Proficiency Scales

Chemistry
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.

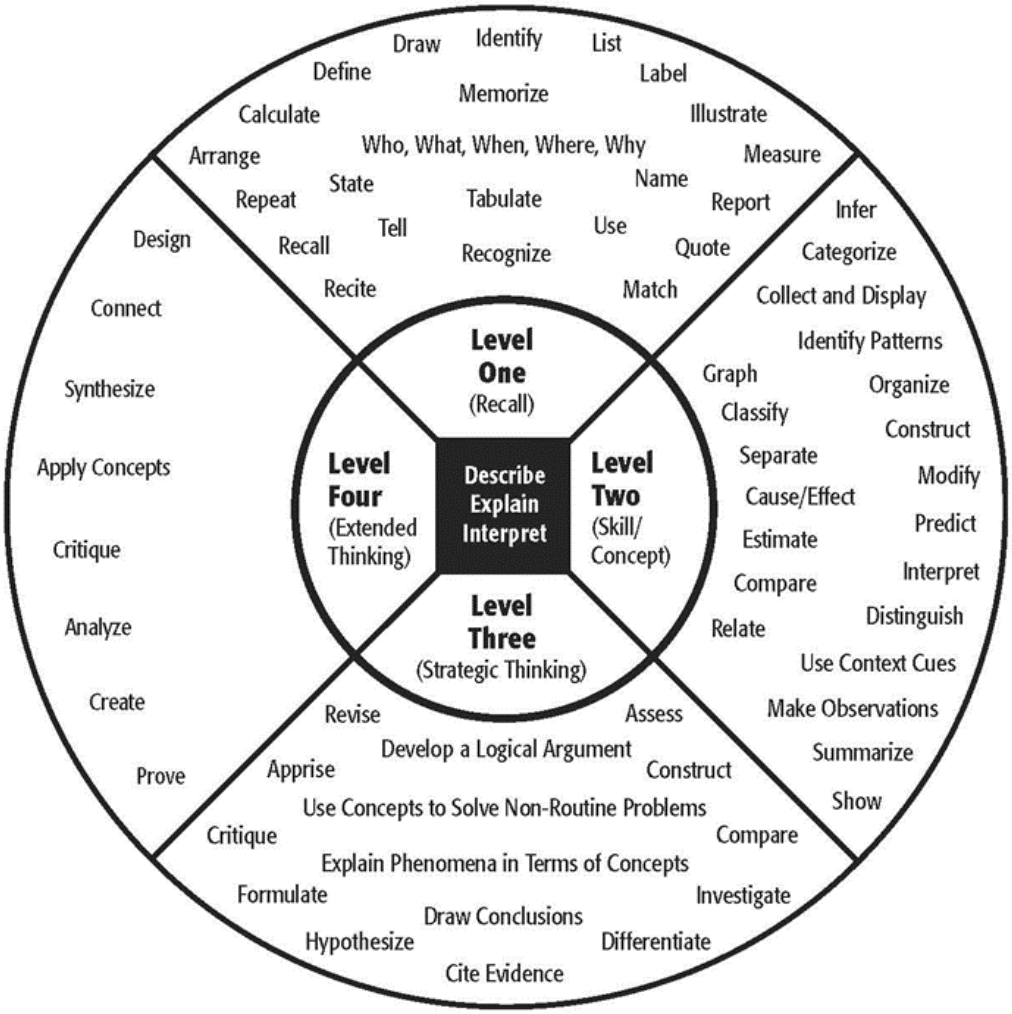
Proficiency scales become the centerpiece of communication and understanding in the classroom, as well as the common language for discussing learning between teacher and student.

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: Structure and Properties of Matter Subject: Chemistry</td></tr>
<tr><td colspan="3">Standard:</td></tr>
<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:

HS-PS1-1 Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms (for example, use information on the periodic table to predict relative properties—such as the reactivity of metals, types of bonds formed, number of bonds formed, and reaction with oxygen—of main group elements).

HS-PS1-3 Conduct an investigation to compare the properties of substances to infer the strength of electrical forces between particles (for example, figure out the bond strengths or electrical forces between ions, atoms, molecules, or networked materials—such as graphite—by investigating the structure and characteristics of different substances, including melting point, boiling point, vapor pressure and surface tension).

HS-PS2-6 Demonstrate how the molecular-level structure is important in the functioning of designed materials (for example, use teacher-provided molecular-level structures of specific designed materials—such as electrically conductive metals, flexible but durable materials, and pharmaceuticals designed to interact with specific receptors—to explain how attractive and repulsive forces at the molecular level determine function).</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">HS-PS1-1 The student will:

• Recognize or recall specific vocabulary (for example, atom, atomic mass, atomic nucleus, atomic number, bond, electrons, element, element stability, elements of matter, neutrons, outermost energy level, periodic table, periodicity, predict, protons, property, reaction, reactivity, relative, relative mass, representative elements, subatomic particles, valence electrons, weight of subatomic particles).
• Use the periodic table to gather information about representative elements.

HS-PS1-3 The student will:

• Recognize or recall specific vocabulary (for example, atom, atomic energy, boiling point, electrical force, elementary particle, ion, melting point, molecule, networked material, particle, strength, structure, substance, surface tension, vapor pressure).
• Model the structures of various substances.
• Describe the relationship between electrical forces and particles.

