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SUBJECT

Superintendent of Public Instruction update to the State Board of Education

BACKGROUND/DISCUSSION

Superintendent of Public Instruction, Sherri Ybarra, will provide updates on the State Department of Education, report on the progress of implementing Mastery Education, provide a Legislative update, and discuss teacher shortages and teacher evaluation audits.

BOARD ACTION

This item is for informational purposes only. Any action will be at the Board's discretion.

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STATE DEPARTMENT OF EDUCATION

SUBJECT

Temporary Rule – IDAPA 08.02.03.004.01, Rules Governing Thoroughness, Incorporated by Reference – Idaho Content Standards

REFERENCE

April 2009	Board approved updated Idaho Content Standards.
April 2010	Board approved revision of Science Standards.
August 2015	Board approved updated Humanities and Science standards (rejected by legislature).
August 2016	Board approved updated Arts and Humanities, English Language Arts, Health, Mathematics, Physical Education, and Social Studies standards. Board approved new Computer Science Standards.

APPLICABLE STATUTE, RULE, OR POLICY

Idaho State Board of Education, Organization Specific Policies & Procedures, Section IV.B.9
Section 33-1612, Idaho Code
IDAPA 08.02.03.004.01, Rules Governing Thoroughness – The Idaho Content Standards

BACKGROUND/DISCUSSION

The Idaho Content Standards reflect statements of what students should know and do in various content disciplines and grades. Content standards are adopted statewide and reviewed every six (6) years by teams of educators and stakeholders. These standards provide a consistent foundational level of academic content needed to be successful at each grade level and to graduate from Idaho's public schools.

Citing the need for further public comments, the Idaho Legislature rejected the science standards in Spring 2016. The State Department of Education (Department) began negotiated rulemaking in April 2016 which included solicitation of public comment online and in regional face to face meetings statewide. Comments through the submission form were accepted for 23 days between when the negotiated rulemaking notice was posted on April 6, 2016 to the end of the comment period on April 29, 2016. Over 400 comments were received with the majority being positive for revised Science standards (96%). All comments were posted online on the Department website.

Following the comment period, the science standards committee met to consider all comments and make changes the committee felt were substantive and warranted. Spring of 2016, draft revised Science standards were developed and finalized in June 2016, but the standards were not sent to the Board in August

with the other revised content standards to allow for additional deliberation on possible revisions.

The sixteen (16) member science standards committee of educators and stakeholders, comprised of new as well as previously serving members, as listed in attachment 3, reconvened in October 2016 to address and further consider public comment and to reformat the Science standards document. The changes brought forth by the committee reflect their belief that these changes should be incorporated into the standards.

The science standards attached are a revised set of standards and are a different version than what the board adopted in August 2015. Differences between the two revisions include substantial revisions of structure and organization, including eliminating correlations to Idaho Content Standards in Mathematics and English Language Arts and Literacy, as well as other correlations to engineering practices. In addition, the committee made revisions to the standards to accommodate and answer concerns of stakeholders and legislators centered on how ideas describing impacts on the earth and age of the Earth are expressed.

IMPACT

These changes to the proposed standards will have no discernible financial impact.

ATTACHMENTS

STAFF COMMENTS AND RECOMMENDATIONS

Temporary rules go into effect at the time of Board approval unless an alternative effective date is specified by Board action. To qualify as a temporary rule, the rule must meet one of three criteria: provides protection of the public health, safety, or welfare; or is to come into compliance with deadlines in amendments to governing law or federal programs; or is conferring a benefit. Temporary rules that are approved prior to the start of a legislative session normally expire at the end of that legislative session. While not typical, there are provisions that allow an agency to present a temporary rule that has been approved prior to the start of a legislative session to the Legislature and to request they extend the rule one year. If the Legislature grants the extension the rule would then expire at the end of the following legislation. To make a temporary rule permanent the Board will have to promulgate a proposed and then pending rule incorporating the new science standards during the 2017 rulemaking cycle. If the temporary rule is extended by the 2017 Legislature a new temporary rule will not have to

promulgate a new temporary rule at that same time in order to keep the standards in place in 2017.

Idaho's science content standards were last updated in 2009. During the 2015 rulemaking cycle new science standards were adopted by the Board and incorporated by reference into Administrative Code. When the rules and incorporated science standards were presented during the 2016 legislative session both the Senate and House Education Committee members expressed concern that the public may not have had enough opportunity to provide feedback to the new standards. The standards were rejected by the Legislature to provide for additional comment and vetting. If approved by the Board, staff could ask the Legislature to extend the rule for another year.

BOARD ACTION

I move to approve the Revised Idaho Science Content Standards, the incorporated by reference document, as submitted in Attachment 3.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

AND

I move to approve the Temporary Rule amendment to IDAPA 08.02.03.004, Rules Governing Thoroughness, the Idaho Content Standards, as submitted in Attachment 1.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

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IDAPA 08
TITLE 02
CHAPTER 03

08.02.03 - RULES GOVERNING THOROUGHNESS

004. INCORPORATION BY REFERENCE.

The following documents are incorporated into this rule: (3-30-07)

01. The Idaho Content Standards. The Idaho Content Standards as adopted by the State Board of Education. Individual subject content standards are adopted in various years in relation to the curricular materials adoption schedule. Copies of the document can be found on the State Board of Education website at www.boardofed.idaho.gov. (3-29-10)

a. Driver Education, as revised and adopted on August 21, 2008. (3-29-10)

b. Health, as revised and adopted on April 17, 2009. (3-29-10)

c. Humanities Categories: (3-29-10)

i. Art, as revised and adopted on April 17, 2009; (3-29-10)

ii. Dance, as revised and adopted on April 17, 2009; (3-29-10)

iii. Drama, as revised and adopted on April 17, 2009; (3-29-10)

iv. Interdisciplinary, as revised and adopted on April 17, 2009; (3-29-10)

v. Music, as revised and adopted on April 17, 2009; (3-29-10)

vi. World languages, as revised and adopted on April 17, 2009; (3-29-10)

d. English Language Arts, as revised and adopted on August 11, 2010. (4-7-11)

e. Limited English Proficiency, as revised and adopted on August 21, 2008. (3-29-10)

f. Mathematics, as revised and adopted on August 11, 2010. (4-7-11)

g. Physical Education, as revised and adopted on April 17, 2009. (3-29-10)

h. Science, as revised and adopted on ~~April 17, 2009~~ December 15, 2016. ~~(3-29-10)~~( )T

i. Social Studies, as revised and adopted on April 17, 2009. (3-29-10)

j. Information and Communication Technology, as revised and adopted on April 22, 2010. (4-7-11)

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Idaho Science Standards White Paper

Science Standards Recommendation
We, the Executive Committee on the Idaho Science Standards Revision, recommend that the Idaho State Department of Education adopt the Idaho State Science Standards. Idaho has a long tradition of local ownership of our educational process and the revised science standards have been created by Idaho's K-16 educators for use in Idaho's science classrooms.

What is Science?
Science is the coordination of a body of knowledge about the natural world and a set of practices that enable humans to explore and understand that world. Science is truly the original human endeavor. Natural explanations for observed phenomena must be based on empirical evidence.

What are the weaknesses of our current science standards?
Science standards are currently in place for K-12 classrooms in Idaho. These standards are very broad and vague in nature. National and local evaluations of these current standards indicate a lack of clarity in science content topics. This makes it very difficult to assess student achievement of these standards because there are not clear performance expectations embedded in them. Inquiry-based learning methods are a best-practice in the field of science education yet they are missing from the Idaho Science document. Another valid criticism of the current science document that that it fails to adequately link math and English Language Arts practices to key scientific applications. Standards should contain a planned scope and sequence of practices and content themes that spirals from kindergarten all the way through to high school and yet the current standards are compartmentalized and full of gaps.

Why do we need to revise our science standards?
Science as a practice is dynamic in nature. Our current science standards document was originally adopted in 2001 with few significant changes in the interim. In the last fifteen years, there have been significant advancements in science and technology; therefore updated science standards are necessary. Science classrooms offer a unique opportunity for students to practice 21st century learning skills that will enable them to be more productive in their future endeavors. When comparing our current science standards with the revised science standards, it becomes clear that the document does not contain new content but is instead driven by a new approach to teaching that content.

Revising Idaho's science standards allows for the integration of "knowing science" and "doing science". Conceptual understanding of content will require practicing science in place of memorizing facts. Structuring science standards around performance expectations makes mastery assessment of student knowledge an embedded component of science education. Updated science standards in this state will allow for learning experiences that will increase both content knowledge as well as scientific and engineering practices over time. This will eliminate the gaps and compartmentalization that is endemic in the current document.
National movement towards an updated version of science standards that is similar to Idaho's revised science standards document is dictating that professional development opportunities and curricular materials that are in development will align better with the revised document than with the current standards. Many of Idaho's post-secondary institutions are already using a version of science standards similar to the revised Idaho Science Standards document in their science and their science education departments to train potential graduates in these fields.

Our science standards are strengthened when we teach science with a Three-Dimensional approach. Teaching three dimensionally means incorporating science content with crosscutting concepts and science and engineering practices. These include adding the following topics into our standards:

- Asking questions/Defining problems
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computer technology and computational thinking
- Constructing explanations/Designing solutions
- Engaging in argument from evidence
- Obtaining, evaluating and communicating information
- Identifying patterns
- Cause and effect
- Scale, proportion and quantity
- Systems and system models
- Energy and matter: flows cycles and conservation
- Structure and function
- Stability and change

2015 Science Committee Members:

- Jason George, Vision Charter, High School Science Teacher & K-12 Science Coordinator, Idaho Presidential Award Recipient
- Chris Taylor, Boise School District, K-12 Science/Social Studies Coordinator
- Melyssa Ferro, Syringa Middle, Science Teacher K-12 Caldwell K-12 Science Coordinator, National Presidential Award Recipient, Idaho Teacher of the Year Award
- Erin Johnson, Aberdeen Middle School Science Teacher, Idaho Science Teacher Association
- Scott Ray, Malad Middle School Science Teacher
- Joe Kelly, Science Coordinator West Ada School District
- Sarah Anderson, Boise State University Department of Education
- Tanya Elmer, Eagle High School Chemistry Teacher, West Ada School District
- Ralph Peterson, North Gem High School Science Teacher, Idaho Science Teacher Association
- Karen Abbot, Boise School District (retired), Idaho Presidential Award Recipient
- Tauna Johnson, Genesee Elementary School, National Presidential Award Recipient
- Zoe Jorgensen, Bush Elementary School Idaho Falls, Idaho Presidential Award Recipient
- Anne Siefert, Idaho National Lab K-12 STEM Coordinator, National STEM Professional Development Leadership Award
- Dr. Bob Compton, Doctor of Veterinary Medicine
- Scott Smith, State Department of Education, K-12 Science and STEM Coordinator
- Scott Cook, State Department of Education, Director, Academic Services/Support/Professional Development
- Angela Hemingway, Idaho STEM Action Center, Executive Director

2016 Science Standards Review Committee Members

Monday, October 24, 2016

- Tammy Nichols, Patron
- Melyssa Ferro, Middle School Science Teacher
- Chris Stoker, K-12 STEM Coordinator, West Ada School District
- Chris Taylor, K-12 Science/Social Studies Coordinator, Boise School District
- Anne Seifert, Idaho National Lab K-12 STEM Coordinator
- Tanya Elmer, Eagle High School Chemistry Teacher
- Tauna Johnson, Genesee Elementary School
- Micah Lauer, Heritage Middle School Life Science Teacher
- Xochi Campos, Boise State University Preservice Teacher
- Ken Wareham, Lewis-Clark State College Higher Ed K-12
- Sarah Anderson, Boise State University Higher Ed K-12
- Angela Hemingway, Idaho STEM Action Center Executive Director
- Scott Smith, State Department of Education K-12 Science and STEM Coordinator
- Heidi Arrate, State Department of Education K-12 Assessment Specialist
- Scott Cook, State Department of Education Curriculum Director
- Marilyn Whitney, Governor's Senior Special Assistant for Education

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IDAHO CONTENT STANDARDS
KINDERGARTEN
SCIENCE

Standard 1: Nature of Science

Students explore the process of scientific investigation through observations and collection of data over time. Students follow instructions and work with others.

Goal 1.1: Understand Systems, Order, and Organization

No objectives at this grade level.

Goal 1.2: Understand Concepts and Processes of Evidence, Models, and Explanations

Objective(s): By the end of Kindergarten, the student will be able to:

K.S.1.2.1 Make observations and collect data. (528.01.a)

Goal 1.3: Understand Constancy, Change, and Measurement

Objective(s): By the end of Kindergarten, the student will be able to:

K.S.1.3.1 Measure in non-standard units. (528.02.b)

Goal 1.4: Understand the Theory that Evolution is a Process that Relates to the Gradual Changes in the Universe and of Equilibrium as a Physical State

Objective(s): By the end of Kindergarten, the student will be able to:

K.S.1.4.1 Apply the concepts of yesterday, today, and tomorrow. (528.03.a)

Goal 1.5: Understand Concepts of Form and Function

No objectives at this grade level.

Goal 1.6: Understand Scientific Inquiry and Develop Critical Thinking Skills

Objective(s): By the end of Kindergarten, the student will be able to:

K.S.1.6.1 Make observations. (529.01.a)

Goal 1.7: Understand That Interpersonal Relationships Are Important in Scientific Endeavors

Objective(s): By the end of Kindergarten, the student will be able to:

K.S.1.7.1 Use cooperation and interaction skills. (538.01.a)

Goal 1.8: Understand Technical Communication

Objective(s): By the end of Kindergarten, the student will be able to:

K.S.1.8.1 Follow instructions. (538.02.a)

Standard 2: Physical Science

Students use their senses to investigate the organizational patterns in the world around them and describe a variety of objects.

Goal 2.1: Understand the Structure and Function of Matter and Molecules and Their Interactions

Objective(s): By the end of Kindergarten, the student will be able to:

K.S.2.1.1 Use senses to describe matter. (530.01.a)

Goal 2.2: Understand Concepts of Motion and Forces

No objectives at this grade level.

Goal 2.3: Understand the Total Energy in the Universe is Constant

No objectives at this grade level.

Goal 2.4: Understand the Structure of Atoms

No objectives at this grade level.

Goal 2.5: Understand Chemical Reactions

No objectives at this grade level.

Standard 3: Biology

Students observe plants and animals and describe their characteristics.

Goal 3.1: Understand the Theory of Biological Evolution

Objective(s): By the end of Kindergarten, the student will be able to:

K.S.3.1.1 Observe and describe the characteristics of plants and animals. (532.01.a)

Goal 3.2: Understand the Relationship between Matter and Energy in Living Systems

Objective(s): By the end of Kindergarten, the student will be able to:

K.S.3.2.1 Describe the difference between living and non-living things. (533.01.a)

Goal 3.3: Understand the Cell is the Basis of Form and Function for All Living Things

No objectives at this grade level.

Standard 4: Earth and Space Systems

Students make and describe observations of seasonal changes.

~~Goal 4.1: Understand Scientific Theories of Origin and Subsequent Changes in the Universe and Earth Systems~~

~~Objective(s): By the end of Kindergarten, the student will be able to:~~

~~K.S.4.1.1 Name the four seasons. (534.01.a)~~
~~K.S.4.1.2 Place the four seasons in order. (534.01.a)~~

~~Goal 4.2: Understand Geo-chemical Cycles and Energy in the Earth System~~

~~No objectives at this grade level.~~

~~Standard 5~~: ~~Personal and Social Perspectives; Technology~~

~~Students describe local environments~~

~~Goal 5.1: Understand Common Environmental Quality Issues, Both Natural and Human Induced~~

~~Objective(s): By the end of Kindergarten, the student will be able to:~~

~~K.S.5.1.1 Describe characteristics of a man-made environment (home, school…). (536.01.a)~~

~~Goal 5.2: Understand the Relationship between Science and Technology~~

~~No objectives at this grade level.~~

~~Goal 5.3: Understand the Importance of Natural Resources and the Need to Manage and Conserve Them~~

~~No objectives at this grade level.~~

IDAHO CONTENT STANDARDS
GRADE 1
SCIENCE

Standard 1: Nature of Science

Students explore the process of scientific investigation through observations and data collection, using standard and non-standard units of measurement. Students follow multi-step instructions and work with others.

Goal 1.1: Understand Systems, Order, and Organization

No objectives at this grade level.

Goal 1.2: Understand Concepts and Processes of Evidence, Models, and Explanations

Objective(s): By the end of Grade 1, the student will be able to:

1.S.1.2.1 Make observations, collect data, and use data. (543.01.a)

Goal 1.3: Understand Constancy, Change, and Measurement

Objective(s): By the end of Grade 1, the student will be able to:

1.S.1.3.1 Measure in both standard and non-standard units. (543.02.b)

Goal 1.4: Understand the Theory that Evolution is a Process that Relates to the Gradual Changes in the Universe and of Equilibrium as a Physical State

Objective(s): By the end of Grade 1, the student will be able to:

1.S.1.4.1 Explain the concepts of past, present, and future. (543.03.a)

Goal 1.5: Understand Concepts of Form and Function

No objectives at this grade level.

Goal 1.6: Understand Scientific Inquiry and Develop Critical Thinking Skills

Objective(s): By the end of Grade 1, the student will be able to:

1.S.1.6.1 Make and record observations. (544.01.a)

Goal 1.7: Understand That Interpersonal Relationships Are Important in Scientific Endeavors

Objective(s): By the end of Grade 1, the student will be able to:

1.S.1.7.1 Demonstrate cooperation and interaction skills. (553.01.a)

Goal 1.8: Understand Technical Communication

Objective(s): By the end of Grade 1, the student will be able to:

1.S.1.8.1 Follow multi-step instructions. (553.02.a)

Standard 2: Physical Science

Students describe properties of common objects and how movement is a change of position.

Goal 2.1: Understand the Structure and Function of Matter and Molecules and Their Interactions

Objective(s): By the end of Grade 1, the student will be able to:

1.S.2.1.1 Describe properties of objects. (545.01.a)

Goal 2.2: Understand Concepts of Motion and Forces

Objective(s): By the end of Grade 1, the student will be able to:

1.S.2.2.1 Describe the position and motion of objects. (ex. revolve, rotate, at rest, float, and fall) (545.02.a)

Goal 2.3: Understand the Total Energy in the Universe is Constant

No objectives at this grade level.

Goal 2.4: Understand the Structure of Atoms

No objectives at this grade level.

Goal 2.5: Understand Chemical Reactions

No objectives at this grade level.

Standard 3: Biology

Students describe the life cycles of living things and how they survive in their environment.

Goal 3.1: Understand the Theory of Biological Evolution

Objective(s): By the end of Grade 1, the student will be able to:

1.S.3.1.1 Describe the life cycle of a plant (seed, growth, reproduction, death). (547.01.a)
1.S.3.1.2 Describe the life cycle of an animal (birth, development, reproduction, death). (547.01.a)

Goal 3.2: Understand the Relationship between Matter and Energy in Living Systems

Objective(s): By the end of Grade 1, the student will be able to:

1.S.3.2.1 State that living things need food to survive. (548.01.a)

Goal 3.3: Understand the Cell is the Basis of Form and Function for All Living Things

No objectives at this grade level.

Standard 4: Earth and Space Systems

Students describe characteristics for each season and the cycle of the seasons.

Goal 4.1: Understand Scientific Theories of Origin and Subsequent Changes in the Universe and Earth Systems

Objective(s): By the end of Grade 1, the student will be able to:

1.S.4.1.1 Identify the four seasons and their characteristics for a local region. (549.01.a)

Goal 4.2: Understand Geo-chemical Cycles and Energy in the Earth System

No objectives at this grade level.

Standard 5: Personal and Social Perspectives; Technology

Students describe characteristics of the local environment.

Goal 5.1: Understand Common Environmental Quality Issues, Both Natural and Human Induced

Objective(s): By the end of Grade 1, the student will be able to:

1.S.5.1.1 Identify the characteristics of local natural environments. (playground, backyard). (551.01.a)

Goal 5.2: Understand the Relationship between Science and Technology

No objectives at this grade level.

Goal 5.3: Understand the Importance of Natural Resources and the Need to Manage and Conserve Them

No objectives at this grade level.

IDAHO CONTENT STANDARDS
GRADE 2
SCIENCE

Students are expected to know content and apply skills from previous grades.

Standard 1: Nature of Science

Students identify questions that can be answered through observation, collection, recording, and analysis of data. Students explain that the shape of an item is determined by its function. Students follow multi-step instructions, work cooperatively and use communication skills.

Goal 1.1: Understand Systems, Order, and Organization

No objectives at this grade level.

Goal 1.2: Understand Concepts and Processes of Evidence, Models, and Explanations

Objective(s): By the end of Grade 2, the student will be able to:

2.S.1.2.1 Make observations, record and interpret data. (558.01.a)

Goal 1.3: Understand Constancy, Change, and Measurement

Objective(s): By the end of Grade 2, the student will be able to:

2.S.1.3.1 Measure in standard and non-standard units. (558.01.b)

Goal 1.4: Understand the Theory that Evolution is a Process that Relates to the Gradual Changes in the Universe and of Equilibrium as a Physical State

Objective(s): By the end of Grade 2, the student will be able to:

2.S.1.4.1 Apply the concepts of past, present, and future. (558.03.a)

Goal 1.5: Understand Concepts of Form and Function

Objective(s): By the end of Grade 2, the student will be able to:

2.S.1.5.1 Identify shape and use of objects. (558.04.a)

Goal 1.6: Understand Scientific Inquiry and Develop Critical Thinking Skills

Objective(s): By the end of Grade 2, the student will be able to:

2.S.1.6.1 Identify questions to be investigated. (559.01.a)
2.S.1.6.2 Make observations. (559.01.b)
2.S.1.6.3 Analyze information and evidence. (559.01.d)
2.S.1.6.4 Communicate observations. (559.01.f)

Goal 1.7: Understand That Interpersonal Relationships Are Important in Scientific Endeavors

Objective(s): By the end of Grade 2, the student will be able to:

2.S.1.7.1 Practice cooperation and interaction skills. (568.01.a)

Goal 1.8: Understand Technical Communication

Objective(s): By the end of Grade 2, the student will be able to:

2.S.1.8.1 Follow multi-step instructions. (568.02.a)

Standard 2: Physical Science

Students describe objects by their properties and explain the affect motion has on an object.

