Proficiency Scales

Biology
High School
2020

SOUTHWESTERN UNION
EDUCATION

PROFICIENCY SCALES

Proficiency scales serve as a starting point for unit planning, creating assessments, delivering instruction, grading, and reporting progress, as well as making teaching visible to students and guiding their growth on the standards. Specifically, a proficiency scale is a continuum or learning progression that articulates distinct levels of knowledge and skills relative to specific standards. It shows teachers and students what proficiency looks like, what knowledge and skills students need to achieve proficiency, and how students might go beyond proficiency.

A proficiency scale is composed of a series of levels as follows:

Score 3.0—Heart of the proficiency scale; it defines the target content that teachers expect all students to know and be able to do. I CAN statements are provided for this level.

Score 2.0—Simpler content; it describes the foundational knowledge and skills that students will need to master before progressing to proficiency.

Score 4.0—Challenging content; it provides students the opportunity to go above and beyond expectations by applying their knowledge in new situations or demonstrating understanding beyond what the teacher teaches in class. A generic statement is provided for this level.

Scores 1.0 and 0.0—No specific content; 1.0 indicates that a student can demonstrate some knowledge or skill with help from the teacher, but not independently; 0.0 means that, even with help, a student cannot show any understanding. Generic statements are provided for these levels.

Half-point Scores—More precise measurement of knowledge and skills that is between two levels. Generic statements are provided for these levels.

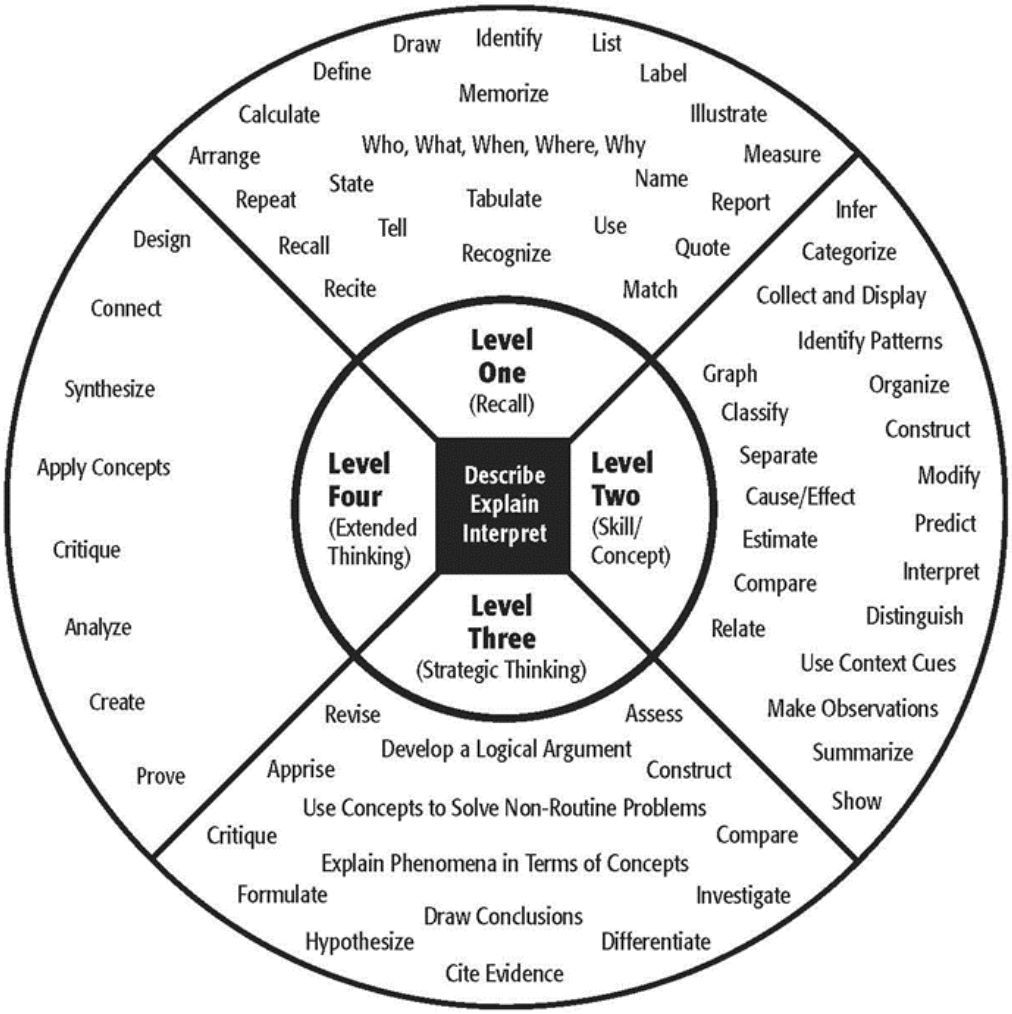
Proficiency scales become the centerpiece of communication and understanding in the classroom, as well as the common language for discussing learning between teacher and student.

