CLOSE ENCOUNTERS BETWEEN THE 2009 NAEP SCIENCE FRAMEWORK AND THE WASHINGTON GRADE 8 STATE SCIENCE CONTENT STANDARDS

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BACKGROUND

- The importance of state science assessments has increased with NCLB
  - 2007/2008 states were required to administer a science assessment at each level of school
- NAEP data provide another perspective of student achievement on state assessments
- NAEP data are being used in educational research to evaluate the results of NCLB
- The 2009 NAEP Science Framework will determine the design of NAEP science assessments through 2017

METHODOLOGY

- Question to be answered: “How do our state standards compare with the 2009 NAEP Science Framework?”
- How to compare standards/frameworks to one another?

METHODOLOGY

- Current methodologies:
  - Webb
    - Model combines qualitative expert judgments and quantified coding and analysis of standards and assessments
  - Porter
    - Model uses a content matrix and language which has two dimensions for categorizing subject content: Content Topics and Cognitive Demand. This allows for the analysis of standards, assessments, and instruction across states, districts, and schools
  - Achieve
    - Model provides an in-depth qualitative and quantitative analysis on the alignment of assessments to state standards
  - Project 2061
    - Model based on identification of specific learning goals associated with assessment task targets and effectiveness of task in probing student achievement

METHODOLOGY

- What would meet my needs?
  - Time
  - Elemental analysis
  - Clear result

METHODOLOGY

- The Institute of Education Sciences (IES)published a study by the Regional Educational Laboratory (REL) comparing Science standards in Southwest states to the 2009 NAEP Science framework
  - Uses WestEd methodology
    - "quality review" of grade level expectations within and across grades
      - Gap analysis
      - Order analysis
      - Depth and breadth analysis

Methodology

- Developed matrix to review standards
  - Grade 8 NAEP content statements were listed by topics and subtopics
  - Blank cell to list related Washington GLEs
  - Rating column
  - Code column

MATRIX

	NAEP Science Content Statement	Washington Grade Level Expectation	Overall Rating	Code
	Earth and Space Science			
EARTH AND SPACE IN TIME				
	E8.1: In contrast to an earlier theory that Earth is the center of the universe, it is now known that the sun, an average star, is the central and largest body in the solar system. Earth is the third planet from the sun in a system that includes seven other planets and their moons, as well as smaller objects, such as asteroids and comets.			
	E8.2: Gravity is the force that keeps most objects in the solar system in regular and predictable motion. Those motions explain such phenomena as the day, the year, phases of the moon, and eclipses.			
	E8.3: Fossils provide important evidence of how life and environmental conditions have changed in a given location.			
	E8.4: Earth processes seen today, such as erosion and mountain building, made possible the measurement of geologic time through methods such as observing rock sequences and using fossils to correlate the sequences at various locations.			
	TOTAL EARTH AND SPACE IN TIME			

Washington Science Standard Structure

Essential Academic Learning Requirements

Component

Grade Level Expectation

EALR 1 — SYSTEMS: The student knows and applies scientific concepts and principles to understand the properties, structures, and changes in physical, earth/space, and living systems.

Component 1.2 Structures: Understand how components, structures, organizations, and interconnections describe systems.

	GLE	6	7	8	9	10
Physical Systems	1.2.3 Structure of Matter	Understand that all matter is made of particles called atoms and that atoms may combine to form molecules and that atoms and molecules can form mixtures. W ■ (6) Describe that matter is made of particles called atoms and molecules. ■ (8) Describe that elements are made of one kind of atom. ■ (8) Describe how atoms may be combined in various ways and ratios to form molecules. ■ (8) Describe the different atoms and molecules in mixtures (e.g., dissolving carbon dioxide in water produces a type of mixture [solution] of CO_2 and H_2O molecules.)			Understand the structure of atoms, how atoms bond to form molecules, and that molecules form solutions. W ■ (10) Describe molecules forming a solution (e.g., salt added to water dissolves, forming a salt water solution, until saturation when no more salt will dissolve). ■ (10) Describe how to separate mixtures and or solutions of several different kinds of substances (e.g., sand, sugar, iron filings). ■ (10) Describe the structure of atoms in terms of protons and neutrons forming the nucleus, which is surrounded by electrons (e.g., a helium atom usually has a nucleus formed by 2 protons and 2 neutrons, which is surrounded by 2 electrons). ■ (10) Describe how atoms bond to form molecules in terms of transferring and/or sharing electrons (e.g., sodium atoms transfer an electron to chlorine atoms to form salt).	