Goal 2.1: Understand the Structure and Function of Matter and Molecules and Their Interactions

Objective(s): By the end of Grade 2, the student will be able to:

2.S.2.1.1 List properties of an object. (560.01.a)

Goal 2.2: Understand Concepts of Motion and Forces

Objective(s): By the end of Grade 2, the student will be able to:

2.S.2.2.1 Explain how force affects the position and motion of objects. (560.01.a)

Goal 2.3: Understand the Total Energy in the Universe is Constant

No objectives at this grade level.

Goal 2.4: Understand the Structure of Atoms

No objectives at this grade level.

Goal 2.5: Understand Chemical Reactions

No objectives at this grade level.

Standard 3: Biology

Students list the basic needs of animals.

Goal 3.1: Understand the Theory of Biological Evolution

No objectives at this grade level.

Goal 3.2: Understand the Relationship between Matter and Energy in Living Systems

Objective(s): By the end of Grade 2, the student will be able to:

2.S.3.2.1 Identify four basic needs of all living things (food, shelter, water, space). (563.01.a)
2.S.3.2.2 Discuss how animals are suited to live in different habitats. (547.01.b)

Goal 3.3: Understand the Cell is the Basis of Form and Function for All Living Things

No objectives at this grade level.

Standard 4: Earth and Space Systems

Students describe weather conditions.

Goal 4.1: Understand Scientific Theories of Origin and Subsequent Changes in the Universe and Earth Systems

Objective(s): By the end of Grade 2, the student will be able to:
2.S.4.1.1 Describe the characteristics of different weather conditions. (564.01.b)

Goal 4.2: Understand Geo-chemical Cycles and Energy in the Earth System

No objectives at this grade level.

Standard 5: Personal and Social Perspectives; Technology

Students compare man-made and natural environments. Students identify scientific tools.

Goal 5.1: Understand Common Environmental Quality Issues, Both Natural and Human Induced

Objective(s): By the end of Grade 2, the student will be able to:
2.S.5.1.1 Compare and contrast man-made and natural environments. (566.01.a)

Goal 5.2: Understand the Relationship between Science and Technology

Objective(s): By the end of Grade 2, the student will be able to:
2.S.5.2.1 Identify tools people have invented for everyday life and for scientific investigations. (565.01.b)

Goal 5.3: Understand the Importance of Natural Resources and the Need to Manage and Conserve Them

No objectives at this grade level.

IDAHO CONTENT STANDARDS
GRADE 3
SCIENCE

Students are expected to know content and apply skills from previous grades.

Standard 1: Nature of Science

Students apply scientific methods to conduct experiments. Students read and give multi-step instructions.

Goal 1.1: Understand Systems, Order, and Organization

Objective(s): By the end of Grade 3, the student will be able to:

3.S.1.1.1 Label the parts of a system. (573.01.a)

Goal 1.2: Understand Concepts and Processes of Evidence, Models, and Explanations

Objective(s): By the end of Grade 3, the student will be able to:

3.S.1.2.1 Make observations, collect data and evaluate it. (573.02.a)
3.S.1.2.2 Replicate and/or use models. (573.02.b)

Goal 1.3: Understand Constancy, Change, and Measurement

Objective(s): By the end of Grade 3, the student will be able to:

3.S.1.3.1 Measure changes that occur. (573.03.b)
3.S.1.3.2 Measure in both U.S. Customary and International System of Measurement (metric system) units. (573.03.c)

Goal 1.4: Understand the Theory that Evolution is a Process that Relates to the Gradual Changes in the Universe and of Equilibrium as a Physical State

No objectives at this grade level.

Goal 1.5: Understand Concepts of Form and Function

Objective(s): By the end of Grade 3, the student will be able to:

3.S.1.5.1 Describe the relationship between shape and use. (573.05.a)

Goal 1.6: Understand Scientific Inquiry and Develop Critical Thinking Skills

Objective(s): By the end of Grade 3, the student will be able to:

3.S.1.6.1 Identify questions that can be answered by conducting scientific tests. (574.01.a)
3.S.1.6.2 Conduct scientific tests (574.01.b)
3.S.1.6.3 Use appropriate tools and techniques to gather and display data. (574.01.c)
3.S.1.6.4 Use data to construct a reasonable explanation. (574.01.d)
3.S.1.6.5 Make simple predictions based on data. (574.01.e)
3.S.1.6.6 Identify logical alternative explanations. (574.01.f)

3.S.1.6.7 Communicate the results of tests to others. (574.01.g)

Goal 1.7: Understand That Interpersonal Relationships Are Important in Scientific Endeavors

No objectives at this grade level.

Goal 1.8: Understand Technical Communication

Objective(s): By the end of Grade 3, the student will be able to:

3.S.1.8.1 Read and give multi-step instructions. (583.02.a)

Standard 2: Physical Science

Students use scientific instruments to describe the physical properties of the three states of matter.

Goal 2.1: Understand the Structure and Function of Matter and Molecules and Their Interactions

Objective(s): By the end of Grade 3, the student will be able to:

3.S.2.1.1 Use instruments to measure properties. (575.01.a)
3.S.2.1.2 Identify the physical properties of solids, liquids, and gases. (575.01.b)
3.S.2.1.3 Explain that heating and cooling can cause changes of state in common materials. (575.01.c)

Goal 2.2: Understand Concepts of Motion and Forces

No objectives at this grade level.

Goal 2.3: Understand the Total Energy in the Universe is Constant

3.S.2.3.1 Identify potential and kinetic energy. (590.03.a)

Goal 2.4: Understand the Structure of Atoms

No objectives at this grade level.

Goal 2.5: Understand Chemical Reactions

No objectives at this grade level.

Standard 3: Biology

Students explore the diversity of plants and animals in their environments. Students demonstrate an understanding of food webs.

Goal 3.1: Understand the Theory of Biological Evolution

Objective(s): By the end of Grade 3, the student will be able to:

3.S.3.1.1 Describe the adaptations of plants and animals to their environment. (577.01.a)

Goal 3.2: Understand the Relationship between Matter and Energy in Living Systems

Objective(s): By the end of Grade 3, the student will be able to:

3.S.3.2.1 Describe the energy needed for living systems to survive. (578.01.a)
3.S.3.2.2 Compare and contrast the energy requirements of plants and animals. (593.01.a)
3.S.3.2.3 Label a food chain that shows how organisms cooperate and compete in an ecosystem. (578.01.b)
3.S.3.2.4 Diagram the food web and explain how organisms both cooperate and compete in ecosystems. (593.01.b)

Goal 3.3: Understand the Cell is the Basis of Form and Function for All Living Things

No objectives at this grade level.

Standard 4: Earth and Space Systems

Students explore the relationship between the sun and Earth.

Goal 4.1: Understand Scientific Theories of Origin and Subsequent Changes in the Universe and Earth Systems

Objective(s): By the end of Grade 3, the student will be able to:

3.S.4.1.1 Explain the reasons for length of a day, the seasons, and the year on Earth. (594.01.a)

Goal 4.2: Understand Geo-chemical Cycles and Energy in the Earth System

No objectives at this grade level.

Standard 5: Personal and Social Perspectives; Technology

Students identify local environmental issues. Students identify the relationship of tools to scientific investigation.

Goal 5.1: Understand Common Environmental Quality Issues, Both Natural and Human Induced

Objective(s): By the end of Grade 3, the student will be able to:

3.S.5.1.1 Identify local environmental issues. (581.01.a)

Goal 5.2: Understand the Relationship between Science and Technology

Objective(s): By the end of Grade 3, the student will be able to:

3.S.5.2.1 Describe how technology helps develop tools. (580.01.a)

~~3.S.5.2.2 Describe the development of tools over time. (580.01.b)~~

~~Goal 5.3: Understand the Importance of Natural Resources and the Need to Manage and Conserve Them~~

~~Objective(s): By the end of Grade 3, the student will be able to:~~

~~3.S.5.3.1 Explain the concept of recycling. (581.03.a)~~

IDAHO CONTENT STANDARDS
GRADE 4
SCIENCE

Students are expected to know content and apply skills from previous grades.

Standard 1: Nature of Science

Students apply scientific methods to conduct experiments, analyze alternative explanations and communicate results of tests. Students analyze and follow multi-step instructions.

Goal 1.1: Understand Systems, Order, and Organization

Objective(s): By the end of Grade 4, the student will be able to:

- 4.S.1.1.1 Explain that a system consists of an organized group of related objects that form a whole. (588.01.a)

Goal 1.2: Understand Concepts and Processes of Evidence, Models, and Explanations

Objective(s): By the end of Grade 4, the student will be able to:

- 4.S.1.2.1 Make and record observations then analyze and communicate the collected data. (588.02.a)
- 4.S.1.2.2 Define observations and inferences. (588.02.b)
- 4.S.1.2.3 Make, describe and/or use models. (588.02.c)

Goal 1.3: Understand Constancy, Change, and Measurement

Objective(s): By the end of Grade 4, the student will be able to:

- 4.S.1.3.1 Describe how changes occur and can be measured. (588.03.b)
- 4.S.1.3.2 Measure in both U.S. Customary and International System of Measurement (metric system) units. (588.03.c)

Goal 1.4: Understand the Theory that Evolution is a Process that Relates to the Gradual Changes in the Universe and of Equilibrium as a Physical State

No objectives at this grade level.

Goal 1.5: Understand Concepts of Form and Function

Objective(s): By the end of Grade 4, the student will be able to:

- 4.S.1.5.1 Explain the relationship between shape and use. (588.05.a)

Goal 1.6: Understand Scientific Inquiry and Develop Critical Thinking Skills

Objective(s): By the end of Grade 4, the student will be able to:

- 4.S.1.6.1 Write questions that can be answered by conducting scientific tests. (589.01.a)
- 4.S.1.6.2 Conduct scientific tests. (589.01.b)
- 4.S.1.6.3 Use appropriate tools and techniques to gather and display data. (589.01.c)

4.S.1.6.4 Use data to construct a reasonable explanation. (589.01.d)
4.S.1.6.5 Make predictions based on data. (589.01.e)
4.S.1.6.6 Analyze alternative explanations. (589.01.f)
4.S.1.6.7 Communicate the results of tests to others in multiple formats. (589.01.g)

Goal 1.7: Understand That Interpersonal Relationships Are Important in Scientific Endeavors

No objectives at this grade level.

Goal 1.8: Understand Technical Communication

Objective(s): By the end of Grade 4, the student will be able to:
4.S.1.8.1 Analyze and follow multi-step instructions. (598.02.a)

Standard 2: Physical Science

Students use scientific instruments to describe and measure the properties of the three states of matter.

Goal 2.1: Understand the Structure and Function of Matter and Molecules and Their Interactions

Objective(s): By the end of Grade 4, the student will be able to:
4.S.2.1.1 Use instruments to measure properties (590.01.a)
4.S.2.1.2 Describe the physical properties of solids, liquids, and gases. (590.01.b)
4.S.2.1.3 Explain the changes caused by heating and cooling materials. (590.01.c)

Goal 2.2: Understand Concepts of Motion and Forces

No objectives at this grade level.

Goal 2.3: Understand the Total Energy in the Universe is Constant

No objectives at this grade level.

Goal 2.4: Understand the Structure of Atoms

No objectives at this grade level.

Goal 2.5: Understand Chemical Reactions

No objectives at this grade level.

Standard 3: Biology

Students analyze how plants and animals adapt to their environments. Students classify vertebrates.

Goal 3.1: Understand the Theory of Biological Evolution

Objective(s): By the end of Grade 4, the student will be able to:

4.S.3.1.1 Analyze and communicate the adaptations of plants and animals to their environment. (592.01.a)
4.S.3.1.2 Describe the difference between vertebrate and invertebrate animals. (592.01.c)
4.S.3.1.3 Classify the five groups of vertebrates (mammal, reptiles, amphibians, birds, and fish) based on characteristics. (592.01.c)

Goal 3.2: Understand the Relationship between Matter and Energy in Living Systems

No objectives at this grade level.

Goal 3.3: Understand the Cell is the Basis of Form and Function for All Living Things

No objectives at this grade level.

Standard 4: Earth and Space Systems

Students investigate the basic contents of our solar system.

Goal 4.1: Understand Scientific Theories of Origin and Subsequent Changes in the Universe and Earth Systems

Objective(s): By the end of Grade 4, the student will be able to:

4.S.4.1.1 Compare and contrast the basic components of our solar system (planets, sun, moon, asteroids, comets, meteors). (594.01.b)
4.S.4.1.2 Explain the effect of gravity on orbits and objects. (594.01.c)
4.S.4.1.3 Explain the effect of moon's gravity on Earth's tides. (594.01.c)

Goal 4.2: Understand Geo-chemical Cycles and Energy in the Earth System

No objectives at this grade level.

Standard 5: Personal and Social Perspectives; Technology

Students explain how people have invented tools to meet a need or do a job.

Goal 5.1: Understand Common Environmental Quality Issues, Both Natural and Human Induced

No objectives at this grade level.

Goal 5.2: Understand the Relationship between Science and Technology

Objective(s): By the end of Grade 4, the student will be able to:

4.S.5.2.1 Identify tools used for space exploration and for scientific investigations. (595.01.b)

~~**Goal 5.3: Understand the Importance of Natural Resources and the Need to Manage and Conserve Them**~~

~~No objectives at this grade level.~~

IDAHO CONTENT STANDARDS
GRADE 5
SCIENCE

Students are expected to know content and apply skills from previous grades.

Standard 1: Nature of Science

Students identify the components of a system and explain their relationship to the whole. Students read, execute, and give technical instructions.

Goal 1.1: Understand Systems, Order, and Organization

Objective(s): By the end of Grade 5, the student will be able to:

5.S.1.1.1 Compare and contrast different systems. (603.01.a)

Goal 1.2: Understand Concepts and Processes of Evidence, Models, and Explanation

Objective(s): By the end of Grade 5, the student will be able to:

5.S.1.2.1 Use observations and data as evidence on which to base scientific explanations and predictions. (603.02a)

5.S.1.2.2 Explain the difference between observation and inference. (603.02.b)

5.S.1.2.3 Use models to explain or demonstrate a concept. (603.02.c)

Goal 1.3: Understand Constancy, Change, and Measurement

Objective(s): By the end of Grade 5, the student will be able to:

5.S.1.3.1 Analyze changes that occur in and among systems. (603.03.b)

5.S.1.3.2 Measure in both U.S. Customary and International System of Measurement (metric system) units with an emphasis on the metric system. (603.03.c)

Goal 1.4: Understand the Theory that Evolution is a Process that Relates to the Gradual Changes in the Universe and of Equilibrium as a Physical State

No objectives at this grade level.

Goal 1.5: Understand Concepts of Form and Function

Objective(s): By the end of Grade 5, the student will be able to:

5.S.1.5.1 Explain how the shape or form of an object or system is frequently related to its use or function. (603.05.a)

Goal 1.6: Understand Scientific Inquiry and Develop Critical Thinking Skills

Objective(s): By the end of Grade 5, the student will be able to:

5.S.1.6.1 Write and analyze questions that can be answered by conducting scientific experiments. (604.01.a)

5.S.1.6.2 Conduct scientific investigations using a control and a variable. (604.01.b)

5.S.1.6.3 Select and use appropriate tools and techniques to gather and display data. (604.01.c)
5.S.1.6.4 Use evidence to analyze descriptions, explanations, predictions, and models. (604.01.d)
5.S.1.6.5 State a hypothesis based on observations. (604.01.e)
5.S.1.6.6 Compare alternative explanations and predictions. (604.01.f)
5.S.1.6.7 Communicate scientific procedures and explanations. (604.01.g)

Goal 1.7: Understand That Interpersonal Relationships Are Important in Scientific Endeavors

No objectives at this grade level.

Goal 1.8: Understand Technical Communication

Objective(s): By the end of Grade 5, the student will be able to:
5.S.1.8.1 Read and follow technical instructions. (613.02.a)

Standard 2: Physical Science

Students explain the difference between an element, a mixture, and a compound.

Goal 2.1: Understand the Structure and Function of Matter and Molecules and Their Interactions

Objective(s): By the end of Grade 5, the student will be able to:
5.S.2.1.1 Describe the differences among elements, compounds, and mixtures. (605.01.a)
5.S.2.1.2 Compare the physical differences among solids, liquids, and gases. (605.01.c)
5.S.2.1.3 Explain the nature of physical change and how it relates to physical properties. (605.01.d)

Goal 2.2: Understand Concepts of Motion and Forces

No objectives at this grade level.

Goal 2.3: Understand the Total Energy in the Universe is Constant

No objectives at this grade level.

Goal 2.4: Understand the Structure of Atoms

No objectives at this grade level.

Goal 2.5: Understand Chemical Reactions

No objectives at this grade level.

Standard 3: Biology

Students explain the differences between plant and animal cells. Students understand that plants convert energy. Students know that traits are passed from parents to offspring.

Goal 3.1: Understand the Theory of Biological Evolution

No objectives at this grade level.

Goal 3.2: Understand the Relationship between Matter and Energy in Living Systems

Objective(s): By the end of Grade 5, the student will be able to:

5.S.3.2.1 Communicate how plants convert energy from the sun through photosynthesis. (608.01.a)

Goal 3.3: Understand the Cell is the Basis of Form and Function for All Living Things

Objective(s): By the end of Grade 5, the student will be able to:

5.S.3.3.1 Compare and contrast the structural differences between plant and animal cells. (606.01.b)

5.S.3.3.2 Explain the concept that traits are passed from parents to offspring. (606.01.c)

Standard 4: Earth and Space Systems

Students describe the dynamic changes that occur on Earth.

Goal 4.1: Understand Scientific Theories of Origin and Subsequent Changes in the Universe and Earth Systems

Objective(s): By the end of Grade 5, the student will be able to:

5.S.4.1.1 Describe the interactions among the solid earth, oceans and atmosphere (erosion, climate, tectonics and continental drift). (609.01.a)

Goal 4.2: Understand Geo-chemical Cycles and Energy in the Earth System

Objective(s): By the end of Grade 5, the student will be able to:

5.S.4.2.1 Explain the rock cycle and identify the three classifications of rocks. (609.02.a)

Standard 5: Personal and Social Perspectives; Technology

Students use the scientific method to identify environmental issues.

Goal 5.1: Understand Common Environmental Quality Issues, Both Natural and Human Induced

Objective(s): By the end of Grade 5, the student will be able to:

5.S.5.1.1 Identify issues for environmental studies. (611.01.a)

~~Goal 5.2: Understand the Relationship between Science and Technology~~

~~Objective(s): By the end of Grade 5, the student will be able to:~~

~~5.S.5.2.1 Describe how science and technology are part of a student's life. (610.01.a)~~
~~5.S.5.2.2 List examples of science and technology. (610.01.b)~~

~~Goal 5.3: Understand the Importance of Natural Resources and the Need to Manage and Conserve Them~~

~~Objective(s): By the end of Grade 5, the student will be able to:~~

~~5.S.5.3.1 Identify the differences between renewable and nonrenewable resources. (611.03.a)~~

IDAHO CONTENT STANDARDS
GRADE 6
SCIENCE

Students are expected to know content and apply skills from previous grades.

Standard 1: Nature of Science

Students gather evidence to differentiate between predictions, observations, and inferences. Students read, give, and execute technical instructions.

Goal 1.1: Understand Systems, Order, and Organization

Objective(s): By the end of Grade 6, the student will be able to:

6.S.1.1.1 Analyze different systems. (618.01.a)

Goal 1.2: Understand Concepts and Processes of Evidence, Models, and Explanation

Objective(s): By the end of Grade 6, the student will be able to:

6.S.1.2.1 Explain how observations and data are used as evidence on which to base scientific explanations and predictions. (618.02.a)
6.S.1.2.2 Use observations to make inferences. (618.02.b)
6.S.1.2.3 Use models to explain or demonstrate a concept. (618.02.c)

Goal 1.3: Understand Constancy, Change, and Measurement

Objective(s): By the end of Grade 6, the student will be able to:

6.S.1.3.1 Analyze changes that occur in and among systems. (618.03.b)
6.S.1.3.2 Measure in both U.S. Customary and International System of Measurement (metric system) units with an emphasis on the metric system. (618.03.c)

Goal 1.4: Understand the Theory that Evolution is a Process that Relates to the Gradual Changes in the Universe and of Equilibrium as a Physical State

No objectives at this grade level.

Goal 1.5: Understand Concepts of Form and Function

Objective(s): By the end of Grade 6, the student will be able to:

6.S.1.5.1 Analyze how the shape or form of an object or system is frequently related to its use and/or function. (618.05.a)

Goal 1.6: Understand Scientific Inquiry and Develop Critical Thinking Skills

Objective(s): By the end of Grade 6, the student will be able to:

6.S.1.6.1 Write and analyze questions that can be answered by conducting scientific experiments. (619.02.a)

6.S.1.6.2 Conduct scientific investigations using a control and variables. Repeat same experiment using alternate variables. (619.02.b)
6.S.1.6.3 Select and use appropriate tools and techniques to gather and display data. (619.02.c)
6.S.1.6.4 Use evidence to analyze data in order to develop descriptions, explanations, predictions, and models. (619.2.d)
6.S.1.6.5 Test a hypothesis based on observations. (619.02.e)
6.S.1.6.6 Communicate scientific procedures and explanations. (619.02.g)

Goal 1.7: Understand That Interpersonal Relationships Are Important in Scientific Endeavors

No objectives at this grade level.

Goal 1.8: Understand Technical Communication

Objective(s): By the end of Grade 6, the student will be able to:
6.S.1.8.1 Read, give, and execute technical instructions. (628.01a)

Standard 2: Physical Science

Students compare and contrast elements, compounds and mixtures. Students explore the effects of force and energy on objects.

Goal 2.1: Understand the Structure and Function of Matter and Molecules and Their Interactions

Objective(s): By the end of Grade 6, the student will be able to:
6.S.2.1.1 Compare and contrast the differences among elements, compounds and mixtures. (620.01.a)
6.S.2.1.2 Define the properties of matter. (620.01.b)
6.S.2.1.3 Compare densities of equal volumes of a solid, a liquid, or a gas. (619.01.c)
6.S.2.1.4 Describe the effect of temperature on density. (620.01.c)
6.S.2.1.5 Explain the nature of physical change and how it relates to physical properties (the distance between molecules as water changes from ice to liquid water, and to water vapor). (620.01.d)

Goal 2.2: Understand Concepts of Motion and Forces

Objective(s): By the end of Grade 6, the student will be able to:
6.S.2.2.1 Describe the effects of different forces (gravity and friction) on the movement, speed, and direction of an object. (620.03.d)

Goal 2.3: Understand the Total Energy in the Universe is Constant

No objectives at this grade level.

