Building Essential Test Readiness Skills in Science for the TASC

Central/Southern Tier RAEN
April 8, 2014
9 A.M.–12 noon

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Director of Program Support for OACE

Learning Objectives

- To understand the Framework of the Next Generation Science Standards
- To use strategies and resources to engage students in science content
- To better understand the TASC Science assessment, and the content and process skills students need to master

Agenda

- Introductions
- Objectives
- Kingdom Characteristics: Activity/ Share/ Discussion
- Science Vocabulary and Strategies: Jigsaw read/ Share/ Discussion
- Structure of the TASC
- Compare and Contrast
- Depth of Knowledge
- Next Generation Science Standards: Organization/ Major Shifts/ Discussion
- Wrap-up/Evaluations

Cooperative Learning Brainstorm Directions

1. Work in groups of four.
2. Spend 45 seconds writing down everything you know about your assigned Kingdom.
3. When time is called, pass your paper to the right.

4. Read what your partner has written, then spend 45 seconds adding information to the Kingdom on the this sheet.
5. When time is called, pass your paper to the right.

6. Read what your partners have written, then spend 45 seconds adding information to the Kingdom on the third sheet.
7. When time is called, pass your paper to the right.

8. Read what your partners have written, then spend 45 seconds adding information to the last Kingdom on the fourth sheet.

TASC and GED Science Sections Compared

	TASC	GED
Content Area		
• **Physical Sciences**	33%	35%
• **Earth and Space Sciences**	33%	20%
• **Life Sciences**	34%	45%
• **Scientific and Engineering Practices**	Integrated	
• **Cross-Cutting Concepts**	Integrated	
Testing Time	85 min (90 min Spanish)	80 min
Number of Questions	47 MC (8 stimuli)	50 MC

TASC Test Science

- Includes items for the disciplines of Physical Sciences, Life Sciences, and Earth and Space Sciences.
- Each discipline is subdivided into several Core Ideas, which each contain multiple performance expectations.
- Each test item assesses one performance expectation. Items may require recalling knowledge, applying knowledge and skills, or reasoning.
- The number of test items per Core Idea is proportional to the number of performance expectations within the Core Idea. As a result, each Core Idea will have about 2-5 items on a given test.

TASC Test Science

High Emphasis: Life Sciences

- Core Idea: HS-LS1 From Molecules to Organisms: Structures and Processes
- Core Idea: HS-LS2 Ecosystems: Interactions, Energy, and Dynamics
- Core Idea: HS-LS3 Heredity: Inheritance and Variation of Traits
- Core Idea: HS-LS4 Biological Evolution: Unity and Diversity

High Emphasis: Earth and Space Sciences

- Core Idea: HS-ESS1 Earth's Place in the Universe
- Core Idea: HS-ESS1 Earth's Systems
- Core Idea: HS-ESS1 Earth and Human Activity

Medium Emphasis: Physical Sciences

- Core Idea: HS-PS1 Matter and Its Interactions
- Core Idea: HS-PS2 Motion and Stability: Forces and Interactions
- Core Idea: HS-PS3 Energy
- Core Idea: HS-PS4 Waves and Their Applications in Technologies for Information Transfer

TASC Test Science

What are the implications of these changes for

- Curriculum,
- Instruction, and
- Assessment?

1. Reflect individually
2. Table share
3. Whole group share

GED Sample Question

	W	w
W	WW	Ww
w	Ww	ww

*A certain plant species varies in the shape of its leaf edges. The wavy-edged (**W**) is dominant to the straight-edged (**w**). According to the Punnett Square, what is the probability of an offspring having wavy-edged leaves?*

1. 25%
2. 0%
3. 50%
4. 75%
5. 100%

TASC Sample Question

A certain plant species varies in the shape of its leaf edges. Some of the plants have wavy-edged leaves, and some of the plants have straight-edged leaves. In this plant species, the trait for leaf-edge shape is controlled by a single gene. The dominant allele is represented by W, and the recessive allele is represented by w.

Two plants with wavy-edged leaves are crossed with each other, producing 421 offspring plants. Of these, 298 offspring plants have wavy-edged leaves, and 123 offspring plants have straight-edged leaves.

What are the genotypes of the parent plants in this cross?

A. Ww and ww
B. Ww and Ww
C. WW and ww
D. WW and Ww

Calculators

- Calculators may be used for the Science test and the second session of the Mathematics test
  - A calculator is available within the computer-based test

- ONLY Texas Instrument Model TI30XS calculators are permitted for the paper-based test and will be provided by the test center

Calculator: TI-30XS

Examples for each of the DOK Levels, based on Webb (Karin Hess, 2005)

Level 1 Recall & Reproduction	Level 2 Skills & Concepts	Level 3 Strategic Thinking	Level 4 Extended Thinking
a. Recall or recognize a fact, term, definition, simple procedure (such as one step), or property b. Demonstrate a rote response c. Use a well-known formula d. Represent in words or diagrams a scientific concept or relationship e. Provide or recognize a standard scientific representation for simple phenomenon f. Perform a routine procedure, such as measuring length g. Perform a **simple** science process or a	a. Specify and explain the relationship between facts, terms, properties, or variables b. Describe and explain examples and non-examples of science concepts c. Select a procedure according to specified criteria and perform it d. Formulate a routine problem given data and conditions e. Organize, represent, and compare data f. Make a decision as to how to approach the problem g. Classify, organize, or estimate	a. Interpret information from a complex graph (such as determining features of the graph or aggregating data in the graph) b. Use reasoning, planning, and evidence c. Explain thinking (beyond a simple explanation or using only a word or two to respond) d. Justify a response e. Identify research questions and design investigations for a scientific problem f. Use concepts to solve non-routine problems/more than	a. Select or devise approach among many alternatives to solve problem b. Based on provided data from a complex experiment that is novel to the student, deduct the fundamental relationship between several controlled variables. c. Conduct an investigation, from specifying a problem to designing and carrying out an experiment, to analyzing its data and forming conclusions

MS-LS3 Heredity: Inheritance and Variation of Traits

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Students who demonstrate understanding can:

MS-LS3-1. Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. [Clarification Statement: Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.] [Assessment Boundary: Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations.]