Grade Level Expectation Tag

Recommended Grade

Evidence of Learning Statement

STUDY

- Matched GLE to NAEP content statement
- Used 3 point rating system
  - 1 = State standards do not address NAEP content statement
  - 2 = State standards partially address NAEP content statement
  - 3 = State standards fully address NAEP content statement
- Noted if GLE was available at a higher or lower grade level

PROBLEMS

- Current Washington standard design identifies two Essential Academic Learning Requirements not identified in NAEP Framework
  - Inquiry in Science
  - Application of Science
- The 2009 NAEP Science assessment will not only assess science content statements but also the way in which knowledge is used.
  - Key Science Practices
  - Science Content is crossed with Science Practices

General Performance Expectations for Science Practices

← Communicate accurately and effectively →

Identifying Science Principles	Describe, measure, or classify observations	State or recognize correct science principles	Demonstrate relationships among closely related science principles	Demonstrate relationships among different representations of principles
Using Science Principles	Explain observations of phenomena	Predict observations of phenomena	Suggest examples of observations that illustrate a science principle	Propose, analyze, and/or evaluate alternative explanations or predictions
Using Scientific Inquiry	Design or critique aspects of scientific investigations	Conduct scientific investigations using appropriate tools and techniques	Identify patterns in data and/or relate patterns in data to theoretical models	Use empirical evidence to validate or criticize conclusions about explanations and predictions
Using Technological Design	Propose or critique solutions to problems given criteria and scientific constraints	Identify scientific trade-offs in design decisions and choose among alternative solutions	Apply science principles or data to anticipate effects of technological design decisions	

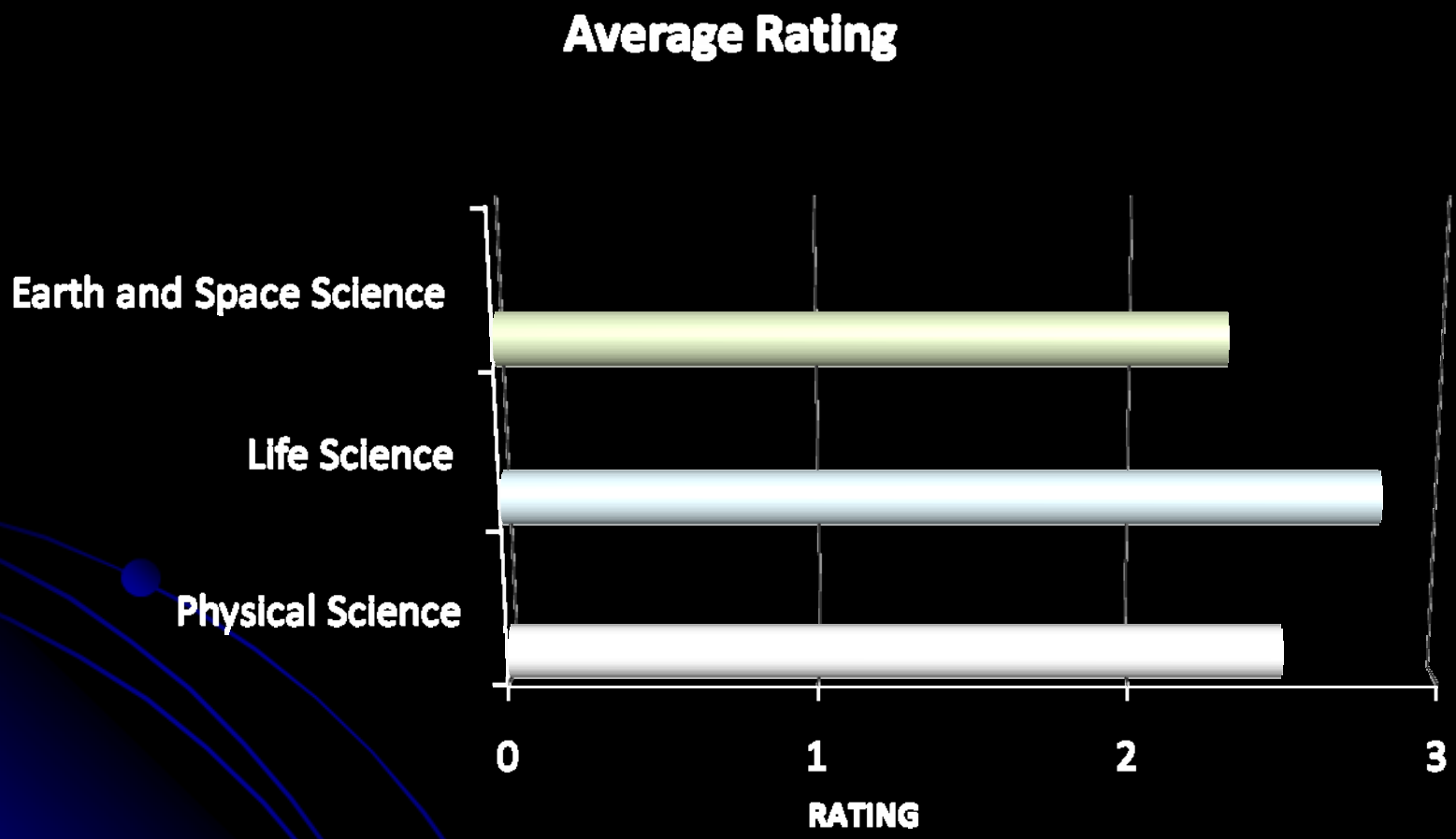
Table 12. Generating Examples of Grade 8 Performance Expectations