Goal 2.4: Understand the Structure of Atoms

No objectives at this grade level.

Goal 2.5: Understand Chemical Reactions

No objectives at this grade level.

Standard 3: Biology

Students understand the building blocks of organisms.

Goal 3.1: Understand the Theory of Biological Evolution

No objectives at this grade level.

Goal 3.2: Understand the Relationship between Matter and Energy in Living Systems

No objectives at this grade level.

Goal 3.3: Understand the Cell is the Basis of Form and Function for All Living Things

Objective(s): By the end of Grade 6, the student will be able to:

6.S.3.3.1 Identify the different structural levels of which an organism is comprised (cells, tissues, organs, organ systems, and organisms). (621.01.a)
6.S.3.3.2 Analyze the structural differences between plant and animal cells. (621.01.b)
6.S.3.3.3 Describe how traits are passed from parents to offspring. (621.01.c)

Standard 4: Earth and Space Systems

Students understand and explain the relationship among the systems on Earth, such as solid earth, oceans, atmosphere, and organisms.

Goal 4.1: Understand Scientific Theories of Origin and Subsequent Changes in the Universe and Earth Systems

Objective(s): By the end of Grade 6, the student will be able to:

6.S.4.1.1 Explain the interactions among the solid earth, oceans, atmosphere, and organisms. (624.01.a)
6.S.4.1.2 Explain the water cycle and its relationship to weather and climate. (624.01.b)
6.S.4.1.3 Identify cumulus, cirrus, and stratus clouds and how they relate to weather changes. (624.01.c)

Goal 4.2: Understand Geo-chemical Cycles and Energy in the Earth System

No objectives at this grade level.

Standard 5: Personal and Social Perspectives; Technology

Students identify issues for environmental studies and understand the difference between renewable and nonrenewable resources.

Goal 5.1: Understand Common Environmental Quality Issues, Both Natural and Human Induced

Objective(s): By the end of Grade 6, the student will be able to:

6.S.5.1.1 Identify issues for environmental studies. (626.01.a)

Goal 5.2: Understand the Relationship between Science and Technology

Objective(s): By the end of Grade 6, the student will be able to:

6.S.5.2.1 Describe how science and technology are part of our society. (625.01.a)
6.S.5.2.2 Describe how science and technology are interrelated. (625.01.b)

Goal 5.3: Understand the Importance of Natural Resources and the Need to Manage and Conserve Them

Objective(s): By the end of Grade 6, the student will be able to:

6.S.5.3.1 Explain the difference between renewable and nonrenewable resources. (626.03.a)

IDAHO CONTENT STANDARDS
GRADE 7
SCIENCE

Students are expected to know content and apply skills from previous grades.

Standard 1: Nature of Science

Students carry out investigations over time using appropriate tools and equipment. Students make inferences based upon data they collect. Students accurately communicate the results of their investigations and observations. Students support or revise their conclusions by critically analyzing alternate explanations. Students carry out investigations following written lab procedures. Students follow safety protocols in carrying out investigations.

Goal 1.1: Understand Systems, Order, and Organization

Objective(s): By the end of Grade 7 the student will be able to:

7.S.1.1.1 Define small systems as a part of a whole system. (633.01.a)
7.S.1.1.2 Determine how small systems contribute to the function of the whole. (633.01.a)
7.S.1.1.3 Identify the different structural levels of an organism (cells, tissues, organs, and organ systems). (633.01.b)

Goal 1.2: Understand Concepts and Processes of Evidence, Models, and Explanation

Objective(s): By the end of Grade 7, the student will be able to:

7.S.1.2.1 Describe how observations and data are evidence on which to base scientific explanations and predictions. (633.02.a)
7.S.1.2.2 Use observations to make defendable inferences. (633.02.b)
7.S.1.2.3 Use models to explain or demonstrate a concept. (633.02.c)

Goal 1.3: Understand Constancy, Change, and Measurement

Objective(s): By the end of Grade 7, the student will be able to:

7.S.1.3.1 Identify concepts of science that have been stable over time. (633.03.a)
7.S.1.3.2 Recognize changes that occur within systems. (633.03.b)
7.S.1.3.3 Make metric measurements using appropriate tools. (633.03.c)

Goal 1.4: Understand the Theory that Evolution is a Process that Relates to the Gradual Changes in the Universe and of Equilibrium as a Physical State

Reference to objective 7.S.3.2.1

Goal 1.5: Understand Concepts of Form and Function

No objectives at this grade level.

Goal 1.6: Understand Scientific Inquiry and Develop Critical Thinking Skills

Objective(s): By the end of Grade 7, the student will be able to:

7.S.1.6.1 Identify controls and variables used in scientific investigations. (634.01.b)
7.S.1.6.2 Use appropriate tools and techniques to gather and display data. (634.01c)
7.S.1.6.3 Evaluate data in order to form conclusions. (634.01.d)
7.S.1.6.4 Use evidence and critical thinking to accept or reject a hypothesis. (634.01.e)
7.S.1.6.5 Evaluate alternative explanations or predictions. (634.01.f)
7.S.1.6.6 Communicate and defend scientific procedures and explanations. (634.01.g)

Goal 1.7: Understand That Interpersonal Relationships Are Important in Scientific Endeavors

No objectives at this grade level.

Goal 1.8: Understand Technical Communication

Objective(s): By the end of Grade 7, the student will be able to:

7.S.1.8.1 Read and evaluate technical instructions. (643.02.a)

Standard 2: Physical Science

No goals or objectives at this grade level.

Standard 3: Biology

Students state the levels of cellular organization and list cell parts and their respective functions. Students explain how traits are passed from one generation to another. Students differentiate between plant and animals cells by identifying the characteristic parts of each. Students explain how organisms are adapted to their environment and interact with the biotic and abiotic components of the environment.

Goal 3.1: Understand the Theory of Biological Evolution

Objective(s): By the end of Grade 7, the student will be able to:

7.S.3.1.1 Describe how natural selection explains species change over time. (637.01.a)

Goal 3.2: Understand the Relationship between Matter and Energy in Living Systems

Objective(s): By the end of Grade 7, the student will be able to:

7.S.3.2.1 Describe how energy stored in food is primarily derived from the sun through photosynthesis. (638.01.a)
7.S.3.2.2 Describe how the availability of resources (matter and energy) limits the distribution and abundance of organisms. (638.01.b)
7.S.3.2.3 Illustrate how atoms and molecules cycle among the living and nonliving components of the biosphere. (638.01.c)
7.S.3.2.4 Identify how energy flows through ecosystems in one direction, from photosynthetic organisms to herbivores, carnivore, and decomposers. (638.01.d)

Goal 3.3: Understand the Cell is the Basis of Form and Function for All Living Things

Objective(s): By the end of Grade 7, the student will be able to:

7.S.3.3.1 Explain the relationships among specialized cells, tissues, organs, organ systems, and organisms. (636.01.a)
7.S.3.3.2 Identify the parts of specialized plant and animal cells. (636.01.b)
7.S.3.3.3 Identify the functions of cell structures. (636.01.b)
7.S.3.3.4 Describe cell functions that involve chemical reactions. (630.01.c)
7.S.3.3.5 Describe how dominant and recessive traits are inherited. (636.01.e)

Standard 4: Earth and Space Systems

No goals or objectives at this grade level.

Standard 5: Personal and Social Perspectives; Technology

Students understand that science and technology interact and impact both individuals and society.

Goal 5.1: Understand Common Environmental Quality Issues, Both Natural and Human Induced

No objectives at this grade level.

Goal 5.2: Understand the Relationship between Science and Technology

Objective(s): By the end of Grade 7, the student will be able to:

7.S.5.2.1 Explain how science and technology are interrelated. (640.01.a)
7.S.5.2.2 Explain how science advances technology. (640.01.b)

Goal 5.3: Understand the Importance of Natural Resources and the Need to Manage and Conserve Them

Objective(s): By the end of Grade 7, the student will be able to:

7.S.5.3.1 Identify alternative sources of energy. (641.03.a)

IDAHO CONTENT STANDARDS
GRADE 8-9
PHYSICAL SCIENCE

Students are expected to know content and apply skills from previous grades.

Standard 1: Nature of Science

Students exercise the basic tenets of scientific investigation, make accurate observations, exercise critical thinking skills, apply proper scientific instruments of investigation and measurement tools, and communicate results in problem solving. Students evaluate the validity of information by utilizing the tools of scientific thinking and investigation. Students summarize their findings by creating lab reports using technical writing including graphs, charts, and diagrams to communicate the results of investigations.

Goal 1.1: Understand Systems, Order, and Organization

Objective(s): By the end of Physical Science, the student will be able to:

- 8-9.PS.1.1.1 Explain the scientific meaning of system, order, and organization. (648.01a)
- 8-9.PS.1.1.2 Apply the concepts of order and organization to a given system. (648.01a)

Goal 1.2: Understand Concepts and Processes of Evidence, Models, and Explanation

Objective(s): By the end of Physical Science, the student will be able to:

- 8-9.PS.1.2.1 Use observations and data as evidence on which to base scientific explanations. (648.02a)
- 8-9.PS.1.2.2 Develop models to explain concepts or systems. (648.02b)
- 8-9.PS.1.2.3 Develop scientific explanations based on knowledge, logic, and analysis. (648.02c)

Goal 1.3: Understand Constancy, Change, and Measurement

Objective(s): By the end of Physical Science, the student will be able to:

- 8-9.PS.1.3.1 Measure changes that can occur in and among systems. (648.03b)
- 8-9.PS.1.3.2 Analyze changes that can occur in and among systems. (648.03b)
- 8-9.PS.1.3.3 Measure and calculate using the metric system. (648.03c)

Goal 1.4: Understand the Theory that Evolution is a Process that Relates to the Gradual Changes in the Universe and of Equilibrium as a Physical State

No objectives in Physical Science.

Goal 1.5: Understand Concepts of Form and Function

No objectives in Physical Science.

Goal 1.6: Understand Scientific Inquiry and Develop Critical Thinking Skills

Objective(s): By the end of Physical Science, the student will be able to:

8-9.PS.1.6.1 Identify questions and concepts that guide scientific investigations. (649.01a)
8-9.PS.1.6.2 Utilize the components of scientific problem solving to design, conduct, and communicate results of investigations. (649.01b)
8-9.PS.1.6.3 Use appropriate technology and mathematics to make investigations. (649.01c)
8-9.PS.1.6.4 Formulate scientific explanations and models using logic and evidence. (649.01d)
8-9.PS.1.6.5 Analyze alternative explanations and models. (649.01e)
8-9.PS.1.6.6 Communicate and defend a scientific argument. (649.01f)
8-9.PS.1.6.7 Explain the differences among observations, hypotheses, and theories. (649.01g)

Goal 1.7: Understand That Interpersonal Relationships Are Important in Scientific Endeavors

No objectives in Physical Science.

Goal 1.8: Understand Technical Communication

Objective(s): By the end of Physical Science, the student will be able to:

8-9.PS.1.8.1 Analyze technical writing, graphs, charts, and diagrams. (658.02a)

Standard 2: Physical Science

Students explain the structure and properties of atoms, including isotopes. Students explain how chemical reactions, while requiring or releasing energy, can neither destroy nor create energy or matter. Students explain the differences between fission and fusion. Students explain the interactions of force and mass in describing motion using Newton's Laws. Students explain how energy can be transformed from one form to another while the total amount of energy remains constant. Students classify energy as potential and/or kinetic, and as energy contained in a field.

Goal 2.1: Understand the Structure and Function of Matter and Molecules and Their Interactions

No objectives in Physical Science.

Goal 2.2: Understand Concepts of Motion and Forces

Objective(s): By the end of Physical Science, the student will be able to:

8-9.PS.2.2.1 Explain motion using Newton's Laws of Motion. (650.04b)

Goal 2.3: Understand the Total Energy in the Universe is Constant

Objective(s): By the end of Physical Science, the student will be able to:

8-9.PS.2.3.1 Explain that energy can be transformed but cannot be created nor destroyed. (650.05a)

8-9.PS.2.3.2 Classify energy as potential and/or kinetic and as energy contained in a field. (650.05b)

Goal 2.4: Understand the Structure of Atoms

Objective(s): By the end of Physical Science, the student will be able to:

8-9.PS.2.4.1 Describe the properties, function, and location of protons, neutrons, and electrons. (650.01a)

8-9.PS.2.4.2 Explain the processes of fission and fusion. (650.01b)

8-9.PS.2.4.3 Describe the characteristics of isotopes. (650.01c)

8-9.PS.2.4.4 State the basic electrical properties of matter. (650.01d)

8-9.PS.2.4.5 Describe the relationships between magnetism and electricity.

Goal 2.5: Understand Chemical Reactions

Objective(s): By the end of Physical Science, the student will be able to:

8-9.PS.2.5.1 Explain how chemical reactions may release or consume energy while the quantity of matter remains constant. (650.03a)

Standard 3: Biology

No goals or objectives in Physical Science.

Standard 4: Earth and Space Systems

No goals or objectives in Physical Science.

Standard 5: Personal and Social Perspectives; Technology

Students understand that science and technology interact and impact both society and the environment.

Goal 5.1: Understand Common Environmental Quality Issues, Both Natural and Human Induced

No objectives in Physical Science.

Goal 5.2: Understand the Relationship between Science and Technology

Objective(s): By the end of Physical Science, the student will be able to:

8-9.PS.5.2.1 Explain how science advances technology. (655.01a)

8-9.PS.5.2.2 Explain how technology advances science. (655.01a)

~~8-9.PS.5.2.3 Explain how science and technology are pursued for different purposes. (656.01b)~~

~~Goal 5.3: Understand the Importance of Natural Resources and the Need to Manage and Conserve Them~~

~~No objectives in Physical Science.~~

IDAHO CONTENT STANDARDS
GRADE 8-9
EARTH SCIENCE

Students are expected to know content and apply skills from previous grades.

Standard 1: Nature of Science

Students exercise the basic tenets of scientific investigation, make accurate observations, exercise critical thinking skills, apply proper scientific instruments of investigation and measurement tools, and communicate results in problem solving. Students evaluate the validity of information by utilizing the tools of scientific thinking and investigation. Students summarize their findings by creating lab reports using technical writing including graphs, charts, and diagrams to communicate the results of investigations.

Goal 1.1: Understand Systems, Order, and Organization

Objective(s): By the end of Earth Science, the student will be able to:

- 8-9.ES.1.1.1 Explain the scientific meaning of system, order, and organization. (648.01a)
- 8-9.ES.1.1.2 Apply the concepts of order and organization to a given system. (648.01a)

Goal 1.2: Understand Concepts and Processes of Evidence, Models, and Explanation

Objective(s): By the end of Earth Science, the student will be able to:

- 8-9.ES.1.2.1 Use observations and data as evidence on which to base scientific explanations. (648.02a)
- 8-9.ES.1.2.2 Develop models to explain concepts or systems. (648.02b)
- 8-9.ES.1.2.3 Develop scientific explanations based on knowledge, logic, and analysis. (648.02c)

Goal 1.3: Understand Constancy, Change, and Measurement

Objective(s): By the end of Earth Science, the student will be able to:

- 8-9.ES.1.3.1 Measure changes that can occur in and among systems. (648.03b)
- 8-9.ES.1.3.2 Analyze changes that can occur in and among systems. (648.03b)
- 8-9.ES.1.3.3 Measure and calculate using the metric system. (648.03c)

Goal 1.4: Understand the Theory that Evolution is a Process that Relates to the Gradual Changes in the Universe and of Equilibrium as a Physical State

No objectives in Earth Science.

Goal 1.5: Understand Concepts of Form and Function

No objectives in Earth Science.

Goal 1.6: Understand Scientific Inquiry and Develop Critical Thinking Skills

Objective(s): By the end of Earth Science, the student will:

- 8-9.ES.1.6.1 Identify questions and concepts that guide scientific investigations. (649.01a)
- 8-9.ES.1.6.2 Utilize the components of scientific problem solving to design, conduct, and communicate results of investigations. (649.01b)
- 8-9.ES.1.6.3 Use appropriate technology and mathematics to make investigations. (649.01c)
- 8-9.ES.1.6.4 Formulate scientific explanations and models using logic and evidence. (649.01d)
- 8-9.ES.1.6.5 Analyze alternative explanations and models. (649.01e)
- 8-9.ES.1.6.6 Communicate and defend a scientific argument. (649.01f)
- 8-9.ES.1.6.7 Explain the differences among observations, hypotheses, and theories. (649.01g)

Goal 1.7: Understand That Interpersonal Relationships Are Important in Scientific Endeavors

No objectives in Earth Science.

Goal 1.8: Understand Technical Communication

Objective(s): By the end of Earth Science, the student will be able to:

- 8-9.ES.1.8.1 Analyze technical writing, graphs, charts, and diagrams. (658.02a)

Standard 2: Physical Science

No goals or objectives in Earth Science.

Standard 3: Biology

No goals or objectives in Earth Science.

Standard 4: Earth and Space Systems

Students describe the current theory explaining the formation of the solar system. Students explain earth processes, events (erosion, uplifting, earthquakes, volcanic eruptions, etc.), and geological time. Students explain Earth's heat sources.

Goal 4.1: Understand Scientific Theories of Origin and Subsequent Changes in the Universe and Earth Systems

Objective(s): By the end of Earth Science, the student will be able to:

- 8-9.ES.4.1.1 Explain the current scientific theory that suggests that the solar system formed from a nebular cloud of dust and gas. (654.01a)
- 8-9.ES.4.1.2 Identify methods used to estimate geologic time. (654.01b)
- 8-9.ES.4.1.3 Show how interactions among the solid earth, oceans, atmosphere, and organisms have changed the earth system over time. (654.01c)

Goal 4.2: Understand Geo-chemical Cycles and Energy in the Earth System

Objective(s): By the end of Earth Science, the student will be able to:

8-9.ES.4.2.1 Explain the internal and external energy sources of the earth (654.02a)

Standard 5: Personal and Social Perspectives; Technology

Students understand that science and technology interact and impact both society and the environment. Students describe issues such as water and air quality, hazardous waste, renewable and nonrenewable resources.

Goal 5.1: Understand Common Environmental Quality Issues, Both Natural and Human Induced

Objective(s): By the end of Earth Science, the student will be able to:

8-9.ES.5.1.1 Analyze environmental issues such as water and air quality, hazardous waste, and depletion of natural resources. (656.01a)

Goal 5.2: Understand the Relationship between Science and Technology

Objective(s): By the end of Earth Science, the student will be able to:

8-9.ES.5.2.1 Explain how science advances technology. (655.01a)
8-9.ES.5.2.2 Explain how technology advances science. (655.01a)
8-9.ES.5.2.3 Explain how science and technology are pursued for different purposes. (655.01b)

Goal 5.3: Understand the Importance of Natural Resources and the Need to Manage and Conserve Them

Objective(s): By the end of Earth Science, the student will be able to:

8-9.ES.5.3.1 Describe the difference between renewable and nonrenewable resources. (656.03a)

IDAHO CONTENT STANDARDS
GRADE 9-10
BIOLOGY

Students are expected to know content and apply skills from previous grades.

Standard 1: Nature of Science

Students exercise the basic tenets of scientific investigation, make accurate observations, exercise critical thinking skills, apply proper scientific instruments of investigation and measurement tools, and communicate results in problem solving. Students evaluate the validity of information by utilizing the tools of scientific thinking and investigation. Students summarize their findings by creating lab reports using technical writing including graphs, charts, and diagrams to communicate the results of investigations.

Goal 1.1: Understand Systems, Order, and Organization

Objective(s): By the end of Biology, the student will be able to:

- 9-10.B.1.1.1 Explain the scientific meaning of system, order, and organization. (648.01a)
- 9-10.B.1.1.2 Apply the concepts of order and organization to a given system. (648.01a)

Goal 1.2: Understand Concepts and Processes of Evidence, Models, and Explanation

Objective(s): By the end of Biology, the student will be able to:

- 9-10.B.1.2.1 Use observations and data as evidence on which to base scientific explanations. (648.02a)
- 9-10.B.1.2.2 Develop models to explain concepts or systems. (648.02b)
- 9-10.B.1.2.3 Develop scientific explanations based on knowledge, logic and analysis. (648.02c)

Goal 1.3: Understand Constancy, Change, and Measurement

Objective(s): By the end of Biology, the student will be able to:

- 9-10.B.1.3.1 Measure changes that can occur in and among systems. (648.03b)
- 9-10.B.1.3.2 Analyze changes that can occur in and among systems. (648.03b)
- 9-10.B.1.3.3 Measure and calculate using the metric system. (648.03c)

Goal 1.4: Understand the Theory that Evolution is a Process that Relates to the Gradual Changes in the Universe and of Equilibrium as a Physical State

Reference to 7.S.3.2.1

Goal 1.5: Understand Concepts of Form and Function

No objectives in Biology.

Goal 1.6: Understand Scientific Inquiry and Develop Critical Thinking Skills

Objective(s): By the end of Biology, the student will be able to:

- 9-10.B.1.6.1 Identify questions and concepts that guide scientific investigations. (649.01a)
- 9-10.B.1.6.2 Utilize the components of scientific problem solving to design, conduct, and communicate results of investigations. (649.01b)
- 9-10.B.1.6.3 Use appropriate technology and mathematics to make investigations. (649.01c)
- 9-10.B.1.6.4 Formulate scientific explanations and models using logic and evidence. (649.01d)
- 9-10.B.1.6.5 Analyze alternative explanations and models. (649.01e)
- 9-10.B.1.6.6 Communicate and defend a scientific argument. (649.01f)
- 9-10.B.1.6.7 Explain the differences among observations, hypotheses, and theories. (649.01g)

Goal 1.7: Understand That Interpersonal Relationships Are Important in Scientific Endeavors

No objectives in Biology.

Goal 1.8: Understand Technical Communication

Objective(s): By the end of Biology, the student will be able to:

- 9-10.B.1.8.1 Analyze technical writing, graphs, charts, and diagrams. (658.02a)

Standard 2: Physical Science

No goals or objectives in Biology.