The proficiency scales are organized according to the domains and strands in the NAD standards.

The cognitive rigor or complexity of the 3.0 learning targets has also been included, for it impacts the selection of instructional activities as well as assessment tasks. The Depth of Knowledge (DOK) model is generally used for this purpose, which is a taxonomy of four levels of cognitive demand. The levels are:

- **Level 1**—Recall
- **Level 2**—Skill/Concept
- **Level 3**—Strategic Thinking
- **Level 4**—Extended Thinking

Depth of Knowledge (DOK) Levels



Level One Activities	Level Two Activities	Level Three Activities	Level Four Activities
Recall elements and details of story structure, such as sequence of events, character, plot and setting.	Identify and summarize the major events in a narrative.	Support ideas with details and examples.	Conduct a project that requires specifying a problem, designing and conducting an experiment, analyzing its data, and reporting results/ solutions.
Conduct basic mathematical calculations.	Use context cues to identify the meaning of unfamiliar words.	Use voice appropriate to the purpose and audience.	Apply mathematical model to illuminate a problem or situation.
Label locations on a map.	Solve routine multiple-step problems.	Identify research questions and design investigations for a scientific problem.	Analyze and synthesize information from multiple sources.
Represent in words or diagrams a scientific concept or relationship.	Describe the cause/effect of a particular event.	Develop a scientific model for a complex situation.	Describe and illustrate how common themes are found across texts from different cultures.
Perform routine procedures like measuring length or using punctuation marks correctly.	Identify patterns in events or behavior.	Determine the author's purpose and describe how it affects the interpretation of a reading selection.	Design a mathematical model to inform and solve a practical or abstract situation.
Describe the features of a place or people.	Formulate a routine problem given data and conditions.	Apply a concept in other contexts.	
	Organize, represent and interpret data.		

Webb, Norman L. and others. "Web Alignment Tool" 24 July 2005. Wisconsin Center of Educational Research. University of Wisconsin-Madison. 2 Feb. 2006. <http://www.wcer.wisc.edu/WAT/index.aspx>.

Science and Engineering Practices

1. Asking and Defining Problems
2. Developing and Using Models
3. Using Mathematics and Computational Thinking
4. Planning and Carrying Out Investigations
5. Constructing Explanations and Designing Solutions
6. Obtaining, Evaluating, and Communicating Information
7. Analyzing and Interpreting Data
8. Engaging in Argument From Evidence

Southwestern Union Conference
Secondary Science Committee

Amy Abernathy — North Dallas Adventist Academy
Larry Camp — Sandia View Academy
Jon Dickerson — Chisholm Trail Academy
Robert Fetters — Ozark Adventist Academy
Pablo Gonzalez — Houston Adventist Academy
David Pena — South Texas Christian Academy

<table>
<tr><td colspan="3">Title: Matter and Energy in Organisms Subject: Biology</td></tr>
<tr><td colspan="3">Standard:</td></tr>
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<tr><td></td><td>Score 3.5</td><td>In addition to score 3.0 performance, partial success at score 4.0 content</td></tr>
<tr><td>Score 3.0</td><td colspan="2">The student will:

HS-LS1-5 Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy (for example, use diagrams, chemical equations, and conceptual models to show the inputs and outputs of matter and the transfer and transformation of energy in photosynthesis by plants and other photosynthesizing organisms).

HS-LS1-6 Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules (for example, use evidence from models and simulations to support an explanation for how elements in sugar molecules combine with other elements to form amino acids or other large carbon-based molecules).