		Science Content		
		Physical Science content statements	Life Science content statements	Earth and Space Science content statements
Science Practices	Identifying Science Principles	Identify the units that might be used to measure the speed of an ant and the speed of an airplane. (See P8.14.)	Identify the raw materials that plants use to make sugars. (See L8.4.)	Identify wind as the movement of air from higher to lower pressure regions. (See E8.11.)
	Using Science Principles	An object (e.g., a toy car) moves with a constant speed along a straight line. Predict (with justification) what might happen to this object's speed as it rolls downhill. (See P8.16.)	Explain why sugars are found to move primarily down the stem of a growing plant (e.g., potato, carrot) (See L8.4.)	Explain why mountain soils are generally thinner than floodplain soils. (See E8.6.)
	Using Scientific Inquiry	Design an experiment to determine how the speed of a battery-operated toy car changes as a result of added mass. (See P8.16.)	Criticize conclusions about likely consequences of consuming various diets based on flawed premises or flaws in reasoning. (See L8.5.)	Given data (indexed by month) on annual trends of incoming solar radiation for five cities, determine whether the location is in the Northern or Southern Hemisphere. (See E8.12.)
	Using Technological Design	Evaluate the following car designs to determine which one is most likely to maintain a constant speed as it goes down a hill. (See P8.16.)	Identify possible ecological side effects of agricultural fertilizer runoff into a lake. (See L8.7.)	Describe the consequences (e.g., erosion) of undercutting a steep slope for a road cut. (See E8.4.)