Standard 3: Biology

Students explain the importance of cells as they relate to the organization and structure of complex organisms, differentiation and specialization during development, and the chemical reactions necessary to sustain life. Students describe the functions of cell structures. Students use the theory of evolution to explain diversity of life.

Goal 3.1: Understand the Theory of Biological Evolution

Objective(s): By the end of Biology, the student will be able to:

- 9-10.B.3.1.1 Use the theory of evolution to explain how species change over time. (652.01a)
- 9-10.B.3.1.2 Explain how evolution is the consequence of interactions among the potential of a species to increase its numbers, genetic variability, a finite supply of resources, and the selection by the environment of those offspring better able to survive and reproduce. (652.01a)

Goal 3.2: Understand the Relationship between Matter and Energy in Living Systems

Objective(s): By the end of Biology, the student will be able to:

- 9-10.B.3.2.1 Explain how matter tends toward more disorganized states (entropy). (653.01a)
- 9-10.B.3.2.2 Explain how organisms use the continuous input of energy and matter to maintain their chemical and physical organization. (653.01b)
- 9-10.B.3.2.3 Show how the energy for life is primarily derived from the sun through photosynthesis. (653.01c)
- 9-10.B.3.2.4 Describe cellular respiration and the synthesis of macromolecules. (653.01d)
- 9-10.B.3.2.5 Show how matter cycles and energy flows through the different levels of organization of living systems (cells, organs, organisms, communities) and their environment. (653.01h)

Goal 3.3: Understand the Cell is the Basis of Form and Function for All Living Things

Objective(s): By the end of Biology, the student will be able to:

- 9-10.B.3.3.1 Identify the particular structures that underlie the cellular functions. (651.01a)
- 9-10.B.3.3.2 Explain cell functions involving chemical reactions. (651.01b)
- 9-10.B.3.3.3 Explain how cells use DNA to store and use information for cell functions. (651.01c)
- 9-10.B.3.3.4 Explain how selective expression of genes can produce specialized cells from a single cell. (651.01e)

Standard 4: Earth and Space Systems

No goals or objectives in Biology.

Standard 5: Personal and Social Perspectives; Technology

Students understand that science and technology interact and impact both society and the environment. Students describe issues such as water and air quality, hazardous waste, renewable and nonrenewable resources.

Goal 5.1: Understand Common Environmental Quality Issues, Both Natural and Human Induced

Objective(s): By the end of Biology, the student will be able to:

- 9-10.B.5.1.1 Analyze environmental issues such as water and air quality, hazardous waste, forest health, and agricultural production. (656.01a)

Goal 5.2: Understand the Relationship between Science and Technology

Objective(s): By the end of Biology, the student will be able to:

- 9-10.B.5.2.1 Explain how science advances technology. (655.01a)
- 9-10.B.5.2.2 Explain how technology advances science. (655.01a)

9-10.B.5.2.3 Explain how science and technology are pursued for different purposes. (656.01b)

Goal 5.3: Understand the Importance of Natural Resources and the Need to Manage and Conserve Them

Objective(s): By the end of Biology, the student will be able to:

9-10.B.5.3.1 Describe the difference between renewable and nonrenewable resources. (656.03a)

IDAHO CONTENT STANDARDS
GRADE 11-12
CHEMISTRY

Students are expected to know content and apply skills from previous grades.

Standard 1: Nature of Science

Students exercise the basic tenets of scientific investigation, make accurate observations, exercise critical thinking skills, apply proper scientific instruments of investigation and measurement tools, and communicate results in problem solving. Students evaluate the validity of information by utilizing the tools of scientific thinking and investigation. Students summarize their findings by creating lab reports using technical writing including graphs, charts, and diagrams to communicate the results of investigations.

Goal 1.1: Understand Systems, Order, and Organization

Objective(s): By the end of Chemistry, the student will be able to:

11-12.C.1.1.1 Use the periodic table to predict physical and chemical properties.

Goal 1.2: Understand Concepts and Processes of Evidence, Models, and Explanation

Objective(s): By the end of Chemistry, the student will be able to:

11-12.C.1.2.1 Describe the historical development of the periodic table.
11-12.C.1.2.2 Create and interpret graphs of data.
11-12.C.1.2.3 Explain and interpret the key concepts of the kinetic molecular theory.
11-12.C.1.2.4 Distinguish the common theories defining acids and bases.

Goal 1.3: Understand Constancy, Change, and Measurement

Objective(s): By the end of Chemistry, the student will be able to:

11-12.C.1.3.1 Identify, compare and contrast physical and chemical properties and changes and appropriate computations.
11-12.C.1.3.2 Perform computations using scientific notation, the metric system and dimensional analysis.
11-12.C.1.3.3 Compute measurement uncertainty to include precision, accuracy and the rules for significant digits.

11-12.C.1.3.4 Perform calculations related to the conversion of grams to moles to particles, atoms, molecules and volume.
11-12.C.1.3.5 Analyze and solve reaction stoichiometry problems.
11-12.C.1.3.6 Express concentrations of solutions in various ways including molarity.
11-12.C.1.3.7 Interpret how the presence of solute particles affect the properties of a solution and be able to do calculations involving colligative properties.
11-12.C.1.3.8 Analyze quantitative relationships involved in acid/base chemistry including pH.

Goal 1.4: Understand the Theory that Evolution is a Process that Relates to the Gradual Changes in the Universe and of Equilibrium as a Physical State

No objectives in Chemistry.

Goal 1.5: Understand Concepts of Form and Function

No objectives in Chemistry.

Goal 1.6: Understand Scientific Inquiry and Develop Critical Thinking Skills

Objective(s): By the end of Chemistry, the student will be able to:
11-12.C.1.6.1 Demonstrate an understanding of the scientific method.
11-12.C.1.6.2 Select and use appropriate scientific equipment, materials and techniques.

Goal 1.7: Understand That Interpersonal Relationships Are Important in Scientific Endeavors

Objective(s): By the end of Chemistry, the student will be able to:
11-12.C.1.7.1 Explain how a series of historically related and documented experiments led to the current model and structure of the atom.

Goal 1.8: Understand Technical Communication

Objective(s): By the end of Chemistry, the student will be able to:
11-12.C.1.8.1 Correctly write symbols, formulas and names for common elements, ions and compounds.
11-12.C.1.8.2 Communicate scientific investigations and information clearly.

Standard 2: Physical Science

Students explain the structure and properties of atoms, including isotopes. Students explain how chemical reactions, while requiring or releasing energy, can neither destroy nor create energy or matter. Students explain the differences between fission and fusion. Students explain the interactions of force and mass in describing motion using Newton's Laws. Students explain how energy can be transformed from one form to another while the total amount of energy remains constant. Students classify energy as potential and/or kinetic, and as energy contained in a field.

Goal 2.1: Understand the Structure and Function of Matter and Molecules and Their Interactions

Objective(s): By the end of Chemistry, the student will be able to:

11-12.C.2.1.1 Explain and understand how electrons are involved in the formation of chemical bonds using the octet rule and Lewis dot diagrams.
11-12.C.2.1.2 Predict the polarity of chemical bonds using electronegativity.
11-12.C.2.1.3 Predict physical properties of compounds based upon the attractive forces between atoms and molecules.
11-12.C.2.1.4 Distinguish and classify all matter into appropriate categories.
11-12.C.2.1.5 Explain the relationship and reactions of acids, bases, and salts.
11-12.C.2.1.6 Explain the role of dissociation and ionization in producing strong, weak, and nonelectrolytes.

Goal 2.2: Understand Concepts of Motion and Forces

Objective(s): By the end of Chemistry, the student will be able to:

11-12.C.2.2.1 Describe the Kinetic Molecular Theory as it applies to phases of matter.

Goal 2.3: Understand the Total Energy in the Universe is Constant

Objective(s): By the end of Chemistry, the student will be able to:

11-12.C.2.3.1 Explain and calculate the changes in heat energy that occur during chemical reactions and phase changes.
11-12.C.2.3.2 Demonstrate the conservation of matter by balancing chemical equations.
11-12.C.2.3.3 Differentiate between exothermic and endothermic chemical reactions during chemical or physical changes.

Goal 2.4: Understand the Structure of Atoms

Objective(s): By the end of Chemistry, the student will be able to:

11-12.C.2.4.1 Interpret the classic historical experiments that were used to identify the components of an atom and its structure.
11-12.C.2.4.2 Deduce the number of protons, neutrons and electrons for an atom or ion.
11-12.C.2.4.3 Describe the relationship between the structure of atoms and light absorption and emission.
11-12.C.2.4.4 Determine and illustrate electron arrangements of elements using electron configurations and orbital energy diagrams.

Goal 2.5: Understand Chemical Reactions

Objective(s): By the end of Chemistry, the student will be able to:

11-12.C.2.5.1 Illustrate the Law of Conservation of Mass and the Law of Definite Proportions.
11-12.C.2.5.2 Classify, write and balance chemical equations for common types of chemical reactions and predict the products.
11-12.C.2.5.3 Describe the factors that influence the rates of chemical reactions.

~~Standard 3: Biology~~

~~No goals or objectives in Chemistry.~~

~~Standard 4: Earth and Space Systems~~

~~No goals or objectives in Chemistry.~~

~~Standard 5: Personal and Social Perspectives; Technology~~

~~Students understand that science and technology interact and impact both society and the environment.~~

~~Goal 5.1: Understand Common Environmental Quality Issues, Both Natural and Human Induced~~

~~Objective(s): By the end of Chemistry, the student will be able to:~~

~~11-12.C.5.1.1 Demonstrate the ability to work safely and effectively in a chemistry laboratory.~~

~~Goal 5.2: Understand the Relationship between Science and Technology~~

~~Objective(s): By the end of Chemistry, the student will be able to:~~

~~11-12.C.5.2.1 Assess the role of chemistry in enabling technological advances.~~

~~Goal 5.3: Understand the Importance of Natural Resources and the Need to Manage and Conserve Them~~

~~Objective(s): By the end of Chemistry, the student will be able to:~~

~~11-12.C.5.3.1 Evaluate the role of chemistry in energy and environmental issues.~~

Idaho State Science Standards

Draft

November 2016

Table of Contents

Introduction

The Idaho State Science Standards are essential for developing the science literacy of Idaho students, as it is vital that our students understand the fundamental laws and practices within scientific disciplines. This document provides stakeholders with a set of rigorous and relevant science performance standards that prepare students to be informed, contributing citizens of the 21st century world. The unifying goal is for Idaho students to practice and perform science and use their working knowledge of science to successfully function in a complex world.

Using this Document

PS2-K-1

Science Domain + Unit (physical science) (energy is the 2nd unit)

Grade Level (kindergarten)

Standard # (1st performance standard)

Category Headings	Other Abbreviations
PS - Performance Standard SC - Supporting Content	ETS - Engineering and Technology Standard K - Kindergarten MS - Middle School HS - High School

Science Domains

LS - Life Science
PS - Physical Science
PSC - Physical Science Chemistry
PSP - Physical Science Physics
ESS - Earth and Space Science

Elementary School (Kindergarten)

PS: Physical Sciences

PS1-K Motion and Stability: Forces and Interactions

Performance Standards

Students who demonstrate understanding can:

PS1-K-1. Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

- Further Explanation: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.
- Content Limit: Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets.

PS1-K-2. Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.

- Further Explanation: Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn.
- Content Limit: Assessment does not include friction as a mechanism for change in speed.

Supporting Content

PS2.A: Forces and Motion

- Pushes and pulls can have different strengths and directions. (PS1-K-1, PS1-K-2)
- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. (PS1-K-1, PS1-K-2)

PS2.B: Types of Interactions

- When objects touch or collide, they push on one another and can change motion. (PS1-K-1)

PS3.C: Relationship Between Energy and Forces

- A bigger push or pull makes things speed up or slow down more quickly. (PS1-K-1)

ETS1.A: Defining Engineering Problems

- A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. (PS1-K-2)

PS2-K Energy

Performance Standards

Students who demonstrate understanding can:

PS2-K-1. Make observations to determine the effect of sunlight on Earth's surface.

- Further Explanation: Examples of Earth's surface could include sand, soil, rocks, and water.
- Content Limit: Assessment of temperature is limited to relative measures such as warmer/cooler.

PS2-K-2. Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.

- Further Explanation: Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun.

Supporting Content

PS3.B: Conservation of Energy and Energy Transfer

- Sunlight warms Earth's surface. (PS2-K-1, PS2-K-2)

LS: Life Sciences

LS1-K Molecules to Organisms: Structure and Processes

Performance Standards

Students who demonstrate understanding can:

LS1-K-1. Use observations to describe patterns of what plants and animals (including humans) need to survive.

- Further Explanation: Examples of patterns could include that animals need to take in food but plants produce their own; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.

LS1-K-2. Use classification supported by evidence to differentiate between living and non-living items.

- Further Explanation: Use chart or Venn diagram to sort objects or pictures into living and not-living items.

Supporting Content

LS1.C: Organization for Matter and Energy Flow in Organisms

- All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. (LS1-K-1)
- Living and non-living things have distinct characteristics. (LS1-K-2)

ESS: Earth and Space Sciences

ESS1-K Earth's Systems

Performance Standards

Students who demonstrate understanding can:

ESS1-K-1. Use and share observations of local weather conditions to describe patterns over time, which includes the 4 seasons.

- Further Explanation: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months.
- Content Limit: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.

ESS1-K-2. Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.

- Further Explanation: Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete.

Supporting Content

ESS2.D: Weather and Climate

- Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time. (ESS1-K-1)
- The four seasons occur in a specific order due to their weather patterns. (ESS1-K-1)

ESS2.E: Biogeology

- Plants and animals can change their environment. (ESS1-K-2)

ESS3.C: Human Impacts on Earth Systems

- Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. (ESS1-K-2)

ESS2-K Earth and Human Activity

Performance Standards

Students who demonstrate understanding can:

ESS2-K-1. Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.

- Further Explanation: Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas; and, grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system.

ESS2-K-2. Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.

- Further Explanation: Emphasis is on local forms of severe weather.

ESS2-K-3. Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.

- Further Explanation: Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles.

Supporting Content

ESS3.A: Natural Resources

- Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. (ESS2-K-1)

ESS3.B: Natural Hazards

- Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events. (ESS2-K-2)

ESS3.C: Human Impacts on Earth Systems

- Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. (ESS2-K-3)

ETS1.A: Defining and Delimiting an Engineering Problem

- Asking questions, making observations, and gathering information are helpful in thinking about problems. (ESS2-K-2)

ETS1.B: Developing Possible Solutions

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (ESS2-K-3)

Elementary School (1st Grade)

PS: Physical Sciences

PS1-1 Waves

Performance Standards

Students who demonstrate understanding can:

PS1-1-1. Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

- Further Explanation: Examples of vibrating materials that make sound could include tuning forks and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.

PS1-1-2. Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.

- Further Explanation: Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.

PS1-1-3. Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.

- Further Explanation: Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), and reflective (such as a mirror).
- Content Limit: Assessment does not include the speed of light.

PS1-1-4. Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.

- Further Explanation: Examples of devices could include a light source to send signals, paper cup and string "telephones," and a pattern of drum beats.
- Content Limit: Assessment does not include technological details for how communication devices work.

Supporting Content

PS4.A: Wave Properties

- Sound can make matter vibrate, and vibrating matter can make sound. (PS1-1-1)

PS4.B: Electromagnetic Radiation (light)

- Objects can be seen if light is available to illuminate them or if they give off their own light. (PS1-1-2)
- Some materials allow light to pass through them, others allow only some light through and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. (Boundary: The idea that light travels from place to place is developed through experiences with light sources, mirrors, and shadows, but no attempt is made to discuss the speed of light.) (PS1-1-3)

PS4.C: Information Technologies and Instrumentation

- People also use a variety of devices to communicate (send and receive information) over long distances. (PS1-1-4)

LS: Life Sciences

LS1-1 Molecules to Organisms: Structure and Processes

Performance Standards

Students who demonstrate understanding can:

LS1-1-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

- Further Explanation: Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and, detecting intruders by mimicking eyes and ears.

LS1-1-2. Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.

- Further Explanation: Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) and the responses of the parents (such as feeding, comforting, and protecting the offspring).

LS1-1-3. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

- Further Explanation: Changes organisms go through during their life form a pattern.
- Content Limit: Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction.

Supporting Content

LS1.A: Structure and Function

- All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. (LS1-1-1)

LS1.B: Growth and Development of Organisms

- Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive. (LS1-1-2)
- Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (LS1-1-3)

LS1.D: Information Processing

- Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs. (LS1-1-1)

LS2-1 Heredity: Inheritance and Variation of Traits

Performance Standards

Students who demonstrate understanding can:

LS2-1-1. Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.

- Further Explanation: Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plant are the same shape but can differ in size; and, a particular breed of dog looks like its parents but is not exactly the same.
- Content Limit: Assessment does not include inheritance or animals that undergo metamorphosis or hybrids.

Supporting Content

LS3.A: Inheritance of Traits

- Young animals are very much, but not exactly like, their parents. Plants also are very much, but not exactly, like their parents. (LS2-1-1)

LS3.B: Variation of Traits

- Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways. (LS2-1-1)

ESS: Earth and Space Sciences

ESS1-1 Earth's Place in the Universe

Performance Standards

Students who demonstrate understanding can:

ESS1-1-1. Use observations of the sun, moon, and stars to describe patterns that can be predicted.

- Further Explanation: Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars other than our sun are visible at night but not during the day.
- Content Limit: Assessment of star patterns is limited to stars being seen at night and not during the day.

ESS1-1-2. Make observations at different times of year to relate the amount of daylight to the time of year.

- Further Explanation: Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.
- Content Limit: Assessment is limited to relative amounts of daylight, not quantifying the hours or time of daylight.

Supporting Content

ESS1.A: The Universe and its Stars

- Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (ESS1-1-1)

ESS1.B: Earth and the Solar System

- Seasonal patterns of sunrise and sunset can be observed, described, and predicted. (ESS1-1-2)
- Seasons are created by weather patterns for a particular region and time. Local patterns create 4 distinct seasons. (ESS1-1-2)

Elementary School (2nd Grade)

PS: Physical Sciences

PS1-2 Matter and Its Interactions

Performance Standards

Students who demonstrate understanding can:

PS1-2-1. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

- Further Explanation: Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share.

PS1-2-2. Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

- Further Explanation: Examples of properties could include, strength, flexibility, hardness, texture, and absorbency.
- Content Limit: Assessment of quantitative measurements is limited to length.

PS1-2-3. Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.

- Further Explanation: Examples of pieces could include blocks, building bricks, or other assorted small objects.

PS1-2-4. Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.

- Further Explanation: Examples of reversible changes could include materials such as water and butter at different temperatures. Examples of irreversible changes could include cooking an egg, freezing a plant leaf, and heating paper.

Supporting Content

PS1.A: Structure and Properties of Matter

- Different kinds of matter exist and many of them can be solid, liquid, or gas depending on temperature. Matter can be described and classified by its observable properties. (PS1-2-1)
- Different properties are suited to different purposes. (PS1-2-2),(PS1-2-3)
- A great variety of objects can be built up from a small set of pieces. (PS1-2-3)

PS1.B: Chemical Reactions

- Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not. (PS1-2-4)

LS: Life Sciences

LS1-2 Ecosystems: Interactions, Energy, and Dynamics

Performance Standards

Students who demonstrate understanding can:

LS1-2-1. Plan and conduct an investigation to determine if plants need sunlight and water to grow.

- Content Limit: Assessment is limited to testing one variable at a time.

LS1-2-2. Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.

Supporting Content

LS2.A: Interdependent Relationships in Ecosystems

- Plants depend on water and light to grow. (LS1-2-1)
- Plants depend on animals for pollination or to move their seeds around. (LS1-2-2)

ETS1.B: Developing Possible Solutions

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (LS1-2-2)

LS2-2 Biological Adaptation: Unity and Diversity

Performance Standards

Students who demonstrate understanding can:

LS2-2-1. Make observations of plants and animals to compare the diversity of life in different habitats.

- Further Explanation: Emphasis is on the diversity of living things in each of a variety of different habitats.
- Content Limit: Assessment does not include specific animal and plant names in specific habitats.

Supporting Content

LS4.D: Biodiversity and Humans

- There are many different kinds of living things in any area, and they exist in different places on land and in water. (LS2-2-1)

ESS: Earth and Space Sciences

ESS1-2 Earth's Place in the Universe

Performance Standards
Students who demonstrate understanding can: **ESS1-2-1. Use information from several sources to provide evidence that Earth events can occur quickly or slowly.** • Further Explanation: Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly and erosion of rocks, which occurs slowly. • Content Limit: Assessment does not include quantitative measurements of timescales.
Supporting Content
ESS1.C: The History of Planet Earth • Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. (ESS1-2-1)

ESS2-2 Earth's Systems

Performance Standards

Students who demonstrate understanding can:

ESS2-2-1. Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.

- Further Explanation: Examples of solutions could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land.

ESS2-2-2. Develop a model to represent the shapes and kinds of land and bodies of water in an area.

- Content Limit: Assessment does not include quantitative scaling in models.

ESS2-2-3. Obtain information to identify where water is found on Earth and that it can be solid, liquid or gas.

Supporting Content

ESS2.A: Earth Materials and Systems

- Wind and water can change the shape of the land. (ESS2-2-1)

ESS2.B: Plate Tectonics and Large-Scale System Interactions

- Maps show where things are located. One can map the shapes and kinds of land and water in any area. (ESS2-2-2)

ESS2.C: The Roles of Water in Earth's Surface Processes

- Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. (ESS2-2-3)

ETS1.C: Optimizing the Design Solution

- Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (ESS2-2-1)

Elementary School (3rd Grade)

PS: Physical Sciences

PS1-3 Motion and Stability: Forces and Interactions

Performance Standards

Students who demonstrate understanding can:

PS1-3-1. Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

- Further Explanation: Examples could include an unbalanced force on one side of a ball can make it start moving; and, balanced forces pushing on a box from both sides will not produce any motion at all.
- Content Limit: Assessment is limited to one variable at a time: number, size, or direction of forces. Assessment does not include quantitative force size, only qualitative and relative. Assessment is limited to gravity being addressed as a force that pulls objects down.

PS1-3-2. Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.

- Further Explanation: Examples of motion with a predictable pattern could include a child swinging in a swing, a ball rolling back and forth in a bowl, and two children on a see-saw.
- Content Limit: Assessment does not include technical terms such as period and frequency.

