, and classify the properties of electric and magnetic fields.	Students can predict motion using unbalanced forces, diagram an object within a reference frame, compare the gravitational interaction between objects of various masses, and connect effects on objects to electric and magnetic fields.	Students can apply the concepts of force to solve or to investigate problems involving changes in object motion, support an argument that mass and distance determines gravitational strength, and evaluate data from investigations of the effects on objects by electric and magnetic fields
Target D: Energy	Students can categorize different types of energy, identify potential energy in different systems, and describes how the temperature of objects depend upon energy, mass and types of matter.	Students can collect and display data on moving objects, predict an effect from a change in potential energy in a system, and explain that changes in temperature depend upon energy transfers, mass, and types of matter.	Students can explain the relationship between kinetic energy of an object and the object's mass and speed, use a model to describe the interactions in systems based upon potential energy, and use investigations to relate the changes in temperature of an object to energy transfers, mass, and types of matter.
Target E: Waves and Electromagnetic Radiation	Students can identify differences among various waves, observe how waves interact with various materials, and recognize how information can be transmitted.	Students can identify patterns in wave properties, describe the types of wave interactions with objects or media, and compare properties of digital and analog signals.	Students can use equations to explain wave properties and behavior, use models to explain wave interactions with different media, and support an argument with evidence for the reliability of digital over analog signals.

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Target F: Engineering Design in Physical Science	Students can identify criteria or constraints for an engineering problem, match designs to their intended solutions, distinguish defining characteristics of design solutions, and collect data from an engineering test or model.	Students can relate criteria and constraints to an engineering design problem, relate how designs solve their respective problem, identify and organize data from engineering tests, and modify a method for testing an engineering design.	Students can synthesize limitations on a design to prioritize criteria and constraints, argue for or against whether an engineering design solution for a specific problem meets the problem's criteria and constraints, analyze test data on multiple solutions to create an optimum design, and design an iterative process to modify and to optimize a design.

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Claim 2: Life Science	Students typically comprehend and **describe** scientific and engineering ideas, connecting concepts, and procedures or practices (targets A–E) and apply scientific and engineering knowledge **consistently** to problems of **low complexity** and **inconsistently** to problems of **moderate complexity** in the life sciences (Targets A–F).	Students typically comprehend and **explain** scientific and engineering ideas, connecting concepts, and procedures or practices (targets A–E) and apply scientific and engineering knowledge **consistently** to problems of **moderate complexity** and **inconsistently** to problems of **high complexity** in the life sciences (targets A–F).	Students typically comprehend and **analyze** scientific and engineering ideas, connecting concepts, and procedures or practices (targets A–E) and apply scientific and engineering knowledge **consistently** to problems of **high complexity** in the life sciences (targets A–F).

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Target A: Structure, Function, and Information Processing	Students can use data to classify living and nonliving things, describe cells or parts of a cell, and recognize that groups of cells have specific functions in the body.	Students can identify patterns in data among living and non-living things, connects cells or parts of a cell to their functions, and relate the structures of groups of cells to their specific functions in body systems.	Students can use data from investigations as evidence that living things are made of cells, use models to explain how cells or parts of a cell work together, and critique explanations of how interacting groups of cells perform body functions.
Target B: Matter and Energy in Organisms and Ecosystems	Students can describe why plants need sunlight and the environment to live, describes how food molecules contain energy, and identify living and nonliving parts of ecosystems.	Students can explain how plants use matter and energy to make food molecules, explain the relationships between chemical reactions and energy in food molecules, and identify relationships between organisms within an ecosystem and nonliving components of that ecosystem.	Students can use evidence to explain how photosynthesis cycles matter and energy through organisms, use a model of chemical reactions involving food molecules to explain how energy is used in organisms, and use models to explain how organisms within an ecosystem depend upon the cycling of living and nonliving components.
Target C: Interdependent Relationships in Ecosystems	Students can identify different interactions of organisms in ecosystems and describe how humans affect organisms in ecosystems or depend upon processes within an ecosystem.	Students can identify patterns of organism interactions in different ecosystems and predict the effects of human interactions with different organisms or with natural processes within an ecosystem.	Students can make generalized hypotheses about interaction patterns among organisms in ecosystems and critique solutions to minimize the effects of human actions upon biodiversity or upon ecosystem services.