HS-LS1-7 Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy (for example, use a model to demonstrate a conceptual understanding of the inputs and outputs of the process of cellular respiration).</td></tr>
<tr><td></td><td>Score 2.5</td><td>No major errors or omissions regarding score 2.0 content and partial success at score 3.0 content</td></tr>
<tr><td>Score 2.0</td><td colspan="2">HS-LS1-5 The student will:

• Recognize or recall specific vocabulary (for example, chemical energy, convert, energy, input, light energy, matter, organism, output, photosynthesis, photosynthesizing organism, plant, stored energy, transfer, transform, transformation).
• Describe how plants use photosynthesis.
• Describe the inputs and outputs of photosynthesis.
HS-LS1-6 The student will:</td></tr>
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<table>
<tr><td></td><td colspan="2">Recognize or recall specific vocabulary (for example, amino acid, amino acid sequence, biological molecule, carbon, carbon-based molecule, combine, element, hydrogen, molecule, oxygen, sugar).
Describe how the body uses amino acids and other large, carbon-based molecules.
HS-LS1-7 The student will:
Recognize or recall specific vocabulary (for example, bond, cellular respiration, chemical process, compound, energy, food, form, input, molecule, net transfer, output, oxygen).
Describe how organisms use cellular respiration.
Describe the inputs and outputs of cellular respiration.</td></tr>
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<tr><td>Score 3.0</td><td colspan="2">The student will:

HS-LS2-1 Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales (for example, use quantitative analysis to compare the relationships among interdependent factors—such as boundaries, resources, climate, and competition—based on graphs, charts, histograms, or population changes gathered from simulations or historical data sets).

HS-LS2-2 Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales (for example, use mathematical representations—such as finding the average, determining trends, and using graphical comparisons of multiple sets of teacher-provided data—to support and revise explanations about factors affecting biodiversity and populations in ecosystems).

HS-LS2-6 Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem (for example, evaluate the evidence and reasoning behind the claim that in stable conditions, ecosystems maintain relatively consistent numbers and types of organisms, but that a shift in biological or physical conditions (such moderate hunting or a seasonal flood) or an extreme change (such as volcanic eruption or sea-level rise) can result in a new ecosystem).</td></tr>
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<tr><td>Score 2.0</td><td colspan="2">HS-LS2-1 The student will:

• Recognize or recall specific vocabulary (for example, boundary, carrying capacity, climate, competition, data set, ecosystem, factor, graph, histogram, interdependent, population, quantitative analysis, relationship, resource scale, simulation).
• Describe how various factors affect the carrying capacity of ecosystems (for example, boundaries, resources, climate, and competition).

HS-LS2-2 The student will:

• Recognize or recall specific vocabulary (for example, average, biodiversity, data set, ecosystem, equilibrium, factor, population, scale, trend).
• Describe how various factors affect the biodiversity and populations of ecosystems.

HS-LS2-6 The student will:

• Recognize or recall specific vocabulary (for example, biological, change, condition, consistent, ecosystem, extreme, interaction, organism, physical, shift, stable, transition, volcanic eruption).
• Describe the effects of transitions in ecosystems.</td></tr>
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<tr><td>Score 3.0</td><td colspan="2">The student will:

HS-LS2-8 Evaluate the evidence for the role of group behavior on individual and species’ chances to survive and reproduce (for example, review and evaluate information to distinguish between group behavior, such as flocking, schooling, and herding; cooperative behavior, such as hunting, migrating, and swarming; and individual behavior to identify evidence supporting the outcomes of group behavior and to develop logical and reasonable arguments based on this evidence).</td></tr>
<tr><td></td><td>Score 2.5</td><td>No major errors or omissions regarding score 2.0 content and partial success at score 3.0 content</td></tr>
<tr><td>Score 2.0</td><td colspan="2">HS-LS2-8 The student will:

• Recognize or recall specific vocabulary (for example, cooperative behavior, group behavior, individual behavior, outcome, reproduce, species, survive).
• Describe the relationship between group behavior and individual survival.</td></tr>
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<tr><td>Score 3.0</td><td colspan="2">The student will:

HS-LS2-3 Explain the cycling of matter and flow of energy in aerobic and anaerobic conditions (for example, use evidence to create and evaluate an explanation of the role of aerobic and anaerobic respiration in different environments).

HS-LS2-4 Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem (for example, use a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and to explain that matter—particularly atoms and molecules such as carbon, oxygen, hydrogen, and nitrogen—and energy are conserved as matter cycles and energy flows through an ecosystem).