PS1-3-3. Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.

- Further Explanation: Examples of an electric force could include the force on hair from an electrically charged balloon and the electrical forces between a charged rod and pieces of paper; examples of a magnetic force could include the force between two permanent magnets, the force between an electromagnet and steel paperclips, and the force exerted by one magnet versus the force exerted by two magnets. Examples of cause and effect relationships could include how the distance between objects affects strength of the force and how the orientation of magnets affects the direction of the magnetic force.
- Content Limit: Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.

PS1-3-4. Define a simple design problem that can be solved by applying scientific ideas about magnets.

- Further Explanation: Examples of problems could include constructing a latch to keep a door shut and creating a device to keep two moving objects from touching each other.

Supporting Content

PS2.A: Forces and Motion

- Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative additions of forces are used at this level.) (PS1-3-1)
- Force applied to an object can alter the position and motion of that object: revolve, rotate, float, sink, fall and at rest.(PS1-3-2)
- The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.) (PS1-3-2)

PS2.B: Types of Interactions

LS: Life Sciences

LS1-3 Ecosystems: Interactions, Energy, and Dynamics

Performance Standards

Students who demonstrate understanding can:

LS1-3-1. Construct an argument that some animals form groups that help members survive

Supporting Content

LS2.D: Social Interactions and Group Behavior

- Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size. (LS1-3-1)

LS2-3 Heredity: Inheritance and Variation of Traits

Performance Standards

Students who demonstrate understanding can:

LS2-3-1. Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.

- Further Explanation: Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.
- Content Limit: Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.

LS2-3-2. Use evidence to support the explanation that traits can be influenced by the environment.

- Further Explanation: Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted; and, a pet dog that is given too much food and little exercise may become overweight.

Supporting Content

LS3.A: Inheritance of Traits

- Many characteristics of organisms are inherited from their parents. (LS2-3-1)
- Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. (LS2-3-2)

LS3.B: Variation of Traits

- Different organisms vary in how they look and function because they have different inherited information. (LS2-3-1)
- The environment also affects the traits that an organism develops. (LS2-3-2)

ESS: Earth and Space Sciences

ESS1-3 Earth's Systems

Performance Standards

Students who demonstrate understanding can:

ESS1-3-1. Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

- Further Explanation: Examples of data could include average temperature, precipitation, and wind direction.
- Content Limit: Assessment of graphical displays is limited to pictographs and bar graphs. Assessment does not include climate change.

ESS1-3-2. Obtain and combine information to describe climates in different regions of the world.

Supporting Content

ESS2.D: Weather and Climate

- Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. (ESS1-3-1)
- Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. (ESS1-3-2)

ESS2-3 Earth and Human Activity

Performance Standards

Students who demonstrate understanding can:

ESS2-3-1. Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

- Further Explanation: Examples of design solutions to weather-related hazards could include barriers to prevent flooding, wind resistant roofs, and lightning rods.

Supporting Content

ESS3.B: Natural Hazards

- A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (ESS2-3-1)

Elementary School (4th Grade)

PS: Physical Sciences

PS1-4 Energy

Performance Standards

Students who demonstrate understanding can:

PS1-4-1. Use evidence to construct an explanation relating the speed of an object to the energy of that object.
- Content Limit: Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy.

PS1-4-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
- Content Limit: Assessment does not include quantitative measurements of energy.

PS1-4-3. Ask questions and predict outcomes about the changes in energy that occur when objects collide.
- Further Explanation: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.
- Content Limit: Assessment does not include quantitative measurements of energy.

PS1-4-4. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.
- Further Explanation: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound; and, a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.
- Content Limit: Devices should be limited to those that convert motion energy to electric energy or use stored energy to cause motion or produce light or sound.

Supporting Content

PS3.A: Definitions of Energy

- The faster a given object is moving, the more energy it possesses. (PS1-4-1)
- Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (PS1-4-2, PS1-4-3)

PS3.B: Conservation of Energy and Energy Transfer

- Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (PS1-4-2, PS1-4-3)
- Light also transfers energy from place to place. (PS1-4-2)
- Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. (PS1-4-2, PS1-4-4)

PS3.C: Relationship Between Energy and Forces

- When objects collide, the contact forces transfer energy so as to change the objects' motions. (PS1-4-3)

PS3.D: Energy in Chemical Processes and Everyday Life

- The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. (PS1-4-4)

ETS1.A: Defining Engineering Problems

- Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (PS1-4-4)

PS2-4 Waves

Performance Standards

Students who demonstrate understanding can:

PS2-4-1. Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.

- Further Explanation: Examples of models could include diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves.
- Content Limit: Assessment does not include interference effects, electromagnetic waves, non-periodic waves, or quantitative models of amplitude and wavelength.

PS2-4-2. Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.

- Content Limit: Assessment does not include knowledge of specific colors reflected and seen, the cellular mechanisms of vision, or how the retina works.

PS2-4-3. Generate and compare multiple solutions that use patterns to transfer information.

- Further Explanation: Examples of solutions could include drums sending coded information through sound waves, using a grid of 1's and 0's representing black and white to send information about a picture, and using Morse code to send text.

Supporting Content

PS4.A: Wave Properties

- Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. (PS2-4-1)
- Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). (PS2-4-1)

PS4.B: Electromagnetic Radiation

- An object can be seen when light reflected from its surface enters the eyes. (PS2-4-2)

PS4.C: Information Technologies and Instrumentation

- Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa. (PS2-4-3)

ETS1.C: Optimizing The Design Solution

- Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (PS2-4-3)

LS: Life Sciences

LS1-4 Molecules to Organisms: Structure and Processes

Performance Standards

Students who demonstrate understanding can:

LS1-4-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

- Further Explanation: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.
- Content Limit: Assessment is limited to macroscopic structures within plant and animal systems.

LS1-4-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

- Further Explanation: Emphasis is on systems of information transfer.
- Content Limit: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.

Supporting Content

LS1.A: Structure and Function

- Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (LS1-4-1)
- Animals have various body systems with specific functions for sustaining life: skeletal, circulatory, respiratory, muscular, digestive, etc. (LS1-4-1).

LS1.D: Information Processing

- Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. (LS1-4-2)

LS2-4 Ecosystems: Interactions, Energy, and Dynamics

Performance Standards

Students who demonstrate understanding can:

LS2-4-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

- Further Explanation: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.
- Content Limit: Assessment does not include molecular explanations.

Supporting Content

LS2.A: Interdependent Relationships in Ecosystems

- The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (LS2-4-1)

LS2.B: Cycles of Matter and Energy Transfer in Ecosystems

- Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (LS2-4-1)

ESS: Earth and Space Sciences

ESS1-4 Earth's Place in the Universe

Performance Standards

Students who demonstrate understanding can:

ESS1-4-1. Identify evidence from patterns in rock formations and fossils in rock layers for changes in a landscape over time to support an explanation for changes in a landscape over time.

- Further Explanation: Examples of evidence from patterns could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock.
- Content Limit: Assessment does not include specific knowledge of the mechanism of rock formation or memorization of specific rock formations and layers. Assessment is limited to relative time.

Supporting Content

ESS1.C: The History of Planet Earth

- Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (ESS1-4-1)
- There are three classifications of rocks produced within the rock cycle: sedimentary, metamorphic, and igneous. (ESS1-4-1).

ESS2-4 Earth's Systems

Performance Standards

Students who demonstrate understanding can:

ESS2-4-1. Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

- Further Explanation: Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow.
- Content Limit: Assessment is limited to a single form of weathering or erosion.

ESS2-4-2. Analyze and interpret data from maps to describe patterns of Earth's features.

- Further Explanation: Maps can include topographic maps of Earth's land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.

Supporting Content

ESS2.A: Earth Materials and Systems

- Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (ESS2-4-1)

ESS2.B: Plate Tectonics and Large-Scale System Interactions

- The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. (ESS2-4-2)

ESS2.E: Biogeology

- Living things affect the physical characteristics of their regions. (ESS2-4-1)

ESS3-4 Earth and Human Activity

Performance Standards

Students who demonstrate understanding can:

ESS3-4-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

- Further Explanation: Examples of renewable energy resources could include wind energy, water behind dams, and sunlight; non-renewable energy resources are fossil fuels and atomic energy. Examples of environmental effects could include negative biological impacts of wind turbines, erosion due to deforestation, loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from burning of fossil fuels.

ESS3-4-2. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

- Further Explanation: Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity.
- Content Limit: Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.

Supporting Content

ESS3.A: Natural Resources

- Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. (ESS3-4-1)

ESS3.B: Natural Hazards

- A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (ESS3-4-2)

ETS1.B: Designing Solutions to Engineering Problems

- Testing a solution involves investigating how well it performs under a range of likely conditions. (ESS3-4-2)

Elementary School (5th Grade)

PS: Physical Sciences

PS1-5 Matter and Its Interactions

Performance Standards

Students who demonstrate understanding can:

PS1-5-1. Develop a model to describe that matter is made of particles too small to be seen.

- Further Explanation: Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.
- Content Limit: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.

PS1-5-2. Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.

- Further Explanation: Examples of reactions or changes could include phase changes, dissolving, and mixing that form new substances.
- Content Limit: Assessment does not include distinguishing mass and weight.

PS1-5-3. Make observations and measurements to identify materials based on their properties.

- Further Explanation: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.
- Content Limit: Assessment does not include density or distinguishing mass and weight.

PS1-5-4. Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

Supporting Content

PS1.A: Structure and Properties of Matter

- Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects. (PS1-5-1)
- The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. (PS1-5-2)
- Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) (PS1-5-3)

PS1.B: Chemical Reactions

- When two or more different substances are mixed, a new substance with different properties may be formed. (PS1-5-4)
- No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.) (PS1-5-2)

PS2-5 Motion and Stability: Forces and Interactions

Performance Standards

Students who demonstrate understanding can:

PS2-5-1. Support an argument that the gravitational force exerted by Earth on objects is directed down.

- Further Explanation: "Down" is a local description of the direction that points toward the center of the spherical Earth.
- Content Limit: Assessment does not include mathematical representation of gravitational force.

Supporting Content

PS2.B: Types of Interactions

- The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (PS2-5-1)

PS3-5 Energy

Performance Standards

Students who demonstrate understanding can:

PS3-5-1. Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

- Further Explanation: Examples of models could include diagrams, and flow charts.

Supporting Content

PS3.D: Energy in Chemical Processes and Everyday Life

- The energy released from food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). (PS3-5-1)

LS1.C: Organization for Matter and Energy Flow in Organisms

- Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (PS3-5-1)

LS: Life Sciences

LS1-5 Molecules to Organisms: Structure and Processes

Performance Standards

Students who demonstrate understanding can:

LS1-5-1. Support an argument that plants get the materials they need for growth chiefly from air and water.

- Further Explanation: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.

Supporting Content

LS1.C: Organization for Matter and Energy Flow in Organisms

- Plants acquire their material for growth chiefly from air and water. (LS1-5-1)

LS2-5 Biological Adaptation: Unity and Diversity

Performance Standards

Students who demonstrate understanding can:

LS2-5-1. Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.

- Further Explanation: Examples of data could include type, size, and distributions of fossil organisms. Examples of fossils and environments could include marine fossils found on dry land, tropical plant fossils found in Arctic areas, and fossils of extinct organisms.
- Content Limit: Assessment does not include identification of specific fossils or present plants and animals. Assessment is limited to major fossil types and relative ages.

LS2-5-2. Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.

- Further Explanation: Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.

LS2-5-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

- Further Explanation: Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other.

LS2-5-4. Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

- Further Explanation: Examples of environmental changes could include changes in land characteristics, water distribution, temperature, food, and other organisms.
- Content Limit: Assessment is limited to a single environmental change. Assessment does not include the greenhouse effect or climate change.

Supporting Content

LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. (LS2-5-4)

LS4.A: Evidence of Common Ancestry and Diversity

- Some kinds of plants and animals that once lived on Earth are no longer found anywhere. (LS2-5-1)
- Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. (LS2-5-1)

LS4.B: Natural Selection

- Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (LS2-5-2)

LS4.C: Adaptation

- For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (LS2-5-3)

LS4.D: Biodiversity and Humans

- Populations of animals are classified by their characteristics.(LS2-5-2)
- Populations live in a variety of habitats, and change in those habitats affects the organisms living there. (LS2-5-4)

ESS: Earth and Space Sciences

ESS1-5 Earth's Place in the Universe

Performance Standards

Students who demonstrate understanding can:

ESS1-5-1. Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from the Earth.

- Content Limit: Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, or stage).

ESS1-5-2. Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

- Further Explanation: Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.
- Content Limit: Assessment does not include causes of seasons.

Supporting Content

ESS1.A: The Universe and its Stars

- The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. (ESS1-5-1)

ESS1.B: Earth and the Solar System

- The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year. (ESS1-5-2)

ESS2-5 Earth's Systems

Performance Standards

Students who demonstrate understanding can:

ESS2-5-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

- Further Explanation: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.
- Content Limit: Assessment is limited to the interactions of two systems at a time.

ESS2-5-2. Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

- Content Limit: Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.

Supporting Content

ESS2.A: Earth Materials and Systems

- Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. (ESS2-5-1)

ESS2.C: The Roles of Water in Earth's Surface Processes

- Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. (ESS2-5-2)

ESS3-5 Earth and Human Activity

Performance Standards

Students who demonstrate understanding can:

ESS3-5-1. Support Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Supporting Content

ESS3.C: Human Impacts on Earth Systems

- Human activities in agriculture, industry, and everyday life have effects on the land, vegetation, streams, ocean, air, and even outer space. Individuals and communities are doing things to help protect Earth's resources and environments. (ESS3-5-1)

Middle School (6-8)

PS: Physical Sciences

PS1-MS Matter and Its Interactions

Performance Standards

Students who demonstrate understanding can:

PS1-MS-1. Develop models to describe the atomic composition of simple molecules and extended structures.

- Further Explanation: Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could include drawings, 3D ball and stick structures, or computer representations showing different molecules with different types of atoms.
- Content Limit: Assessment does not include valence electrons and bonding energy, discussing the ionic nature of subunits of complex structures, or a complete depiction of all individual atoms in a complex molecule or extended structure.

PS1-MS-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

- Further Explanation: Examples of reactions could include burning sugar or steel wool, fat reacting with sodium hydroxide, and mixing zinc with hydrogen chloride.
- Content Limit: Assessment is limited to analysis of the following properties: density, melting point, boiling point, solubility, flammability, and odor.

PS1-MS-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

- Further Explanation: Emphasis is on natural resources that undergo a chemical process to form the synthetic material. Examples of new materials could include new medicine, foods, and alternative fuels.
- Content Limit: Assessment is limited to qualitative information.

PS1-MS-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

- Further Explanation: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawings and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.

PS1-MS-5. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.

- Further Explanation: Emphasis is on law of conservation of matter and on physical models or drawings, including digital forms, that represent atoms.
- Content Limit: Assessment does not include the use of atomic masses, balancing symbolic equations, or intermolecular forces.

PS1-MS-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.

- Further Explanation: Emphasis is on the design, controlling the transfer of energy to the environment, and modification of a device using factors such as type and concentration of a substance. Examples of designs could involve chemical reactions such as dissolving ammonium chloride or calcium chloride.
- Content Limit: Assessment is limited to the criteria of amount, time, and temperature of substance in testing the device.

Supporting Content

PS1.A Structure and Properties of Matter

- Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (PS1-MS-1)
- Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (PS1-MS-2, PS1-MS-3)
- Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. (PS1-MS-4)
- In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. (PS1-MS-4)
- Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (PS1-MS-1)
- The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. (PS1-MS-4)

PS1.B Chemical Reactions

- Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (PS1-MS-1, PS1-MS-3, PS1-MS-5)
- The total number of each type of atom is conserved, and thus the mass does not change. (PS1-MS-5)
- Some chemical reactions release energy, others store energy. (PS1-MS-6)

PS3A: Definitions of Energy

- The term "heat" as used in everyday language refers both to thermal energy (the motion of atoms or molecules with in a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. (PS1-MS-4)
- The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system's material). The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material. Temperature is not a direct measure of a system's total thermal energy. The total thermal energy (sometimes called total internal energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material. (PS1-MS-6)

ETS1.B Developing Possible Solutions

- A solution needs to be tested, and then modified on the basis of the test results in order to improve it. (PS1-MS-6)
- The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (PS1-MS-6)

PS2-MS Motion and Stability: Forces and Interactions

Performance Standards

Students who demonstrate understanding can:

PS2-MS-1. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.

- Further Explanation: Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle.
- Content Limit: Assessment is limited to vertical or horizontal interactions in one dimension.

PS2-MS-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

- Further Explanation: Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law), frame of reference, and specification of units.
- Content Limit: Assessment is limited to forces and changes in motion in one-dimension in an inertial reference frame and to change in one variable at a time. Assessment does not include the use of trigonometry.

PS2-MS-3. Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.

- Further Explanation: Examples of devices that use electric and magnetic forces could include electromagnets, electric motors, or generators. Examples of data could include the effect of the number of turns of wire on the strength of an electromagnet, or the effect of increasing the number or strength of magnets on the speed of an electric motor.
- Content Limit: Assessment about questions that require quantitative answers is limited to proportional reasoning and algebraic thinking.

PS2-MS-4. Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.

- Further Explanation: Examples of evidence for arguments could include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the Sun, and orbital periods of objects within the solar system.
- Content Limit: Assessment does not include Newton's Law of Gravitation or Kepler's Laws.

PS2-MS-5. Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

- Further Explanation: Examples of this phenomenon could include the interactions of magnets, electrically-charged strips of tape, and electrically-charged pith balls. Examples of investigations could include first-hand experiences or simulations.
- Content Limit: Assessment is limited to electric and magnetic fields, and limited to qualitative evidence for the existence of fields.

Supporting Content

PS2.A: Forces and Motion

- For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law). (PS2-MS-1)
- The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. (PS2-MS-2)
- All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. (PS2-MS-2)

PS2.B: Types of Interactions

- Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. (PS2-MS-3)
- Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun. (PS2-MS-4)
- Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object, or a ball, respectively). (PS2-MS-5)

PS3-MS Energy

Performance Standards

Students who demonstrate understanding can:

PS3-MS-1. Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

- Further Explanation: Emphasis is on descriptive relationships between kinetic energy and mass separately from kinetic energy and speed. Examples could include riding a bicycle at different speeds, rolling different sizes of rocks downhill, and getting hit by a wiffle ball versus a tennis ball.

PS3-MS-2. Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.

- Further Explanation: Emphasis is on relative amounts of potential energy, not on calculations of potential energy. Examples of objects within systems interacting at varying distances could include: the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a magnet, and a balloon with static electrical charge being brought closer to a classmate's hair. Examples of models could include representations, diagrams, pictures, and written descriptions of systems.
- Content Limit: Assessment is limited to two objects and electric, magnetic, and gravitational interactions.

PS3-MS-3. Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.

- Further Explanation: Examples of devices could include an insulated box, a solar cooker, and a Styrofoam cup.
- Content Limit: Assessment does not include calculating the total amount of thermal energy transferred.

PS3-MS-4. Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.

- Further Explanation: Examples of experiments could include comparing final water temperatures after different masses of ice melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the environment, or the same material with different masses when a specific amount of energy is added.
- Content Limit: Assessment does not include calculating the total amount of thermal energy transferred.

PS3-MS-5. Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

- Further Explanation: Examples of empirical evidence used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object.
- Content Limit: Assessment does not include calculations of energy.

Supporting Content

PS3.A: Definitions of Energy

- Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. (PS3-MS-1)
- A system of objects may also contain stored (potential) energy, depending on their relative positions. (PS3-MS-2)
- Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. (PS3-MS-3, PS3-MS-4)

PS3.B: Conservation of Energy and Energy Transfer

- When the motion energy of an object changes, there is inevitably some other change in energy at the same time. (PS3-MS-5)
- The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment. (PS3-MS-4)

- Energy is spontaneously transferred out of hotter regionsor objects and into colder ones. (PS3-MS-3)

PS3.C: Relationship Between Energy and Forces

- When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (PS3-MS-2)

ETS1.A: Defining and Delimiting an Engineering Problem

- The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions. (PS3-MS-3)

ETS1.B: Developing Possible Solutions

- A solution needs to be tested, and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem. (PS3-MS-3)

PS4-MS Waves

Performance Standards

Students who demonstrate understanding can:

PS4-MS-1. Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.

- Further Explanation: Emphasis is on describing waves with both qualitative and quantitative thinking.
- Content Limit: Assessment does not include electromagnetic waves and is limited to standard repeating waves.

PS4-MS-2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.

- Further Explanation: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.
- Content Limit: Assessment is limited to qualitative applications pertaining to light and mechanical waves.

PS4-MS-3. Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.

- Further Explanation: Emphasis is on a basic understanding that waves can be used for communication purposes. Examples could include using fiber optic cable to transmit light pulses, radio wave pulses in WIFI devices, and conversion of stored binary patterns to make sound or text on a computer screen.
- Content Limit: Assessment does not include binary counting. Assessment does not include the specific mechanism of any given device.

Supporting Content

PS4.A: Wave Properties

- A simple wave hasa repeating pattern with a specific wavelength, frequency, and amplitude. (PS4-MS-1)
- A sound wave needs a medium through which it is transmitted. (PS4-MS-2)

PS4.B: Electromagnetic Radiation

- When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. (PS4-MS-2)
- The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends. (PS4-MS-2)
- A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media. (PS4-MS-2)
- However, because light can travel through space, it cannot be a matter wave, like sound or water waves. (PS4-MS-2)

PS4.C: Information Technologies and Instrumentation

- Digitized signals (sent as wave pulses) are a morereliable way to encode and transmit information. (PS4-MS-3)

LS: Life Sciences

LS1-MS Molecules to Organisms: Structure and Processes

Performance Standards

Students who demonstrate understanding can:

MS-LS1-1. Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
- Further Explanation: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living cells, and understanding that living things may be made of one cell or many and varied cells.

MS-LS1-2. Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.
- Further Explanation: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall. These are visible with a light microscope.
- Content Limit: Assessment of organelle structure/function relationships is limited to the cell wall and cell membrane. Assessment of the function of the other organelles is limited to their relationship to the whole cell. Assessment does not include the biochemical function of cells or cell parts.

MS-LS1-3. Use argument supported by evidence for how a living organism is a system of interacting subsystems composed of groups of cells.
- Further Explanation: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.
- Content Limit: Assessment does not include the mechanism of one body system independent of others. Assessment is not focused on human body systems.