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Target D: Growth, Development, and Reproduction in Organisms	Students can identify various animal behaviors and plant structures related to reproduction; recognize genetic and environmental factors important to organisms; and recognize that genes are affected by reproduction and mutation.	Students can compare the differences in reproduction of animals or plants by using behaviors or structures, relate observable organism traits to environmental or genetic factors, and distinguish differences in organism traits to differences in genes and reproduction.	Students can use evidence to support the claim that animal behaviors or plant structures affect reproduction, use models and evidence to explain how genetic and environmental factors affect organisms, and use models to explain how mutation and reproduction affect genetics which then affect organism traits.
Target E: Natural Selection and Adaptations	Students can identify similarities and differences in anatomy among organisms, recognize that traits can affect survival and reproduction, and classify traits as beneficial or harmful to reproduction within different environments.	Students can classify modern and fossil organisms based on anatomical structures, summarize that organism traits affect survival and reproduction, and compare traits based on their changing prevalence in populations over time.	Students can analyze data to explain patterns of relatedness of organisms and of fossils based on collected anatomical data, explains why specific traits will lead to increases or decreases in survival or reproduction chances, and use mathematical relationships to explain changes in traits within populations over time.
Target F: Engineering Design in Life Science	Students can identify a constraint for an engineering problem, match designs to their intended solutions, distinguish defining characteristics of design solutions, and collect data from an engineering test or model.	Students can list different criteria and constraints for design problems, relate how designs solve their respective problem, identify and organize data from engineering tests, and modify a method for testing an engineering design.	Students can synthesize limitations on a design to prioritize criteria and constraints, argue for the best design for a specific problem using criteria and constraints, analyze test data to argue for an optimum design, and synthesize data collected from multiple trials to optimize a design.

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Claim 3: Earth and Space Science	Students typically comprehend and **describe** scientific ideas, connecting concepts, and procedures or practices (targets A–E) and apply scientific and engineering knowledge **consistently** to problems of **low complexity** and **inconsistently** to problems of **moderate complexity** in the earth and space sciences (targets A–F).	Students typically comprehend and **explain** scientific ideas, connecting concepts, and procedures or practices (targets A–E) and apply scientific and engineering knowledge **consistently** to problems of **moderate complexity** and **inconsistently** to problems of **high complexity** in the earth and space sciences (targets A–F).	Students typically comprehend and **analyze** scientific ideas, connecting concepts, and procedures or practices (target A–E) and apply scientific and engineering knowledge **consistently** to problems of **high complexity** in the earth and space sciences (targets A–F).
Target A: Space Systems	Students can observe and record patterns of the Sun and the Moon, recognize the effects of gravity, and identify scale properties of objects in the solar system.	Students can identify patterns to graph repeated positions of the Sun and the Moon, compare the effects of gravity among Solar System bodies, and organize objects in the solar system by scale properties.	Students can use a model to explain patterns involving the Sun and the Moon based upon their relative positions, model how gravity explains motion within the Solar System and within galaxies, and analyze data to explain the differences in the scale of Solar System objects and structures.
Target B: History of Earth	Students can identify the relative ages of features like rock formations and fossils in a stratigraphic column, identify geological processes, and describe tectonic plate movements.	Students can infer past events from rock formations and fossils in a stratigraphic column, distinguish geological features that occur over short or long periods or over small or large distances, and identify relationships between geological features and tectonic plate movements.	Students can use rock formations and fossil data to explain Earth's history; explain how geological processes on varying time and spatial scales create geological features; and use the distribution of fossils, rock types, or geographic or geological features to interpret tectonic plate movements.

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Target C: Earth's Systems	Students can recognize how the flow of energy in geoscience processes affects Earth's materials, identify components of the water cycle, and identify characteristics of natural resources.	Students can relate the flow of energy in geoscience processes to changes in Earth's materials, summarize the role of energy and of gravity in the water cycle, and relate Earth's processes to the formation of natural resources.	Students can model and explain the role of energy in the cycling of Earth's materials, model and explain the roles of energy and of gravity in the water cycle, and use evidence from Earth's processes to explain the distribution of natural resources.
Target D: Weather and Climate	Students can describe characteristics of weather and climate, describe atmospheric and oceanic circulation, and identify factors that affect temperatures around the world.	Students can relate changes in air masses to changes in weather conditions, relate changes in atmospheric and oceanic circulation to heat and to Earth's rotation, and interpret data related to changes in temperatures around the world.	Students can gather evidence of the interactions of air masses to explain changes in weather, model and model explanations of how heat and Earth's rotation produce differences in atmospheric and oceanic circulation patterns that lead to different climates, and evaluate the evidence of how various factors have changed temperatures around the world.
Target E: Human Impacts	Students can recognize characteristics of natural hazards, identify several human impacts on the environment, and describe how humans use natural resources.	Students can identify patterns in data about natural hazards, connects human technology and actions to effects on the environment, and relate patterns of population growth to how humans use natural resources or cause environmental changes.	Students can evaluate strategies to minimize dangers from natural hazards through forecasting and technology, scientifically critique designs to minimize negative human impacts on the environment, and use evidence to argue how population growth increases the use of natural resources and causes environmental changes.

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Target F: Engineering Design in Earth and Space Science	Students can identify a constraint for an engineering problem, match designs to their intended solutions, distinguish defining characteristics of design solutions, and collect data from an engineering test or model.	Students can list different criteria and constraints for design problems, relate how designs solve their respective problem, identify and organize data from engineering tests, and modify a method for testing an engineering design.	Students can synthesize limitations on a design to prioritize criteria and constraints, argue for the best design for a specific problem using criteria and constraints, analyze test data to argue for an optimum design, and synthesize data collected from multiple trials to optimize a design.

Note: All Engineering Targets share similar PLD features but should not be compared.