HS-LS2-5 Demonstrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere (for example, show how photosynthesis and cellular respiration are involved in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere).</td></tr>
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<tr><td>Score 2.0</td><td colspan="2">HS-LS2-3 The student will:

• Recognize or recall specific vocabulary (for example, aerobic, anaerobic, cycle, energy, environment, flow, matter, respiration, role).
• Describe how matter cycles and energy flows in aerobic and anaerobic conditions.

HS-LS2-4 The student will:</td></tr>
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<table>
<tr><td></td><td colspan="2">Recognize or recall specific vocabulary (for example, atom, biomass, carbon, conserve, cycle, ecosystem, energy, flow, hydrogen, matter, molecule, nitrogen, organism, oxygen, store, transfer, trophic level).
Describe the matter cycles and energy flows among organisms in an ecosystem.
HS-LS2-5 The student will:
Recognize or recall specific vocabulary (for example, atmosphere, biosphere, carbon cycle, cellular respiration, geosphere, hydrosphere, photosynthesis).
State accurate information about photosynthesis, cellular respiration, and the carbon cycle.</td></tr>
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<tr><td colspan="3">Title: Humans, Biodiversity, and Ecosystems Subject: Biology</td></tr>
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<tr><td>Score 3.0</td><td colspan="2">The student will:

HS-LS2-7 As stewards of God’s Earth, explore the positive and negative impacts of human activities on the environment and biodiversity (for example, use scientific knowledge, student-generated sources of evidence, prioritized criteria, and trade off considerations to design and evaluate the environmental impact of human activities, such as urbanization, dissemination of invasive species, the mining industry, alternative energy sources, and restoration of areas that have been altered naturally or by human activities.)
HS-LS4-6 Propose a testable solution to mitigate adverse impacts of human activity on biodiversity (for example, design a solution for a proposed problem related to threatened or endangered species or to genetic variation of organisms for multiple species, and create and revise a simulation to test that solution).</td></tr>
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<tr><td>Score 2.0</td><td colspan="2">HS-LS2-7 The student will:

• Recognize or recall specific vocabulary (for example, biodiversity, dissemination, environment, environmental impact, human activity, impact, invasive species, reduce, social, technological, tradeoff, urbanization).
• Describe how technological or social methods have attempted to reduce the impact of human activities.

HS-LS4-6 The student will:

• Recognize or recall specific vocabulary (for example, adverse, biodiversity, endangered species, genetic variation, human activity, human modification of ecosystems, impact, organism, species, threatened species).
• Describe ways in which human activity impacts biodiversity.</td></tr>
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<tr><td>Score 3.0</td><td colspan="2">The student will:

HS-LS1-2 Use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms (for example, create a model and use it to explain the hierarchical organization of interacting systems (such as an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system) that provide specific functions within multicellular organisms at the system level (such as nutrient uptake, water delivery, and organism movement in response to neural stimuli)).

HS-LS1-3 Conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis (for example, investigate feedback mechanisms—such as heart rate response to exercise stomate response to moisture and temperature, and root development in response to water levels—to demonstrate that these mechanisms maintain homeostasis).</td></tr>
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<tr><td>Score 2.0</td><td colspan="2">HS-LS1-2 The student will:

• Recognize or recall specific vocabulary (for example, artery, blood circulatory system, function, hierarchical organization, interact, movement, multicellular, muscle, neural, nutrient uptake, organism, regulate, response, stimulus, system, tissue, water delivery).
• Describe how various systems provide specific functions within multicellular organisms.

HS-LS4-6 The student will:</td></tr>
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	• Recognize or recall specific vocabulary (for example, enzyme, exercise, feedback mechanism, heart rate, homeostasis, moisture, response, root development, stomate, temperature, water). • Describe how various feedback mechanisms maintain homeostasis.	
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<tr><td>Score 3.0</td><td colspan="2">The student will:

HS-LS1-1 Explain how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.

HS-LS1-4 Use a model to illustrate the role of cellular division (mitosis) and differentiation of embryonic cells in complex organisms.</td></tr>
<tr><td></td><td>Score 2.5</td><td>No major errors or omissions regarding score 2.0 content and partial success at score 3.0 content</td></tr>
<tr><td>Score 2.0</td><td colspan="2">HS-LS1-1 The student will:

• Recognize or recall specific vocabulary (for example, cell, DNA, essential, life function, protein, specialized, structure, system).
• Describe the relationship between the structure of DNA and the structure of proteins.