MS-LS1-4. Construct a scientific argument based on evidence to defend a claim of life for a specific object or organism.
- Further Explanation: Examples should include both biotic and abiotic items, and should be defended using accepted characteristics of life.
- Content Limit: Assessment does not include viruses, or other disputed examples.

MS-LS1-5. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
- Further Explanation: Emphasis is on tracing movement of matter and flow of energy.
- Content Limit: Assessment does not include the biochemical mechanisms of photosynthesis.

MS-LS1-6. Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.
- Further Explanation: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released. Also understanding that the elements in the products are the same as the elements in the reactants .
- Content Limit: Assessment does not include details of the chemical reactions for photosynthesis or respiration.

Supporting Content

LS1.A: Structure and Function
- All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (LS1-MS-1)
- Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (LS1-MS-2)
- In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs

that are specialized for particular body functions. (LS1-MS-3)

LS1.B: Characteristics of Living Things

- Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (LS1-MS-4)
- Living things share certain characteristics. (These include response to environment, reproduction, energy use, growth and development, life cycles, made of cells, etc.) (LS1-MS-4)

LS1.C: Organization for Matter and Energy Flow in Organisms

- Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. (LS1-MS-5)
- Within individual organisms, food moves through a series of chemical reactions (cellular respiration) in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (LS1-MS-6)

LS2-MS Ecosystems: Interactions, Energy, and Dynamics

Performance Standards

Students who demonstrate understanding can:

LS2-MS-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

- Further Explanation: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.

LS2-MS-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

- Further Explanation: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.

LS2-MS-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

- Further Explanation: Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system.
- Content Limit: Assessment does not include the use of chemical reactions to describe the processes.

LS2-MS-4. Develop a model to describe the flow of energy through the trophic levels of an ecosystem.

- Further Explanation: Emphasis is on describing the transfer of mass and energy beginning with producers, moving to primary and secondary consumers, and ending with decomposers.
- Content Limit: Assessment does not include the use of chemical reactions to describe the processes.

LS2-MS-5. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

- Further Explanation: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.

LS2-MS-6. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

- Further Explanation: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.

Supporting Content

LS2.A: Interdependent Relationships in Ecosystems

- Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (LS2-MS-1)
- In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. (LS2-MS-1)
- Growth of organisms and population increases are limited by access to resources. (LS2-MS-1)
- Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. (LS2-MS-2)

LS2.B: Cycle of Matter and Energy Transfer in Ecosystems

- Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. (LS2-MS-3)
- Food webs can be broken down into multiple energy pyramids. Concepts should include the 10% rule of energy and biomass transfer between trophic levels and the environment. (LS2-MS-4)

LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (LS2-MS-5)
- Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. (LS2-MS-6)

LS4.D: Biodiversity and Humans

- Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (LS2-MS-6)

ETS1.B: Developing Possible Solutions

- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (LS2-MS-6)

LS3-MS Heredity: Inheritance and Variation of Traits

Performance Standards

Students who demonstrate understanding can:

LS3-MS-1. Develop and use a model to describe why mutations may result in harmful, beneficial, or neutral effects to the structure and function of the organism.

- Further Explanation: Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.
- Content Limit: Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations.

LS3-MS-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.

- Further Explanation: 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.

Supporting Content

LS1.B: Growth and Development of Organisms

- Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (LS3-MS-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. (LS3-MS-1)
- Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (LS3-MS-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. (LS3-MS-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. (LS3-MS-1)

LS4-MS Biological Adaptation: Unity and Diversity

Performance Standards

Students who demonstrate understanding can:

LS4-MS-1. Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.

- Further Explanation: Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.
- Content Limit: Assessment does not include the names of individual species or geological eras in the fossil record.

LS4-MS-2. Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer relationships.

- Further Explanation: Emphasis is on explanations of the relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures.

LS4-MS-3. Analyze displays of pictorial data to compare patterns of similarities in the anatomical structures across multiple species of similar classification levels to identify relationships.

- Further Explanation: Emphasis is on inferring general patterns of relatedness among structures of different organisms by comparing the appearance of diagrams or pictures.
- Content Limit: Assessment of comparisons is limited to gross appearance of anatomical structures within genus and species levels. No memorization of classification levels is required.

LS4-MS-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.

- Further Explanation: Emphasis is on using concepts of natural selection like overproduction of offspring, passage of time, variation in a population, selection of favorable traits, and heritability of traits.

LS4-MS-5. Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

- Further Explanation: Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, gene therapy); and, on the impacts these technologies have on society as well as the technologies leading to these scientific discoveries.

LS4-MS-6. Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

- Further Explanation: Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time. Examples could include Peppered moth population changes before and after the industrial revolution.
- Content Limit: Assessment does not include Hardy Weinberg calculations.

Supporting Content

LS4.A: Classification of Organisms

- The collection of fossils and their placement in chronological order is known as the fossil record and documents the change of many life forms throughout the history of the Earth. Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record enable the classification of living things. (LS4-MS-1, LS4-MS-2)
- Scientific genus and species level names indicate a degree of relationship. (LS4-MS-3)

LS4.B: Natural Selection

- Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (LS4-MS-4)
- In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. (LS4-MS-5)

LS4.C: Adaptation

- Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. (LS4-MS-6)

ESS: Earth and Space Sciences

ESS1-MS Earth's Place in the Universe

Performance Standards

Students who demonstrate understanding can:

ESS1-MS-1. Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

- Further Explanation: Examples of models can be physical, graphical, or conceptual.

ESS1-MS-2. Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.

- Further Explanation: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptual (such as mathematical proportions relative to the size of familiar objects such as students' school or state).
- Content Limit: Assessment does not include Kepler's Laws of orbital motion or the apparent retrograde motion of the planets as viewed from Earth.

ESS1-MS-3. Analyze and interpret data to determine scale properties of objects in the solar system.

- Further Explanation: Emphasis is on the analysis of data from Earth-based instruments, space-based telescopes, and spacecraft to determine similarities and differences among solar system objects. Examples of scale properties include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models.
- Content Limit: Assessment does not include recalling facts about properties of the planets and other solar system bodies.

ESS1-MS-4. Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's history.

- Further Explanation: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or large volcanic eruptions.
- Content Limit: Assessment does not include recalling the names of specific periods or epochs and events within them.

Supporting Content

ESS1.A: The Universe and Its Stars

- Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (ESS1-MS-1)
- Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (ESS1-MS-2)

ESS1.B: Earth and the Solar System

- The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (ESS1-MS-2, ESS1-MS-3)
- This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. (ESS1-MS-1)
- The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (ESS1-MS-2)

ESS1.C: The History of Planet Earth

- The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. (ESS1-MS-4)

ESS2-MS Earth's Systems

Performance Standards

Students who demonstrate understanding can:

ESS2-MS-1. Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.

- Further Explanation: Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials.
- Content Limit: Assessment does not include the identification and naming of minerals.

ESS2-MS-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

- Further Explanation: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.

ESS2-MS-3. Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.

- Further Explanation: Examples of data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches).
- Content Limit: Paleomagnetic anomalies in oceanic and continental crust are not assessed.

ESS2-MS-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.

- Further Explanation: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.
- Content Limit: A quantitative understanding of the latent heats of vaporization and fusion is not assessed.

ESS2-MS-5. Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.

- Further Explanation: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).
- Content Limit: Assessment does not include recalling the names of cloud types or weather symbols used on weather maps or the reported diagrams from weather stations.

ESS2-MS-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

- Further Explanation: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection

cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.
- Content Limit: Assessment does not include the dynamics of the Coriolis effect.

Supporting Content

ESS1.C: The History of Planet Earth
- Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. (ESS2-MS-3)

ESS2.A: Earth's Materials and Systems
- All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. (ESS2-MS-1)
- The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. (ESS2-MS-2)

ESS2.B: Plate Tectonics and Large-Scale System Interactions
- Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. (ESS2-MS-3)

ESS2.C: The Roles of Water in Earth's Surface Processes
- Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. (ESS2-MS-4)
- The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (ESS2-MS-5)
- Global movements of water and its changes in form are propelled by sunlight and gravity. (ESS2-MS-4)
- Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (ESS2-MS-6)
- Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations. (ESS2-MS-2)

ESS2.D: Weather and Climate
- Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (ESS2-MS-6)
- Because these patterns are so complex, weather can only be predicted using probability. (ESS2-MS-5)
- The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. (ESS2-MS-6)

ESS3-MS Earth and Human Activity

Performance Standards

Students who demonstrate understanding can:

ESS3-MS-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
- Further Explanation: Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).

ESS3-MS-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

- Further Explanation: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).

ESS3-MS-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

- Further Explanation: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).

ESS3-MS-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

- Further Explanation: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.

ESS3-MS-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

- Further Explanation: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.

Supporting Content

ESS3.A: Natural Resources

- Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. (ESS3-MS-1)

ESS3.B: Natural Hazards

- Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events. (ESS3-MS-2)

ESS3.C: Human Impacts on Earth Systems

- Human activities have altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. (ESS3-MS-3)
- Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. (ESS3-MS-3, ESS3-MS-4)
- Human activities (such as the release of greenhouse gases from the burning of fossil fuel combustion) are major factors in the current rise in Earth's mean surface temperature. Other natural activities (such as volcanic activity) are also contributors to changing global temperatures. Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. (ESS3-MS-5)

High School (9-12)

LS: Life Sciences (Biology)

LS1-HS Molecules to Organisms: Structure and Processes

Performance Standards

Students who demonstrate understanding can:

LS1-HS-1. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.

- Further Explanation: Emphasis is on the structure of the double helix, the pairing and sequencing of the nitrogenous bases, transcription, translation, and protein synthesis.
- Content Limit: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.

LS1-HS-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

- Further Explanation: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be 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.
- Content Limit: Assessment does not include interactions and functions at the molecular or chemical reaction level.

LS1-HS-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

- Further Explanation: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.
- Content Limit: Assessment does not include the cellular processes involved in the feedback mechanism.

LS1-HS-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

- Content Limit: Assessment does not include specific gene control mechanisms or rote memorization of the steps of mitosis.

LS1-HS-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

- Further Explanation: Emphasis is on illustrating inputs and outputs of matter and the transfer and transformation of energy in photosynthesis by plants and other photosynthesizing organisms. Examples of models could include diagrams, chemical equations, and conceptual models.
- Content Limit: Assessment does not include specific biochemical steps.

LS1-HS-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.

- Further Explanation: Emphasis is on using evidence from models and simulations to support explanations.
- Content Limit: Assessment does not include the details of the specific chemical reactions or identification of macromolecules.

LS1-HS-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.

- Further Explanation: Emphasis is on the conceptual understanding of the inputs and outputs of the process of cellular respiration.
- Content Limit: Assessment should not include identification of the steps or specific processes involved in cellular respiration.

Supporting Content

LS1.A: Structure and Function

- Systems of specialized cells within organisms help them perform the essential functions of life. (LS1-HS-1)
- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (LS1-HS-1)
- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (LS1-HS-2)
- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (LS1-HS-3)

LS1.B: Growth and Development of Organisms

- In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. (LS1-HS-4)

LS1.C: Organization for Matter and Energy Flow in Organisms

- The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen. (LS1-HS-5)
- The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells. (LS1-HS-6)
- As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. (LS1-HS-6, LS1-HS-7)
- As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another. Cellular respiration is a chemical process in which the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport energy to cells. Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment. (LS1-HS-7)

LS2-HS Ecosystems: Interactions, Energy, and Dynamics

Performance Standards

Students who demonstrate understanding can:

LS2-HS- 1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

- Further Explanation: Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate, and competition. Examples of mathematical comparisons could include graphs, charts, histograms, and population changes gathered from simulations or historical data sets.
- Content Limit: Assessment does not include deriving mathematical equations to make comparisons.

LS2-HS-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

- Further Explanation: Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data.
- Content Limit: Assessment is limited to provided data.

LS2-HS-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

- Further Explanation: Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration in different environments.
- Content Limit: Assessment does not include the specific chemical processes of either aerobic or anaerobic respiration.

LS2-HS-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

- Further Explanation: Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen and nitrogen being conserved as they move through an ecosystem.
- Content Limit: Assessment is limited to proportional reasoning to describe the cycling of matter and flow of energy.

LS2-HS-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

- Further Explanation: Examples of models could include simulations and mathematical models.
- Content Limit: Assessment does not include the specific chemical steps of photosynthesis and respiration.

LS2-HS-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.

- Further Explanation: Examples of changes in ecosystem conditions could include modest biological or physical changes, such as a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise.

LS2-HS-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

- Further Explanation: Examples of human activities can include urbanization, building dams, and dissemination of invasive species, utilization of non-renewable resources as opposed to renewable resource.

LS2-HS-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.

- Further Explanation: Emphasis is on: (1) distinguishing between group and individual behavior, (2) identifying evidence supporting the outcomes of group behavior, and (3) developing logical and reasonable arguments based on evidence. Examples of group behaviors could include flocking, schooling, herding, and cooperative behaviors such as hunting, migrating, and swarming.

Supporting Content

LS2.A: Interdependent Relationships in Ecosystems

- Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. (LS2-HS-1, LS2-HS-2)

LS2.B: Cycles of Matter and Energy Transfer in Ecosystems

- Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. (LS2-HS-3)
- Plants or algae form the lowest level of the food web. At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward, to produce growth and release energy in cellular respiration at the higher level. Given this inefficiency, there are generally fewer organisms at higher levels of a food web. Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded. The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. At each link in an ecosystem, matter and energy are conserved. (LS2-HS-4)
- Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, oceans, and geosphere through chemical, physical, geological, and biological processes. (LS2-HS-5)

LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. (LS2-HS-2, LS2-HS-6)
- Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species. (LS2-HS-7)

LS2.D: Social Interactions and Group Behavior

- Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives, gene pool. (LS2-HS-8)

LS4.D: Biodiversity and Humans

- Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). (LS2-HS-7)
- Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. (LS2-HS-7, LS4-HS-6.)

LS3-HS Heredity: Inheritance and Variation of Traits

Performance Standards

Students who demonstrate understanding can:

LS3-HS- 1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

- Content Limit: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.

LS3-HS-2. Make and defend a claim based on evidence that inheritable 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.

- Further Explanation: Emphasis is on using data to support arguments for the way variation occurs.
- Content Limit: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.

LS3-HS-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

- Further Explanation: Emphasis is on the use of mathematics to describe the probability of traits (alleles) as it relates to genetic and environmental factors in the expression

of traits.
- Content Limit: Assessment does not include Hardy-Weinberg calculations.

Supporting Content

LS1.A: Structure and Function
- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins. (LS3-HS-1, LS1-HS-1.)

LS3.A: Inheritance of Traits
- Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. Not all DNA codes for a protein; some segments of DNA are involved in regulatory or structural functions, and some have no as-yet known function. (LS3-HS-1)

LS3.B: Variation of Traits
- In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation. Environmental factors can also cause mutations in genes, and viable mutations are inherited. (LS3-HS-2)
- Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors. (LS3-HS-2, LS3-HS-3)

LS4-HS Biological Adaptation: Unity and Diversity

Performance Standards

Students who demonstrate understanding can:

LS4-HS- 1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
- Further Explanation: Emphasis is on a conceptual understanding of the role each line of evidence has relating to common ancestry and biological evolution. Examples of evidence could include similarities in DNA sequences, anatomical structures, and order of appearance of structures in embryological development.

LS4-HS-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
- Further Explanation: Emphasis is on using evidence to explain the influence each of the four factors has on number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species. Examples of evidence could include mathematical models such as simple distribution graphs and proportional reasoning.
- Content Limit: Assessment does not include other mechanisms of evolution, such as genetic drift, gene flow through migration, and co-evolution.

LS4-HS-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.
- Further Explanation: Emphasis is on analyzing shifts in numerical distribution of traits and using these shifts as evidence to support explanations.
- Content Limit: Assessment is limited to basic statistical and graphical analysis. Assessment does not include allele frequency calculations.

LS4-HS-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

- Further Explanation: Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or evolution of other organisms) contribute to a change in gene frequency over time, leading to adaptation of populations.

LS4-HS-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) the emergence of new species over time, and (3) the extinction of other species.

- Further Explanation: Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, over fishing, application of fertilizers and pesticides, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species.

LS4-HS-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.

- Further Explanation: Emphasis is on designing solutions for a proposed problem related to threatened or endangered species, or to genetic variation of organisms for multiple species.

Supporting Content

LS4.A: Evidence of Common Ancestry and Diversity

- Genetic information, like the fossil record, provides evidence of evolution. DNA sequences vary among species, but there are many overlaps; in fact, the ongoing branching that produces multiple lines of descent can be inferred by comparing the DNA sequences of different organisms. Such information is also derivable from the similarities and differences in amino acid sequences and from anatomical and embryological evidence. (LS4-HS-1)

LS4.B: Natural Selection

- Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. (LS4-HS-2, LS4-HS-3)
- The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population. (LS4-HS-3)

LS4.C: Adaptation

- Evolution is a consequence of the interaction of four factors: (1) the potential for a species to increase in number, (2) the genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for an environment's limited supply of the resources that individuals need in order to survive and reproduce, and (4) the ensuing proliferation of those organisms that are better able to survive and reproduce in that environment. (LS4-HS-2)
- Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. (LS4-HS-3, LS4-HS-4)
- Adaptation also means that the distribution of traits in a population can change when conditions change. (LS4-HS-3)
- Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species. (LS4-HS-5, LS4-HS-6)
- Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' evolution is lost. (LS4-HS-5)

LS4.D: Biodiversity and Humans

- Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. (LS4-HS-6, LS2-HS-7.)

ETS1.B: Developing Possible Solutions

- When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (LS4-HS-6)
- Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs. (LS4-HS-6)

PSC: Physical Sciences (Chemistry)

PSC1-HS Structure and Properties of Matter

Performance Standards

Students who demonstrate understanding can:

PSC1-HS-1. Develop models to describe the atomic composition of simple molecules and extended structures.

- Further Explanation: Emphasis is on reviewing how to develop models of molecules that vary in complexity. This should build on the similar middle school standard (PS1-MS-1). Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could include drawings, 3D ball and stick structures, or computer representations showing different molecules with different types of atoms.
- Content Limit: Students will be provided with the names of the elements, a list of common ions, a list of numerical prefixes and their meanings, and the charges of all cations and anions within the item as necessary. Confine element symbols to the representative and familiar transition metal elements.

PSC1-HS-2. 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.

- Further Explanation: Examples of properties that could be predicted from patterns could include reactivity of metals, types of bonds formed, numbers of bonds formed, and reactions with oxygen.
- Content Limit: Elements will be limited to main group elements. Properties assessed will be limited to reactivity, valence electrons, atomic radius, electronegativity, ionization energy (first), shielding effect, and the most common oxidation number.

PSC1-HS-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

- Further Explanation: Emphasis is on understanding the strengths of forces between particles, not on naming specific intermolecular forces (such as dipole-dipole). Examples of particles could include ions, atoms, molecules, and networked materials (such as graphite). Examples of bulk properties of substances could include the melting point and boiling point, vapor pressure, and surface tension.
- Content Limit: Metallic, ionic, and covalent bonds may be included. Graphical representations of melting or boiling points of different substances may be used in the item (e.g., graph of boiling points vs. molar mass or simple bar graph). Structural formulas of compounds may be used to compare the melting/boiling points of compounds

PSC1-HS-4. 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 other types of radioactive decay.

- Further Explanation: Emphasis is on simple qualitative models, such as pictures or diagrams, and on the scale of energy released in nuclear processes relative to other kinds of transformations.
- Content Limit: Assessment does not include quantitative calculation of energy released. Assessment is limited to alpha, beta, and gamma radioactive decays.

PSC1-HS-5. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

- Further Explanation: Emphasis is on the attractive and repulsive forces that determine the functioning of the material. Examples could include why electrically conductive materials are often made of metal, flexible but durable materials are made up of long chained molecules, and pharmaceuticals are designed to interact with specific receptors.
- Content Limit: Assessment is limited to provided molecular structures of specific designed materials. For questions involving polar vs. nonpolar bonds, item distractors

containing ionic bonds may not be used. Electronegativity differences of ≤ 0.5 should be used for nonpolar covalent bonds. Electronegativity differences of 0.5 – 1.7 should be used for polar covalent bonds.

Supporting Content

PS1.A: Structure and Properties of Matter

- Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (PSC1-HS-1)
- Each atom has a substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons. (PSC1-HS-2)
- The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states. (PSC1-HS-2)
- The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms. (PSC1-HS-3, PSC1-HS-5)

PS1.C: Nuclear Processes

- Nuclear processes, including fusion, fission, and radioactive decays of unstable nuclei, involve release or absorption of energy. The total number of neutrons plus protons does not change in any nuclear process. (PSC1-HS-4)

PS2.B: Types of Interactions

- Attraction and repulsion between electric charges at the atomic scale explain the structure, properties (physical and chemical), and transformations of matter, as well as the contact forces between material objects. (PSC1-HS-2, PSC1-HS3, PSC1-HS-5)

PSC2-HS Chemical Reactions

Performance Standards

Students who demonstrate understanding can:

PSC2-HS-1 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.

- Further Explanation: Examples of chemical reactions could include the reaction of sodium and chlorine, of carbon and oxygen, or of carbon and hydrogen.
- Content Limit: Identify types of chemical reactions including: synthesis/formation/combination reactions, decomposition reactions, single replacement/displacement reactions, double replacement/displacement reactions, oxidation-reduction (redox) reactions (single replacement only), acid base reactions, and combustion reactions (for hydrocarbons). Predict the products of double replacement, single replacement, and combustion reactions only. For the second skill statement, do not use acid names or hydrocarbons when translating between words and formulas. Items will include a list of common ions, as needed.

PSC2-HS-2. 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.

- Further Explanation: Emphasis is on the idea that a chemical reaction is a system that affects the energy change. Examples of models could include molecular-level drawings and diagrams of reactions, graphs showing the relative energies of reactants and products, and representations showing energy is conserved.
- Content Limit: Assessment does not include calculating the total bond energy changes during a chemical reaction from the bond energies of reactants and products.

PSC2-HS-3. 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.

- Further Explanation: Emphasis is on student reasoning that focuses on the number and energy of collisions between molecules.
- Content Limit: Factors that influence the rate of reaction may include temperature, surface area, size of particles, concentration, and catalysts. Can also include concentration and titration relationships. Provide a graphic showing how a catalyst provides a different pathway for a chemical reaction to occur resulting in a lower activation energy. May include a titration curve.