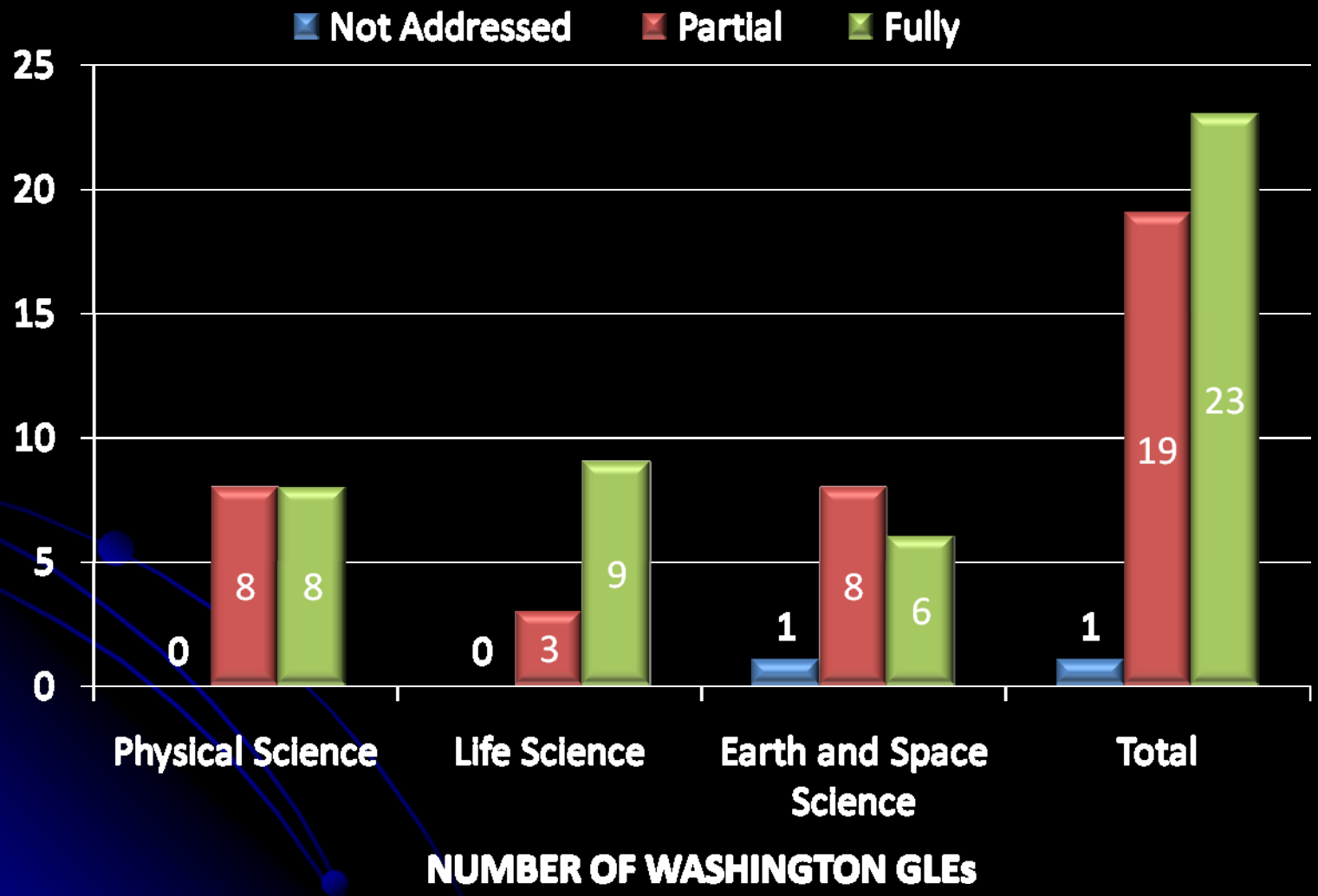
RESULTS

NAPE G8 Content Area and Number of	Average Rating
PHYSICAL SCIENCE (16)	**2.5**
Matter (7)	2.3
Energy (6)	2.5
Motion (3)	3.0
LIFE SCIENCE (12)	**2.8**
Structures and Functions of Living Systems	2.6
Changes in Living Systems (4)	3.0
EARTH AND SPACE SCIENCE (15)	**2.3**
Earth and Space in Time (4)	2.3
Earth Structures (6)	2.3
Earth Systems (5)	2.4
Total Content Statements (43)	**2.5**