MS-LS3-2. Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. [Clarification Statement: Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- Develop and use a model to describe phenomena. (MS-LS3-1),(MS-LS3-2)

Disciplinary Core Ideas

LS1.B: Growth and Development of Organisms

- Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. *(secondary to MS-LS3-2)*

LS3.A: Inheritance of Traits

- Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. (MS-LS3-1)
- Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS3-2)

LS3.B: Variation of Traits

- In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. (MS-LS3-2)
- In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. (MS-LS3-1)

Crosscutting Concepts

Cause and Effect

- Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS3-2)

Structure and Function

- Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS3-1)

Connections to other DCIs in this grade-band: **MS.LS1.A** (MS-LS3-1); **MS.LS4.A** (MS-LS3-1)

Articulation across grade-bands: **3.LS3.A** (MS-LS3-1),(MS-LS3-2); **3.LS3.B** (MS-LS3-1),(MS-LS3-2); **HS.LS1.A** (MS-LS3-1); **HS.LS1.B** (MS-LS3-1),(MS-LS3-2); **HS.LS3.A** (MS-LS3-1),(MS-LS3-2); **HS.LS3-B** (MS-LS3-1),(MS-LS3-2)

Common Core State Standards Connections:

ELA/Literacy –

RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts. *(MS-LS3-1),(MS-LS3-2)*
RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics. *(MS-LS3-1),(MS-LS3-2)*
RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS3-1),(MS-LS3-2)
SL.8.5	Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points. *(MS-LS3-1),(MS-LS3-2)*

Mathematics –

MP.4	Model with mathematics. *(MS-LS3-2)*
6.SP.B.5	Summarize numerical data sets in relation to their context. *(MS-LS3-2)*

Next Generation Science Standards Organization

Title and Code: ***MS*** identifies this as Middle School, ***LS*** as Life Science

MS-LS3 Heredity: Inheritance and Variation of Traits

Students who demonstrate understanding can:

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MS-LS3-2. Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. [Clarification Statement: Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.]

Performance Expectations: what students should be able to do to show mastery

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. ▪ Develop and use a model to describe phenomena. (MS-LS3-1),(MS-LS3-2)	**LS1.B: Growth and Development of Organisms** ▪ Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. *(secondary to MS-LS3-2)* **LS3.A: Inheritance of Traits** ▪ Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. (MS-LS3-1) ▪ Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS3-2) **LS3.B: Variation of Traits** ▪ In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. (MS-LS3-2) ▪ In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. (MS-LS3-1)	**Cause and Effect** ▪ Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS3-2) **Structure and Function** ▪ Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS3-1)

Foundation Box: the Science and Engineering Practices, Disciplinary Core Ideas, and Cross-Cutting Concepts from the Framework for K-12 Science Education used to define the Performance Expectations above

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Connections Box: Connections to other science standards within this grade band, articulations across grade bands, and connections to Common Core Standards in Mathematics and English Language Arts/Literacy

Next Generation Science Standards Organization

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Next Generation Science Standards Organization

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Note the Clarification Statements above, which supply examples or additional clarification to the performance expectations.

Also note the Assessment Boundary statements, which specify the limits to large scale assessment

Next Generation Science Standards

http://www.nextgenscience.org/

Science and Engineering Practices (from Appendix F)

- Asking questions (for science) and defining problems (for engineering)
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Constructing explanations (for science) and designing solutions (for engineering)
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

Cross-Cutting Concepts (from Appendix G)

- Patterns
- Cause and effect
- Scale, proportion, and quantity
- Systems and system models
- Energy and matter
- Structure and function
- Stability and change

7 High Emphasis Core Ideas

Life Sciences

- LS1 From Molecules to Organisms: Structures and Processes
- LS2 Ecosystems: Interactions, Energy, and Dynamics
- LS3 Heredity: Inheritance and Variation of Traits
- LS4 Biological Evolution: Unity and Diversity

Earth and Space Sciences

- ESS1 Earth's Place in the Universe
- ESS1 Earth's Systems
- ESS1 Earth and Human Activity

4 Medium Emphasis Core Ideas

Physical Sciences

- PS1 Matter and Its Interactions
- PS2 Motion and Stability: Forces and Interactions
- PS3 Energy
- PS4 Waves and Their Applications in Technologies for Information Transfer

Shift in Emphasis: The NGSS…

1. Reflect the interconnected nature of science as it is practiced and experienced in the real world.
2. Are student performance expectations: NOT a curriculum.
3. Build science concepts coherently from K to 12.
4. Focus on deeper understanding of content as well as application of content.
5. Integrate application of science, technology, and engineering from K to 12.
6. Are designed to prepare students for college, career, and citizenship.
7. Correlated to the Common Core State Standards in Mathematics and English Language Arts.

Final Reflection

What are your biggest take-aways from today?

What are your unanswered questions?

- Think (quiet reflection for 2 minutes)
- Pair (pick partners)
- Share (with each other for 1 minute each)
- Square (share what you heard with your group of 4)
- Report (report out what your group said and heard)

Online Resources

- Next Generation Science Standards:

  http://www.nextgenscience.org/

- The OACE TASC webpage:

  http://www.oacenyc.org/home/t-a-s-c

- CTB McGraw-Hill's TASC webpage:

  http://www.tasctest.com/