PSC2-HS-4. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

- Further Explanation: Emphasis is on using mathematical ideas to communicate the proportional relationships between masses of atoms in the reactants and the products, and the translation of these relationships to the macroscopic scale using the mole as the conversion from the atomic to the macroscopic scale. Emphasis is on assessing students' use of mathematical thinking and not on memorization and rote application of problem-solving techniques. Should also include calculations related to determining the concentration and/or pH of a solution.
- Content Limit: Conversion problems will be one to two steps (e.g., grams to moles to atoms/molecules). Compounds and formulas should be provided in the stem of the question. Students should be given molecular masses in problems involving gram to other unit conversions. Molar mass calculations should not be combined with conversion problems. All volumes must be at standard temperature and pressure (STP). A balanced equation and molar masses should be included in the item. Calculations may include grams/moles/volume of reactant to grams/moles/volume of product.

PSC2-HS-5. Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.

- Further Explanation: Emphasis is on the application of Le Chatelier's Principle and on refining designs of chemical reaction systems, including descriptions of the connection between changes made at the macroscopic level and what happens at the molecular level. Examples of designs could include different ways to increase product formation including adding reactants or removing products.
- Content Limit: Assessment is limited to specifying the change in only one variable at a time. Assessment does not include calculating equilibrium constants and concentrations.

Supporting Content

PS1.A: Structure and Properties of Matter

- The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar physical and chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states. (PSC2-S-1)
- A stable molecule has less energy than the same set of atoms separated; one must provide at least this energy in order to take the molecule apart. (PSC2-HS-2)

PS1.B: Chemical Reactions

- Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy. (PSC2-HS-2, PSC2-HS-3)
- In many situations, a dynamic and condition-dependent balance between a reaction and the reverse reaction determines the numbers of all types of molecules present. (PSC2-HS-5)
- The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions. (PSC2-HS-1, PSC2-HS-4)

ETS1.C: Optimizing the Design Solution

- Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. (PSC2-HS-5)

PSC3-HS Energy

Performance Standards

Students who demonstrate understanding can:

PSC3-HS-1. Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.

- Further Explanation: Emphasis is on how the experimental evidence supports the claim and how a theory is generally modified in light of new evidence. Examples of a phenomenon could include interference, diffraction, and photoelectric effect.
- Content Limit: Assessment does not include using quantum theory.

PSC3-HS-2 Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

- Further Explanation: Emphasis is on explaining the meaning of mathematical expressions used in the model.
- Content Limit: Provide two temperatures (initial and final), a temperature-time graph, or an enthalpy diagram.

PSC3-HS-3. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).

- Further Explanation: Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy. Examples of models could include diagrams, drawings, descriptions, and computer simulations.
- Content Limit: Provide equations for the gas laws (i.e., ideal gas law, Boyle's law, Charles' law, and the combined gas laws).

PSC3-HS-4*. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. ---OPTIONAL

- Further Explanation: Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include calorimeters, heat and cold packs, solar cells, solar ovens, and electrochemical cells. Examples of constraints could include use of renewable energy forms and efficiency.
- Content Limit: Assessment for quantitative evaluations is limited to total output for a given input. Assessment is limited to devices constructed with materials provided to students.

PSC3-HS-5. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

- Further Explanation: Emphasis is on analyzing data from student investigations and using mathematical thinking to describe the energy changes both quantitatively and conceptually (endothermic/exothermic). Examples of investigations could include mixing liquids at different initial temperatures or adding objects at different temperatures to water.
- Content Limit: For items involving specific heat, provide the equation $Q = mC_p\Delta T$ and specific heats. Include the melting and boiling points of water. Perform calculations for changes that do not involve a change of state. Perform gram to mole and mole to ΔH calculations. Use joules as a unit of measure, as opposed to calories.

Supporting Content

PS4.B: Electromagnetic Radiation

- Electromagnetic radiation (e.g., radio, microwaves, light) can be modeled as a wave of changing electric and magnetic fields or as particles called photons. The wave model is useful for explaining many features of electromagnetic radiation, and the particle model explains other features. (PSC3-HS-1)

PS3.A: Definitions of Energy

- Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. (PSC3-HS-2, PSC3-HS-3)
- At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. (PSC3-HS-3, PSC3-HS-4)
- These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a combination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles). In some cases the relative position energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space. (PSC3-HS-3)

PS3.B: Conservation of Energy and Energy Transfer

- Conservation of energy means that the total change of energy in any system is always equal to the total energy transferred into or out of the system. (PSC3-HS-2)
- Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. (PSC3-HS-2, PSC3-HS-5)
- Mathematical expressions, which quantify how the stored energy in a system depends on its configuration (e.g. relative positions of charged particles, compression of a spring) and how kinetic energy depends on mass and speed, allow the concept of conservation of energy to be used to predict and describe system behavior. (PSC3-HS-2)
- The availability of energy limits what can occur in any system. (PSC3-HS-2)
- Uncontrolled systems always evolve toward more stable states—that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down). (PSC3-HS-5)

PS3.D: Energy in Chemical Processes

- Although energy cannot be destroyed, it can be converted to less useful forms—for example, to thermal energy in the surrounding environment. (PSC3-HS-4, PSC3-HS-5)

Physical Sciences (Physics)

PSP1-HS Motion and Stability: Forces and Interactions

Performance Standards

Students who demonstrate understanding can:

PSP1-HS-1. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

- Further Explanation: Examples of data could include tables or graphs of position or velocity as a function of time for objects subject to a net unbalanced force, such as a falling object, an object rolling down a ramp, or a moving object being pulled by a constant force.
- Content Limit: Assessment is limited to one-dimensional motion and to macroscopic objects moving at non-relativistic speeds.

PSP1-HS-2. Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.

- Further Explanation: Emphasis is on the quantitative conservation of momentum in interactions and the qualitative meaning of this principle (Newton's first law).
- Content Limit: Assessment is limited to systems of two macroscopic bodies moving in one dimension.

PSP1-HS-3. Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.

- Further Explanation: Examples of evaluation and refinement could include determining the success of the device at protecting an object from damage and modifying the design to improve it. Examples of a device could include a football helmet or a parachute.
- Content Limit: Assessment is limited to qualitative evaluations and/or algebraic manipulations.

PSP1-HS-4. Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.

- Further Explanation: Emphasis is on both quantitative and conceptual descriptions of gravitational and electric fields.
- Content Limit: Assessment is limited to systems with two objects.

PSP1-HS-5. Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.

- Content Limit: Assessment is limited to designing and conducting investigations with provided materials and tools.

PSP1-HS-6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

- Further Explanation: Emphasis is on the attractive and repulsive forces that determine the functioning of the material. Examples could include why electrically conductive materials are often made of metal, flexible but durable materials are made up of long chained molecules, and pharmaceuticals are designed to interact with specific receptors.
- Content Limit: Assessment is limited to provided molecular structures of specific designed materials.

Supporting Content

PS1.A: Structure and Properties of Matter

- The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms. (PSP1-HS-6)

PS2.A: Forces and Motion

- Newton's second law accurately predicts changes in the motion of macroscopic objects. (PSP1-HS-1)
- Momentum is defined for a particular frame of reference; it is the mass times the velocity of the object. (PSP1-HS-2)
- If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes in the momentum of objects outside the system. (PSP1-HS-2, PSP1-HS-3)

PS2.B: Types of Interactions

- Newton's law of universal gravitation and Coulomb's law provide the mathematical models to describe and predict the effects of gravitational and electrostatic forces between distant objects. (PSP1-HS-4)
- Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields. (PSP1-HS-4, PSP1-HS-5)
- Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects. (PSP1-HS-6, PSC1-HS-1, PSC1-HS-3)

PS3.A: Definitions of Energy

- "Electrical energy" may mean energy stored in a battery or energy transmitted by electric currents. (PSP1-HS-5)

ETS1.A: Defining and Delimiting an Engineering Problem

- Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (PSP1-HS-3)

ETS1.C: Optimizing the Design Solution

- Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. PSP1-HS-3)

PSP2-HS Energy

Performance Standards

Students who demonstrate understanding can:

PSP2-HS-1 Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

- Further Explanation: Emphasis is on explaining the meaning of mathematical expressions used in the model.
- Content Limit: Assessment is limited to basic algebraic expressions or computations; to systems of two or three components; and to thermal energy, kinetic energy, and/or the energies in gravitational, magnetic, or electric fields.

PSP2-HS-2. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).

- Further Explanation: Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy, the energy stored due to position of an object above the earth, and the energy stored between two electrically-charged plates. Examples of models could include diagrams, drawings, descriptions, and

computer simulations.

PSP2-HS-3. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

- Further Explanation: Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints could include use of renewable energy forms and efficiency.
- Content Limit: Assessment for quantitative evaluations is limited to total output for a given input. Assessment is limited to devices constructed with materials provided to students.

PSP2-HS-4. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

- Further Explanation: Emphasis is on analyzing data from student investigations and using mathematical thinking to describe the energy changes both quantitatively and conceptually. Examples of investigations could include mixing liquids at different initial temperatures or adding objects at different temperatures to water.
- Content Limit: Assessment is limited to investigations based on materials and tools provided to students.

PSP2-HS-5. Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.

- Further Explanation: Examples of models could include drawings, diagrams, and texts, such as drawings of what happens when two charges of opposite polarity are near each other.
- Content Limit: Assessment is limited to systems containing two objects.

Supporting Content

PS3.A: Definitions of Energy

- Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. (PSP2-HS-1, PSP2-HS-2)
- At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. (PSP2-HS-2, PSP2-HS-3)
- These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a combination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles). In some cases the relative position energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space. (PSP2-HS-2)

PS3.B: Conservation of Energy and Energy Transfer

- Conservation of energy means that the total change of energy in any system is always equal to the total energy transferred into or out of the system. (PSP2-HS-1)
- Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. (PSP2-HS-1, PSP2-HS-4)
- Mathematical expressions, which quantify how the stored energy in a system depends on its configuration (e.g. relative positions of charged particles, compression of a spring) and how kinetic energy depends on mass and speed, allow the concept of conservation of energy to be used to predict and describe system behavior. (PSP2-HS-1)
- The availability of energy limits what can occur in any system. (PSP2-HS-1)
- Uncontrolled systems always evolve toward more stable states—that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down). (PSP2-HS-4)

PS3.C: Relationship Between Energy and Forces

- When two objects interacting through a field change relative position, the energy stored in the field is changed. (PSP2-HS-5)

PS3.D: Energy in Chemical Processes

- Although energy cannot be destroyed, it can be converted to less useful forms—for example, to thermal energy in the surrounding environment. (PSP2-HS-3, PSP2-HS-4)

ETS1.A: Defining and Delimiting an Engineering Problem

- Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (PSP2-HS-3)

PSP3-HS Waves

Performance Standards

Students who demonstrate understanding can:

PSP3-HS-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.

- Further Explanation: Examples of data could include electromagnetic radiation traveling in a vacuum and glass, sound waves traveling through air and water, and seismic waves traveling through the Earth.
- Content Limit: Assessment is limited to algebraic relationships and describing those relationships qualitatively.

PSP3-HS-2. Evaluate questions about the advantages of using digital transmission and storage of information.

- Further Explanation: Examples of advantages could include that digital information is stable because it can be stored reliably in computer memory, transferred easily, and copied and shared rapidly. Disadvantages could include issues of easy deletion, security, and theft.

PSP3-HS-3. Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.

- Further Explanation: Emphasis is on how the experimental evidence supports the claim and how a theory is generally modified in light of new evidence. Examples of a phenomenon could include resonance, interference, diffraction, and photoelectric effect.
- Content Limit: Assessment does not include using quantum theory.

PSP3-HS-4. Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.

- Further Explanation: Emphasis is on the idea that photons associated with different frequencies of light have different energies, and the damage to living tissue from electromagnetic radiation depends on the energy of the radiation. Examples of published materials could include trade books, magazines, web resources, videos, and other passages that may reflect bias.
- Content Limit: Assessment is limited to qualitative descriptions.

PSP3-HS-5. Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

- Further Explanation: Examples could include solar cells capturing light and converting it to electricity: medical imaging: and communications technology.
- Content Limit: Assessments are limited to qualitative information. Assessments do not include band theory.

Supporting Content

PS3.D: Energy in Chemical Processes

- Solar cells are human-made devices that likewise capture the sun's energy and produce electrical energy. (PSP3-HS-5)

PS4.A: Wave Properties

- The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing. (PSP3-HS-1)
- Information can be digitized (e.g., a picture stored as the values of an array of pixels); in this form, it can be stored reliably in computer memory and sent over long distances as a series of wave pulses. (PSP3-HS-2, PSP3-HS-5)
- [From the 3–5 grade band endpoints] Waves can add or cancel one another as they cross, depending on their relative phase (i.e., relative position of peaks and troughs of the waves), but they emerge unaffected by each other. (Boundary: The discussion at this grade level is qualitative only; it can be based on the fact that two different sounds can pass a location in different directions without getting mixed up.) (PSP3-HS-3)

PS4.B: Electromagnetic Radiation

- Electromagnetic radiation (e.g., radio, microwaves, light) can be modeled as a wave of changing electric and magnetic fields or as particles called photons. The wave model is useful for explaining many features of electromagnetic radiation, and the particle model explains other features. (PSP3-HS-3)
- When light or longer wavelength electromagnetic radiation is absorbed in matter, it is generally converted into thermal energy (heat). Shorter wavelength electromagnetic radiation (ultraviolet, X-rays, gamma rays) can ionize atoms and cause damage to living cells. (PSP3-HS-4)
- Photoelectric materials emit electrons when they absorb light of a high-enough frequency. (PSP3-HS-5)

PS4.C: Information Technologies and Instrumentation

- Multiple technologies based on the understanding of waves and their interactions with matter are part of everyday experiences in the modern world (e.g., medical imaging, communications, scanners) and in scientific research. They are essential tools for producing, transmitting, and capturing signals and for storing and interpreting the information contained in them. (PSP3-HS-5)

ESS: Earth and Space Sciences

ESS1-HS Earth's Place in the Universe

Performance Standards

Students who demonstrate understanding can:

ESS1-HS-1. Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.

- Further Explanation: Emphasis is on the energy transfer mechanisms that allow energy from nuclear fusion in the sun's core to reach Earth. Examples of evidence for the model include observations of the masses and lifetimes of other stars, as well as the ways that the sun's radiation varies due to sudden solar flares ("space weather"), the 11-year sunspot cycle, and non-cyclic variations over centuries.
- Content Limit: Assessment does not include details of the atomic and sub-atomic processes involved with the sun's nuclear fusion.

ESS1-HS-2. Construct an explanation of the current model of the origin of the universe based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.

- Further Explanation: Emphasis is on the astronomical evidence of the redshift of light from galaxies as an indication that the universe is currently expanding, the cosmic microwave background as the remnant radiation from the event, and the observed composition of ordinary matter of the universe, primarily found in stars and interstellar gases (from the spectra of electromagnetic radiation from stars), which matches that predicted by the scientific model (3/4 hydrogen and 1/4 helium).

ESS1-HS-3. Communicate scientific ideas about the way stars, over their life cycle, produce elements.

- Further Explanation: Emphasis is on the way nucleosynthesis, and therefore the different elements created, varies as a function of the mass of a star and the stage of its lifetime.
- Content Limit: Details of the many different nucleosynthesis pathways for stars of differing masses are not assessed.

ESS1-HS-4. Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

- Further Explanation: Emphasis is on Newtonian gravitational law s governing orbital motions, which apply to human-made satellites as well as planets and moons.
- Content Limit: Mathematical representations for the gravitational attraction of bodies and Kepler's Laws of orbital motions should not deal with more than two bodies, nor involve calculus.

ESS1-HS-5. Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.

- Further Explanation: Emphasis is on the ability of plate tectonics to explain the ages of crustal rocks. Examples include evidence of the ages oceanic crust increasing with distance from mid-ocean ridges (a result of plate spreading) and the ages of North American continental crust increasing with distance away from a central ancient core (a result of past plate interactions).

ESS1-HS-6. Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.

- Further Explanation: Emphasis is on using available evidence within the solar system to reconstruct the early history of Earth, which formed along with the rest of the solar system. Examples of evidence include the absolute ages of ancient materials (obtained by radiometric dating of meteorites, moon rocks, and Earth's oldest minerals), the sizes and compositions of solar system objects, and the impact cratering record of planetary surfaces.

Supporting Content

ESS1 .A : The Universe and Its Stars

- The star called the sun is changing and will burn out over a lifespan of approximately 10 billion years. (ESS1-HS-1)
- The study of stars' light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth. (ESS1-HS-2, ESS1-HS-3)
- The Big Bang theory is a current scientific model of the origin of the universe that is supported by evidence such as observations of distant galaxies receding from our own, of the measured composition of stars and non-stellar gases, and of the maps of spectra of the primordial radiation (cosmic microwave background) that still fills the universe. Other than the hydrogen and helium formed at the time of the event, nuclear fusion within stars produces all atomic nuclei lighter than and including iron, and the process releases electromagnetic energy. Heavier elements are produced when certain massive stars achieve a supernova stage and explode. (ESS1-HS-2, ESS1-HS-3)

ESS1 .B: Earth and the Solar System

- Kepler's laws describe common features of the motions of orbiting objects, including their elliptical paths around the sun. Orbits may change due to the gravitational effects from, or collisions with, other objects in the solar system. (ESS1-HS-4)

ESS1 .C: The History of Planet Earth

- Continental rocks are generally much older than the rocks of the ocean floor. (ESS1-HS-5)
- Although active geologic processes, such as plate tectonics and erosion, have destroyed or altered most of the very early rock record on Earth, other objects in the solar system, such as lunar rocks, asteroids, and meteorites, have changed little over billions of years. Studying these objects can provide information about Earth's formation and early history. (ESS1-HS-6)

ESS2 .B: Plate Tectonics and Large-Scale System Interactions

- Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. (ESS1-HS-5)

PS1 .C: Nuclear Processes

- Spontaneous radioactive decay follows a characteristic exponential decay law. Nuclear lifetimes allow radiometric dating to be used to determine the ages of rocks and other materials. (ESS1-HS-5, ESS1-HS-6)

PS3 .D: Energy in Chemical Processes and Everyday Life

- Nuclear Fusion processes in the center of the sun release the energy that ultimately reaches Earth as radiation. (ESS1-HS-1)

PS4 .B Electromagnetic Radiation

- Atoms of each element emit and absorb characteristic frequencies of light. These characteristics allow identification of the presence of an element, even in microscopic quantities. (ESS1-HS-2)

ESS2-HS Earth's Systems

Performance Standards

Students who demonstrate understanding can:

ESS2-HS-1. Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.

- Further Explanation: Emphasis is on how the appearance of land features (such as mountains, valleys, and plateaus) and sea-floor features (such as trenches, ridges, and seamounts) are a result of both constructive forces (such as volcanism, tectonic uplift, and orogeny) and destructive mechanisms (such as weathering, mass wasting, and coastal erosion).
- Content Limit: Assessment does not include memorization of the details of the formation of specific geographic features of Earth's surface.

ESS2-HS-2. Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.

- Further Explanation: Examples should include climate feedbacks, such as how an increase in greenhouse gases causes a rise in global temperatures that melts glacial ice, which reduces the amount of sunlight reflected from Earth's surface, increasing surface temperatures and further reducing the amount of ice. Examples could also be taken from other system interactions, such as how the loss of ground vegetation causes an increase in water runoff and soil erosion; how dammed rivers increase groundwater recharge, decrease sediment transport, and increase coastal erosion; or how the loss of wetlands causes a decrease in local humidity that further reduces the wetland extent.

ESS2-HS-3. Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.

- Further Explanation: Emphasis is on both a one-dimensional model of Earth, with radial layers determined by density, and a three-dimensional model, which is controlled by mantle convection and the resulting plate tectonics. Examples of evidence include maps of Earth's three-dimensional structure obtained from seismic waves, records of the rate of change of Earth's magnetic field (as constraints on convection in the outer core), and identification of the composition of Earth's layers from high-pressure laboratory experiments.

ESS2-HS-4. Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.

- Further Explanation: Examples of the causes of climate change differ by timescale, over 1-10 years: large volcanic eruption, ocean circulation; 10-100s of years: changes in human activity, ocean circulation, solar output; 10-100s of thousands of years: changes to Earth's orbit and the orientation of its axis; and 10-100s of millions of years: long-term changes in atmospheric composition.
- Content Limit: Assessment of the results of changes in climate is limited to changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.

ESS2-HS-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.

- Further Explanation: Emphasis is on mechanical and chemical investigations with water and a variety of solid materials to provide the evidence for connections between the hydrologic cycle and system interactions commonly known as the rock cycle. Examples of mechanical investigations include stream transportation and deposition using a stream table, erosion using variations in soil moisture content, or frost wedging by the expansion of water as it freezes. Examples of chemical investigations include chemical weathering and recrystallization (by testing the solubility of different materials) or melt generation (by examining how water lowers the melting temperature of most solids).

ESS2-HS-6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

- Further Explanation: Emphasis is on modeling biogeochemical cycles that include the cycling of carbon through the ocean, atmosphere, soil, and biosphere (including humans), providing the foundation for living organisms.

ESS2-HS-7. Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.

- Further Explanation: Emphasis is on the dynamic causes, effects, and feedbacks between the biosphere and Earth's other systems, whereby geoscience factors control the evolution of life, which in turn continuously alters Earth's surface. Examples of include how photosynthetic life altered the atmosphere through the production of oxygen, which in turn increased weathering rates and allowed for the evolution of animal life; how microbial life on land increased the formation of soil, which in turn allowed for the evolution of land plants; or how the evolution of corals created reefs that altered patterns of erosion and deposition along coastlines and provided habitats for the evolution of new life forms.
- Content Limit: Assessment does not include a comprehensive understanding of the mechanisms of how the biosphere interacts with all of Earth's other systems.