HS-PS2-6 The student will:

• Recognize or recall specific vocabulary (for example, attractive, designed material, durable, electrically conductive, electron configuration, electron sharing, electron transfer, flexible, force, formation of polymers, function, ionic motion, isotope, molecular arrangement, molecular level, molecular motion, receptor, repulsive, structure, synthetic polymer).
• Describe the structure of different substances at the molecular level.
• Describe the relationship between attractive and repulsive forces at the molecular level.</td></tr>
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<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>
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Title: **Conservation of Matter**		Subject: **Chemistry**
Standard:		
Score 4.0	In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught	
	Score 3.5	In addition to score 3.0 performance, partial success at score 4.0 content
Score 3.0	The student will: **HS-PS1-7 Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction** (for example, use mathematical ideas—not memorization or rote application of problem-solving techniques—to explain the proportional relationships between the masses of atoms in the reactants and the products of a chemical reaction as well as the translation of these relationships from the atomic to the macroscopic scale using the mole as a conversion).	
	Score 2.5	No major errors or omissions regarding score 2.0 content and partial success at score 3.0 content
Score 2.0	**HS-PS1-7** The student will: • Recognize or recall specific vocabulary (for example, *atom, atomic mass, atomic scale, chemical reaction, conserve, conversion, macroscopic scale, mass, molar volume, mole, product, proportional, reactant, relationship, release of energy, translation*). • Describe the masses of atoms in reactants and products of a chemical reaction. • Convert masses of atoms between the atomic and macroscopic scale (for example, atomic mass to moles).	
	Score 1.5	Partial success at score 2.0 content and major errors or omissions regarding score 3.0 content
Score 1.0	With help, partial success at score 2.0 content and score 3.0 content	
	Score 0.5	With help, partial success at score 2.0 content but not at score 3.0 content
Score 0.0	Even with help, no success	

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<tr><td colspan="3">Title: Chemical Reactions Subject: Chemistry</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-PS1-2 Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties (for example, explain the reasoning behind reactions between elements such as sodium and chlorine, carbon and oxygen, or carbon and hydrogen).

HS-PS1-5 Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs (for example, use evidence from temperature, concentration, and rate data to explain qualitative relationships between rate and temperature in a simple reaction with two reactants focusing on the number and energy of collisions between molecules).

HS-PS1-6 Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium (for example, apply Le Chatelier’s principle to think of ways to increase product formation through the addition of reactants or removal of products).</td></tr>
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<tr><td>Score 2.0</td><td colspan="2">HS-PS1-2 The student will:

• Recognize or recall specific vocabulary (for example, acid /base reaction, atom, atomic configuration, atomic reaction, chemical property, chemical properties of elements, chemical reaction rate, hydrogen,outermost electron state, pattern, periodic table, reaction, simple chemical reaction).
• Describe the outermost electron states of atoms, trends in the periodic table, and patterns of chemical properties.
• Describe the relationship between chemical reactions and outermost electron states of atoms, trends in the periodic table, and patterns of chemical properties.

HS-PS1-5 The student will:

• Recognize or recall specific vocabulary (for example, accelerator catalyst, collision, concentration, data, endothermic reaction, energy, exothermic reaction, molecule, oxidation-reduction, particle, properties of reactants, radical reaction, rate, react, reactant, reaction, recombination of chemical elements, simple reaction, temperature).
• Describe the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.

HS-PS1-6 The student will:

• Recognize or recall specific vocabulary (for example, chemical reaction rate, chemical system, endothermic reaction, equilibrium, exothermic reaction, formation, Le Chatelier’s principle, product, reactant).
• Describe the relationship between elements in a chemical system.
• Describe how products reach equilibrium.</td></tr>
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Title: **Bonds**		Subject: **Chemistry**
Standard:		
Score 4.0	In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught	
	Score 3.5	In addition to score 3.0 performance, partial success at score 4.0 content
Score 3.0	The student will: **HS-PS1-4 Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy** (for example, create a molecular-level drawing or diagram of a reaction, a graph showing the relative energies of reactants and products or a representation showing that energy is conserved to illustrate that a chemical reaction is a system that affects energy change).	
	Score 2.5	No major errors or omissions regarding score 2.0 content and partial success at score 3.0 content
Score 2.0	**HS-PS1-4** The student will: • Recognize or recall specific vocabulary (for example, *absorption, bond, bond energy, chemical change, chemical reaction, conserve, energy, molecular level, product, reactant, reaction, relative energy, release, system*). • Create diagrams of chemical reactions. • Describe changes in total bond energy during a chemical reaction.	
	Score 1.5	Partial success at score 2.0 content and major errors or omissions regarding score 3.0 content
Score 1.0	With help, partial success at score 2.0 content and score 3.0 content	
	Score 0.5	With help, partial success at score 2.0 content but not at score 3.0 content
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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-PS1-8 Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay (for example, create simple qualitative pictures or diagrams to show changes in the composition of the nucleus of the atom and the scale of energy released—relative to other kinds of transformations—during the processes of fission, fusion, and alpha, beta, and gamma radioactive decays).</td></tr>
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<tr><td>Score 2.0</td><td colspan="2">HS-PS1-8 The student will:

• Recognize or recall specific vocabulary (for example, alpha radioactive decay, atom, atomic bomb, beta radioactive decay, decay rate, Enrico Fermi, Ernest Rutherford, fission, fusion, gamma radioactive decay, hydrogen bomb, Lise Meitner, Marie Curie, nuclear force, nuclear mass, nuclear reaction, nuclear stability, nucleus, particle emission, Pierre Curie, radioactive decay, rate of nuclear decay, release, spontaneous nuclear reaction, transformation).
• Describe the processes of fission, fusion, and alpha, beta, and gamma radioactive decay.</td></tr>
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