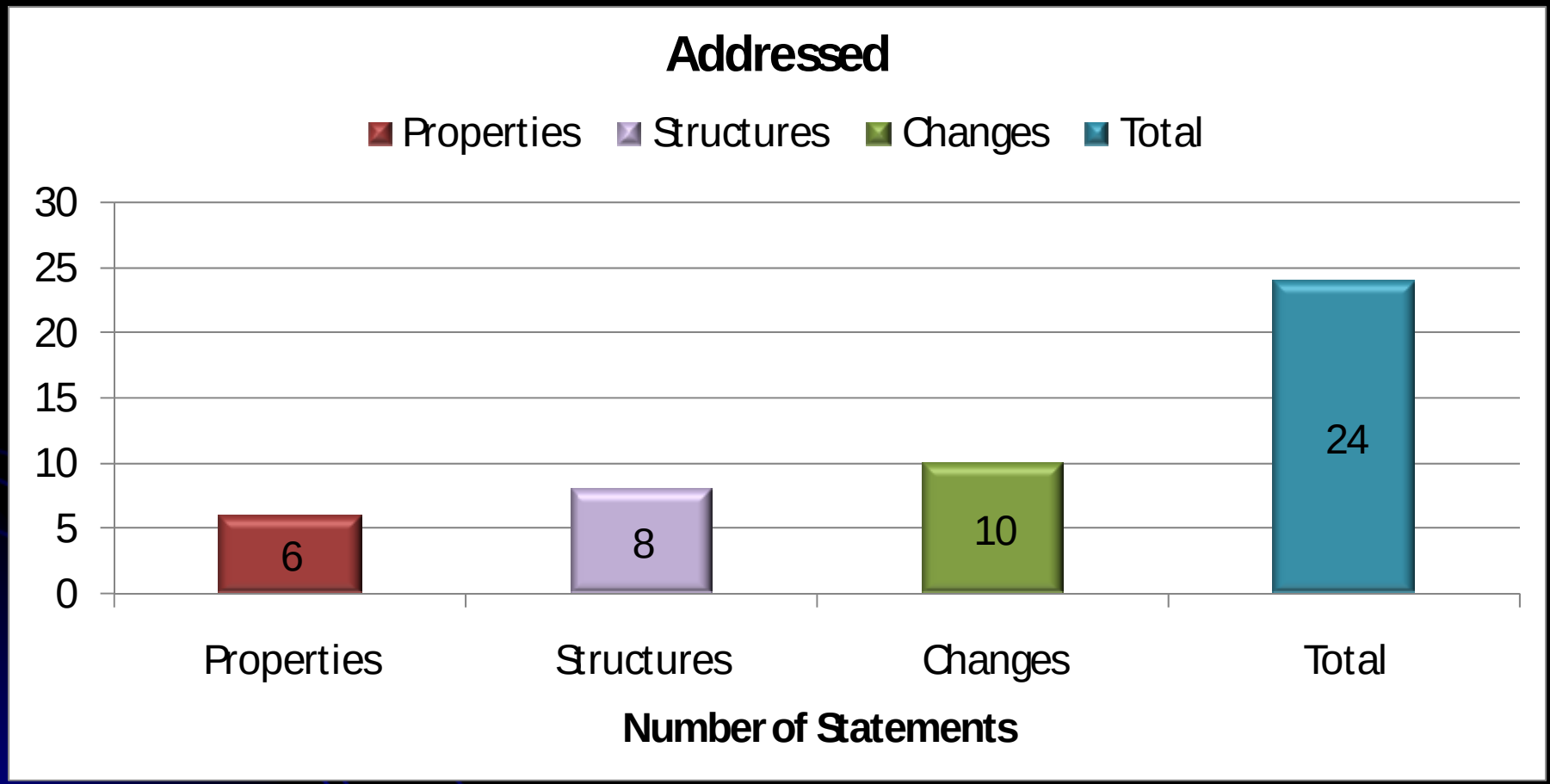
RESULTS


Average Rating
Earth and Space Science
Life Science
Physical Science
0
1
2
3
RATING

RESULTS – Washington GLEs Matching NAEP Content Statements



RESULTS – NAEP Content Statements Matching Washington GLEs



RESULTS

- Only one NAEP content statement was not aligned to Washington's GLEs
- The majority of Washington GLEs are aligned with the NAEP content statements
- The overall rating is 2.5 out of a 3.0 system

Next Steps

- Review with Assessment Director and Science Assessment Manger
- Create report detailing methodology and results
  - Include areas of concern
    - Structure of Washington EALRs vs. NAEP Science Statements and Key Principles

New Question

How do our students performance compare on the 2005 Science Washington Assessment of Student Learning with the 2005 Science NAEP assessment?

Washington 2005 WASL Results Mapped on to NAEP 2005 Science Results

WASL (Scale 0-500)*

NAEP (Scale 0-300)

below basic
basic
proficient
advanced

*Based on Schools participating on 2005 NAEP Science Assessment

Future Analyses

- Create ad hoc committee for input
- Create templates
- Develop scripted methodology for participants
- Provide early intervention for areas of concerns
- Set a specific timeframe

Contact Information

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