HS-LS1-4 The student will:

• Recognize or recall specific vocabulary (for example, cellular communication, cellular differentiation, cellular division, maintain, mitosis, organism, produce).
• Summarize the process of cellular division (mitosis).</td></tr>
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<tr><td></td><td>Score 3.5</td><td>In addition to score 3.0 performance, partial success at score 4.0 content</td></tr>
<tr><td>Score 3.0</td><td colspan="2">The student will:

HS-LS3-1 Describe the dynamics of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring (for example, the central dogma as DNA is transcribed into mRNA and then translated into an amino acid sequence that folds into a protein.)</td></tr>
<tr><td></td><td>Score 2.5</td><td>No major errors or omissions regarding score 2.0 content and partial success at score 3.0 content</td></tr>
<tr><td>Score 2.0</td><td colspan="2">HS-LS3-1 The student will:

• Recognize or recall specific vocabulary (for example, anticodon, chromosome, codon, DNA, function, genotype, homologous chromosomes, instruction, offspring, parent, phenotype, relationship, RNA, trait).
• Describe the functions of DNA and chromosomes.
• Describe the basic relationships between DNA and chromosomes.</td></tr>
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<tr><td colspan="3">Title: Variation of Traits Subject: Biology</td></tr>
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<tr><td></td><td>Score 3.5</td><td>In addition to score 3.0 performance, partial success at score 4.0 content</td></tr>
<tr><td>Score 3.0</td><td colspan="2">The student will:

HS-LS3-2 Illustrate how heritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors (for example, use data to model the different ways in which genetic variation occurs.)

HS-LS3-3 Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population (for example, use Punnett squares or mathematical computation to describe the probability of traits as it relates to genetic factors in the expression of traits).</td></tr>
<tr><td></td><td>Score 2.5</td><td>No major errors or omissions regarding score 2.0 content and partial success at score 3.0 content</td></tr>
<tr><td>Score 2.0</td><td colspan="2">HS-LS3-2 The student will:

• Recognize or recall specific vocabulary (for example, combination, environmental factor, error, gene, genetic, genetic variation, inheritable, meiosis, mutation, replication).
• Describe the ways in which inheritable genetic variations can develop (such as through meiosis, replication errors, or genetic and chromosomal mutations such as crossing over and nondisjunction.

HS-LS3-3 The student will:

• Recognize or recall specific vocabulary (for example, distribution, environmental, expression, factor, genetic, population, probability, selective gene expression, statistics, trait, variation).
• Describe the variation and distribution of expressed traits in a population (for example, use a distribution curve to describe a population.</td></tr>
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<tr><td>Score 3.0</td><td colspan="2">The student will:

HS-LS4-4 Construct an explanation based on evidence for how natural selection leads to adaptation of populations (for example, use data to provide evidence for how specific biotic and abiotic differences in ecosystems—such as ranges of seasonal temperature, long-term climate change, soil acidity, access to light, geographic barriers, or introduction of new organisms — contribute to a change in gene frequency over time, leading to the adaptation of populations).

HS-LS4-5 Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) variation of species over time, and (3) the extinction of other species (for example, evaluate the validity and reliability of the claim that changes to the environment—such as deforestation, fishing, the application of fertilizers, drought, flooding, and the rate of change to the environment—affect the distribution or disappearance of traits in populations).</td></tr>
<tr><td></td><td>Score 2.5</td><td>No major errors or omissions regarding score 2.0 content and partial success at score 3.0 content</td></tr>
<tr><td>Score 2.0</td><td colspan="2">HS-LS4-4 The student will:

• Recognize or recall specific vocabulary (for example, adaptation, barrier, climate change, ecosystem, frequency, gene, geographic, light, macroevolution, microevolution, natural selection, organism, population, soil acidity, temperature).
• Describe the relationship between natural selection and adaptation of populations (microevolution).
• Describe how differences in ecosystems can contribute to natural selection over time.

• Recognize that natural selection does not result in the gain of new information</td></tr>
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<table>
<tr><td></td><td colspan="2">leading to the evolution of new types of organisms.

HS-LS4-5 The student will:

• Recognize or recall specific vocabulary (for example, change, condition, deforestation, disappearance, distribution, diverge, drought, emergence, environment, environmental, extinction, fertilizer, fishing, flood, increase, rate of change, species, trait).
• Describe how environmental conditions can change over time.
• Describe the relationship between environmental conditions and the distribution or disappearance of traits in a population.</td></tr>
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<tr><td colspan="3">Title: Natural Selection Subject: Biology</td></tr>
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<tr><td>Score 4.0</td><td colspan="2">In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught</td></tr>
<tr><td></td><td>Score 3.5</td><td>In addition to score 3.0 performance, partial success at score 4.0 content</td></tr>
<tr><td>Score 3.0</td><td colspan="2">The student will:

Construct an argument based on evidence that macroevolution does not arise from the process of natural selection and/or mutations. (for example, natural selection changes the distribution of traits in populations, mutations are typically not beneficial, they are either lethal, or at best, neutral. Mutations do not allow for the addition of information that lead to the evolution of new types of organisms.)

Construct an explanation that intelligent design is evident in nature and implies a Creator God. (for example, there is similarity of design and function, the complexity of life cannot arise spontaneously any more than order can arise spontaneously in non-living systems, entropy tends toward disorder, not order, life only comes from life (biogenesis), the validity of life coming from non-living sources is statistically impossible.)

HS-LS4-3 Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait leading to microevolution (for example, use basic statistical and graphical analysis to analyze shifts in the numerical distribution of traits, and use these shifts as evidence to support the claim that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait).</td></tr>
<tr><td></td><td>Score 2.5</td><td>No major errors or omissions regarding score 2.0 content and partial success at score 3.0 content</td></tr>
</table>

<table>
<tr><td>Score 2.0</td><td colspan="2">The student will:

• Recognize or recall specific vocabulary (for example, adaptation, behavior, Charles Darwin, competition, entropy, environment, evolution, factor, genetic variation, heritable, influence, intelligent design, law of biogenesis, limited, morphology, mutation, organism, physiology, probability, potential, proliferation, reproduce, resource, sexual reproduction, species, spontaneous generation, survive).
• Recognize that mutation and natural selection do not contribute to the process of macroevolution, but may influence microevolution.

HS-LS4-3 The student will:

• Recognize or recall specific vocabulary (for example, advantageous, distribution, heritable, increase, organism, proportional, reproductive value of traits, shift, survival, survival value of traits, trait).
• Demonstrate basic statistical and graphical analysis.
• Describe the relationship between advantageous heritable traits and survival of organisms.</td></tr>
<tr><td></td><td>Score 1.5</td><td>Partial success at score 2.0 content and major errors or omissions regarding score 3.0 content</td></tr>
<tr><td>Score 1.0</td><td colspan="2">With help, partial success at score 2.0 content and score 3.0 content</td></tr>
<tr><td></td><td>Score 0.5</td><td>With help, partial success at score 2.0 content but not at score 3.0 content</td></tr>
<tr><td>Score 0.0</td><td colspan="2">Even with help, no success</td></tr>
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<tr><td colspan="3">Title: Evidence of Common Ancestry Subject: Biology</td></tr>
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<tr><td>Score 3.0</td><td colspan="2">The student will:

Construct an argument that common ancestry and biological evolution are based on circumstantial evidence with alternative interpretations. (for example, similarities in DNA sequences and anatomical structures are equally evidence of design, embryonic development is not strongly correlated to evolutionary development, phylogenic trees are contradictory to each other, the fossil record shows complexity at the lowest level instead of a simple to complex evolution, transitional organisms are missing in the fossil record. Interpretations are based on worldview and faith, which cannot be established by scientific reasoning.)</td></tr>
<tr><td></td><td>Score 2.5</td><td>No major errors or omissions regarding score 2.0 content and partial success at score 3.0 content</td></tr>
<tr><td>Score 2.0</td><td colspan="2">The student will:

• Recognize or recall specific vocabulary that evolutionists use (for example, anatomical structure, biochemical characteristic, biological evolution, common ancestry, degree of kinship, development, DNA sequence, embryological, evidence for unity of life, order of appearance, origin of life, phylogenetics, shared characteristic, similarity, structure).
• Describe the major difficulties in the theory of evolution.
• Acknowledge God as the Author of all scientific principles and laws regardless of man’s interpretation. BIO1.1.2
• Acknowledge God as Creator of life while recognizing divergent theories. BIO1.4.1</td></tr>
<tr><td></td><td>Score 1.5</td><td>Partial success at score 2.0 content and major errors or omissions regarding score 3.0 content</td></tr>
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	Score 0.5	With help, partial success at score 2.0 content but not at score 3.0 content
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