Supporting Content

ESS1.B: Earth and the Solar System

- Cyclical changes in the shape of Earth's orbit around the sun, together with changes in the tilt of the planet's axis of rotation, both occurring over hundreds of thousands of years, have altered the intensity and distribution of sunlight falling on the earth. These phenomena cause a cycle of ice ages and other gradual climate changes. (ESS2-HS-4)

ESS2.A: Earth Materials and Systems

- Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. (ESS2-HS-1, ESS2-HS-2)
- Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface and its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, a solid mantle and crust. Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from Earth's interior and gravitational movement of denser materials toward the interior. (ESS2-HS-3)
- The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles. (ESS2-HS-4)

ESS2.B: Plate Tectonics and Large-Scale System Interactions

- The radioactive decay of unstable isotopes continually generates new energy within Earth's crust and mantle, providing the primary source of the heat that drives mantle convection. Plate tectonics can be viewed as the surface expression of mantle convection. (ESS2-HS-3)
- Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within Earth's crust. (ESS2-HS-1)

ESS2.C: The Roles of Water in Earth's Surface Processes

- The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks. (ESS2-HS-5)

ESS2.D: Weather and Climate

- The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space. (ESS2-HS-2,ESS2-HS-4)
- Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. (ESS2-HS-6, ESS2-HS-7)
- Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate. (ESS2-HS-6, ESS2-HS-4)

ESS2.E: Biogeology

- The many dynamic and delicate feedbacks between the biosphere and other Earth systems cause a continual co-evolution of Earth's surface and the life that exists on it. (ESS2-HS-7)

PS4.A: Wave Properties

- Geologists use seismic waves and their reflection at interfaces between layers to probe structures deep in the planet. (ESS2-HS-3)

ESS3-HS Earth and Human Activity

Performance Standards

Students who demonstrate understanding can:

ESS3-HS-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

- Further Explanation: Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils such as river deltas, and high concentrations of minerals and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, mass wasting and soil erosion), and severe weather (such as hurricanes, floods, and droughts). Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the types of crops and livestock that can be raised.

ESS3-HS-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.

- Further Explanation: Emphasis is on the conservation, recycling, and reuse of resources (such as minerals and metals) where possible, and on minimizing impacts where it is not. Examples include developing best practices for agricultural soil use, mining (for coal, tar sands, and oil shales), and pumping (for petroleum and natural gas). Science knowledge indicates what can happen in natural systems—not what should happen.

ESS3-HS-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

- Further Explanation: Examples of factors that affect the management of natural resources include costs of resource extraction and waste management, per-capita consumption, and the development of new technologies. Examples of factors that affect human sustainability include agricultural efficiency, levels of conservation, and urban planning.
- Content Limit: Assessment for computational simulations is limited to using provided multi-parameter programs or constructing simplified spreadsheet calculations.

ESS3-HS-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

- Further Explanation: Examples of data on the impacts of human activities could include the quantities and types of pollutants released, changes to biomass and species diversity , or areal changes in land surface use (such as for urban development, agriculture and livestock, or surface mining). Examples for limiting future impacts could range from local efforts (such as reducing, reusing, and recycling resources) to large-scale geoengineering design solutions (such as altering global temperatures by making large changes to the atmosphere or ocean).

ESS3-HS-5. Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.

- Further Explanation: Examples of evidence, for both data and climate model outputs, are for climate changes (such as precipitation and temperature) and their associated impacts (such as on sea level, glacial ice volumes, or atmosphere and ocean composition).
- Content Limit: Assessment is limited to one example of a climate change and its associated impacts.

ESS3-HS-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

- Further Explanation: Examples of Earth systems to be considered are the hydrosphere, atmosphere, cryosphere, geosphere, and/or biosphere . A n example of the far-reaching impacts from a human activity is how an increase in atmospheric carbon dioxide results in an increase in photosynthetic biomass on land and an increase in ocean acidification, with resulting impacts on sea organism health and marine populations.
- Content Limit: Assessment does not include running computational representations but is limited to using the published results of scientific computational models.

Supporting Content

ESS2 .D: Weather and Climate

- Current models predict that, although future regional climate changes will be complex and varied, average global temperatures will continue to rise. The outcomes predicted by global climate models strongly depend on the amounts of human-generated greenhouse gases added to the atmosphere each year and by the ways in which these gases are absorbed by the ocean and biosphere. (ESS3-HS-6)

ESS3 .A : Natural Resources

- Resource availability has guided the development of human society. (ESS3-HS-1)
- All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors. (ESS3-HS-2)

ESS3 .B: Natural Hazards

- Natural hazards and other geologic events have shaped the course of human history. They have altered the sizes of human populations and have driven human migrations. (ESS3-HS-1)

ESS3 .C: Human Impacts on Earth Systems

- The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. (ESS3-HS-3)
- Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. (ESS3-HS-4)
- Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts. (ESS3-HS-5)

- Through computer simulations and other studies, important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in response to human activities. (ESS3-HS-6)

ET S1 .B: Developing Possible Solutions

- When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, environmental impacts. (ESS3-HS-2, ESS3-HS-4)

Appendix A: Suggested Middle and High School Course Progressions

Grades 6-8

Assessment Given At End of 8th Grade As Either Cumulative ISAT OR Content Specific EOC

Conceptual Progressions Model

Course 1		Course 2		Course 3	
SCs	PSs	SCs	PSs	SCs	PSs
PS1.A	PS1-MS-1	PS3.C	PS4-MS-3	LS2.C	LS2-MS-5
PS1.B	PS1-MS-2	PS4.B	LS1-MS-1	LS4.A	LS2-MS-6
PS2.A	PS1-MS-3	PS4.C	LS1-MS-2	LS4.B	LS4-MS-1
PS2.B	PS1-MS-4	LS1.A	LS1-MS-3	LS4.C	LS4-MS-2
PS3.A	PS1-MS-5	LS1.B	LS1-MS-4	LS4.D	LS4-MS-3
PS3.B	PS1-MS-6	LS1.C	LS1-MS-5	ESS1.C	LS4-MS-4
PS4.A	PS2-MS-1	LS2.B	LS1-MS-6	ESS2.D	LS4-MS-5
LS2.A	PS2-MS-2	LS3.A	LS2-MS-3	ESS3.C	LS4-MS-6
ESS1.B	PS2-MS-3	LS3.B	LS2-MS-4	ESS3.C	ESS1-MS-4
ESS2.B	PS2-MS-4	ESS1.A	LS3-MS-1	ETS1.A	ESS3-MS-3
ESS2.C	PS2-MS-5	ESS2.A	LS3-MS-2	ETS1.B	ESS3-MS-4
ESS3.A	PS3-MS-1	ESS2.A	ESS2-MS-1		ESS3-MS-5
ETS1.A	PS3-MS-2	ESS2.D	ESS2-MS-2		
ETS1.B	PS3-MS-3	ESS3.B	ESS2-MS-3		
	PS3-MS-4	ETS1.A	ESS2-MS-4		
	PS3-MS-5	ETS1.B	ESS2-MS-5		
	PS4-MS-1		ESS2-MS-6		
	PS4-MS-2		ESS3-MS-1		
	LS2-MS-1		ESS3-MS-2		
	LS2-MS-2				
	ESS1-MS-1				
	ESS1-MS-2				
	ESS1-MS-3				

Science Domains Model

Physical		Life		Earth	
SCs	PSs	SCs	PSs	SCs	PSs
PS1.A	PS1-MS-1	LS1.A	LS1-MS-1	ESS1.A	ESS1-MS-1
PS1.B	PS1-MS-2	LS1.B	LS1-MS-2	ESS1.B	ESS1-MS-2
PS2.A	PS1-MS-3	LS1.C	LS1-MS-3	ESS1.C	ESS1-MS-3
PS2.B	PS1-MS-4	LS2.A	LS1-MS-4	ESS2.A	ESS1-MS-4
PS3.A	PS1-MS-5	LS2.B	LS1-MS-5	ESS2.B	ESS2-MS-1
PS3.B	PS1-MS-6	LS2.C	LS1-MS-6	ESS2.C	ESS2-MS-2
PS3.C	PS2-MS-1	LS3.A	LS2-MS-1	ESS2.D	ESS2-MS-3
PS4.A	PS2-MS-2	LS3.B	LS2-MS-2	ESS3.A	ESS2-MS-4
PS4.B	PS2-MS-3	LS4.A	LS2-MS-3	ESS3.B	ESS2-MS-5
PS4.C	PS2-MS-4	LS4.B	LS2-MS-4	ESS3.C	ESS2-MS-6
ETS1.A	PS2-MS-5	LS4.C	LS2-MS-5	ESS3.C	ESS3-MS-1
ETS1.B	PS3-MS-1	LS4.D	LS2-MS-6		ESS3-MS-2
	PS3-MS-2	ETS1.B	LS3-MS-1		ESS3-MS-3
	PS3-MS-3		LS3-MS-2		ESS3-MS-4
	PS3-MS-4		LS4-MS-1		ESS3-MS-5
	PS3-MS-5		LS4-MS-2		
	PS4-MS-1		LS4-MS-3		
	PS4-MS-2		LS4-MS-4		
	PS4-MS-3		LS4-MS-5		
			LS4-MS-6		

Grades 9-12

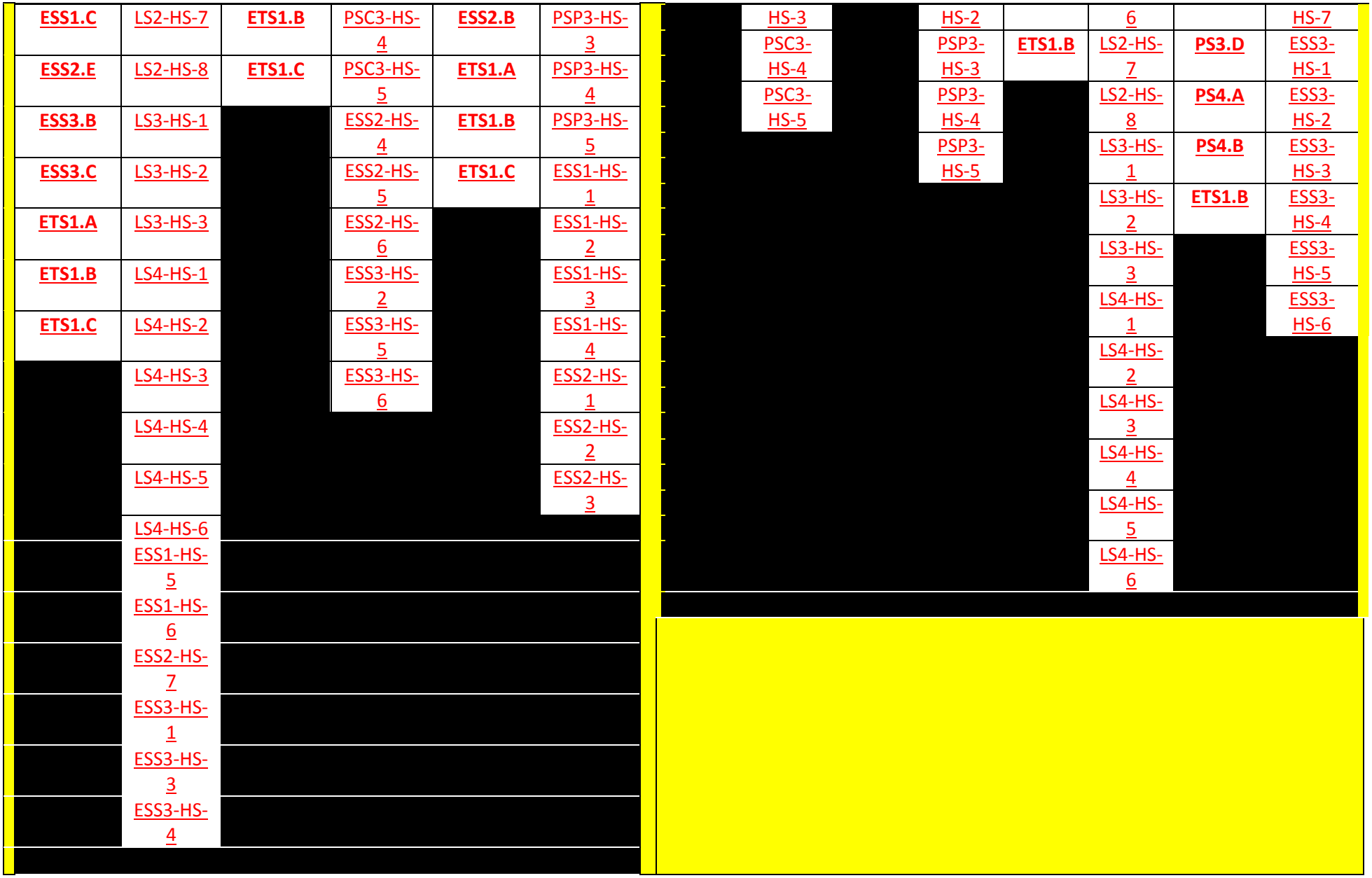
DISTRICT CHOICE	BIOLOGY	CHEMISTRY	PHYSICS
No Assessment	Biology EOC	Chemistry EOC	No Assessment

Modified Science Domains Model

Biology		Chemistry		Physics	
SCs	PSs	SCs	PSs	SCs	PSs
LS1.A	LS1-HS-1	PS1.A	PSC1-HS-1	PS1.A	PSP1-HS-1
LS1.B	LS1-HS-2	PS1.B	PSC1-HS-2	PS2.A	PSP1-HS-2
LS1.C	LS1-HS-3	PS1.C	PSC1-HS-3	PS2.B	PSP1-HS-3
LS2.A	LS1-HS-4	PS2.B	PSC1-HS-4	PS3.A	PSP1-HS-4
LS2.B	LS1-HS-5	PS3.A	PSC1-HS-5	PS3.B	PSP1-HS-5
LS2.C	LS1-HS-6	PS3.B	PSC2-HS-1	PS3.C	PSP1-HS-6
LS2.D	LS1-HS-7	PS3.D	PSC2-HS-2	PS3.D	PSP2-HS-1
LS3.A	LS2-HS-1	PS4.B	PSC2-HS-3	PS4.A	PSP2-HS-2
LS3.B	LS2-HS-2	ESS2.C	PSC2-HS-4	PS4.B	PSP2-HS-3
LS4.A	LS2-HS-3	ESS2.D	PSC2-HS-5	PS4.C	PSP2-HS-4
LS4.B	LS2-HS-4	ESS3.A	PSC3-HS-1	ESS1.A	PSP2-HS-5
LS4.C	LS2-HS-5	ESS3.C	PSC3-HS-2	ESS1.B	PSP3-HS-1
LS4.D	LS2-HS-6	ETS1.A	PSC3-HS-3	ESS2.A	PSP3-HS-2

Science Domains Model

Chemistry		Physics		Biology		Earth / Space	
SCs	PSs	SCs	PSs	SCs	PSs	SCs	PSs
PS1.A	PSC1-HS-1	PS1.A	PSP1-HS-1	LS1.A	LS1-HS-1	ESS1.A	ESS1-HS-1
PS1.B	PSC1-HS-2	PS2.A	PSP1-HS-2	LS1.B	LS1-HS-2	ESS1.B	ESS1-HS-2
PS1.C	PSC1-HS-3	PS2.B	PSP1-HS-3	LS1.C	LS1-HS-3	ESS1.C	ESS1-HS-3
PS2.B	PSC1-HS-4	PS3.A	PSP1-HS-4	LS2.A	LS1-HS-4	ESS2.A	ESS1-HS-4
PS3.A	PSC1-HS-5	PS3.B	PSP1-HS-5	LS2.B	LS1-HS-5	ESS2.B	ESS1-HS-5
PS3.B	PSC2-HS-1	PS3.C	PSP1-HS-6	LS2.C	LS1-HS-6	ESS2.C	ESS1-HS-6
PS3.D	PSC2-HS-2	PS3.D	PSP2-HS-1	LS2.D	LS1-HS-7	ESS2.D	ESS2-HS-1
PS4.B	PSC2-HS-3	PS4.A	PSP2-HS-2	LS3.A	LS2-HS-1	ESS2.E	ESS2-HS-2
ETS1.C	PSC2-HS-4	PS4.B	PSP2-HS-3	LS3.B	LS2-HS-2	ESS3.A	ESS2-HS-3
	PSC2-HS-5	PS4.C	PSP2-HS-4	LS4.A	LS2-HS-3	ESS3.B	ESS2-HS-4
	PSC3-HS-1	ETS1.A	PSP2-HS-5	LS4.B	LS2-HS-4	ESS3.C	ESS2-HS-5
	PSC3-HS-2	ETS1.C	PSP3-HS-1	LS4.C	LS2-HS-5	ESS3.C	ESS2-HS-6
	PSC3-		PSP3-	LS4.D	LS2-HS-	PS1.C	ESS2-



ESS1.C	LS2-HS-7	**ETS1.B**	PSC3-HS-4	**ESS2.B**	PSP3-HS-3
ESS2.E	LS2-HS-8	**ETS1.C**	PSC3-HS-5	**ETS1.A**	PSP3-HS-4
ESS3.B	LS3-HS-1		ESS2-HS-4	**ETS1.B**	PSP3-HS-5
ESS3.C	LS3-HS-2		ESS2-HS-5	**ETS1.C**	ESS1-HS-1
ETS1.A	LS3-HS-3		ESS2-HS-6		ESS1-HS-2
ETS1.B	LS4-HS-1		ESS3-HS-2		ESS1-HS-3
ETS1.C	LS4-HS-2		ESS3-HS-5		ESS1-HS-4
	LS4-HS-3		ESS3-HS-6		ESS2-HS-1
	LS4-HS-4				ESS2-HS-2
	LS4-HS-5				ESS2-HS-3
	LS4-HS-6				
	ESS1-HS-5				
	ESS1-HS-6				
	ESS2-HS-7				
	ESS3-HS-1				
	ESS3-HS-3				
	ESS3-HS-4				

HS-3	HS-2		6		HS-7
PSC3-HS-4	PSP3-HS-3	**ETS1.B**	LS2-HS-7	**PS3.D**	ESS3-HS-1
PSC3-HS-5	PSP3-HS-4		LS2-HS-8	**PS4.A**	ESS3-HS-2
	PSP3-HS-5		LS3-HS-1	**PS4.B**	ESS3-HS-3
			LS3-HS-2	**ETS1.B**	ESS3-HS-4
			LS3-HS-3		ESS3-HS-5
			LS4-HS-1		ESS3-HS-6
			LS4-HS-2		
			LS4-HS-3		
			LS4-HS-4		
			LS4-HS-5		
			LS4-HS-6		

Appendix B: Glossary of Terms

This tool provides terminologies that represent the overarching concepts and ideas needed to understand the Idaho State Science Standards. The Glossary of Terms is not meant to be exhaustive, but seeks to address critical terms and definitions essential in building science content knowledge and understanding. This tool will assist in promoting consistency across disciplines, increasing student outcomes, and improving stakeholder communication.

analyze - studying the data of an investigation or experiment and looking for trends or patterns in the data or graph to see if the change had an effect

argument/evidence-based account - a reason or set of reasons given with the aim of persuading others that an action or idea is right or wrong, based on empirical evidence

cause and effect - the relationship between events or things, where one is the result of the other or others (action and reaction)

claim - to state or assert that something is true, typically without providing evidence

classify - grouping items together based on traits and/or characteristics

data - the result of your experimentation (facts, figures, and other evidence) that you usually record on a chart and then make a graph

empirical - verifiable by observation (using senses) or experience

evidence -the available body of facts or information indicating whether a claim or proposition is true or valid

example - a thing characteristic of its kind or illustrating a general rule/idea

experimental design - a method of research in which a controlled experimental variable is subjected to special treatment for the purpose of comparison with a variable kept constant

fact - an observation that has been repeatedly confirmed

graph - a diagram showing the visual relationship between variable quantities

hypothesis - a testable statement about the natural world that can be used to build more complex inferences and explanations

inference - a conclusion reached on the basis of evidence and reasoning

interpret - to explain and understand the meaning of evidence based on credible scientific information

investigation - a process to carry out a systematic or formal inquiry to discover and examine the facts

law - a descriptive generalization about how some aspect of the natural world behaves under stated circumstances

measure -to determine the dimensions, quantity or capacity of an object

model (computational, mathematical, etc.)- a representation of an idea, object, process or a system that is used to describe, explain, and make predictions about phenomena that cannot be experienced directly

observation - receiving knowledge of the natural world through our senses, recording information using scientific tools or instruments

pattern/trend - consistent and recurring set of characteristics or traits that helps in the identification of a phenomenon or problem and serves as an indicator or model for predicting future behavior

prediction - a forecast or statement about an uncertain event that is based upon experience or evidence

relationship - the connections between two variables

science - the process of trying to understand the world around us through exploration, invention, and problem solving

scientific reasoning - a justification that connects evidence to a claim

simulation - the imitation of the operation of a real-world process or system over time

solution - a method or a process for dealing with a problem that relies on scientific and/or engineering practices

theory - a substantiated explanation of some aspect of the natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment; the scientific community validates each theory before it is accepted; if new evidence is discovered that the theory does not accommodate, the theory is generally modified in light of this new evidence

variable - any factor that can be controlled, changed, and/or measured; usually in an experiment

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PROFESSIONAL STANDARDS COMMISSION

SUBJECT

Professional Standards Commission – 2015-2016 Annual Report.

REFERENCE

February 2015	Board was accepted the Professional Standards Commission 2013-2014 annual report.
February 2016	Board was accepted the Professional Standards Commission 2014-2015 annual report.

APPLICABLE STATUTE, RULE, OR POLICY

Sections 33-1208, 33-1251, 33-1252, 33-1253, 33-1254, and 33-1258, Idaho Code

BACKGROUND/DISCUSSION

In 1972, the Legislature established the Professional Standards Commission (PSC). This legislative action combined the Professional Practices Commission, established by the Legislature in 1969, with the Professional Standards Board, an advisory board appointed by the State Board of Education. The PSC consists of eighteen (18) constituency members appointed or reappointed by the Board for terms of three (3) years:

- Secondary or Elementary Classroom Teacher (5)
- Exceptional Child Teacher (1)
- School Counselor (1)
- Elementary School Principal (1)
- Secondary School Principal (1)
- Special Education Director (1)
- School Superintendent (1)
- School Board Member (1)
- Public Higher Education Faculty Member (3)
- Private Higher Education Faculty Member (1)
- Public Higher Education Letters and Sciences Faculty Member (1)
- State Career & Technical Education Staff Member (1)
- State Department of Education Staff Member (1)

The PSC publishes an annual report following the conclusion of each fiscal year to the Board regarding the accomplishments of the commission.

IMPACT

This report advises the Board regarding the accomplishments of the Professional Standards Commission at the conclusion of each fiscal year.

ATTACHMENTS

Attachment 1 – 2015-2016 Annual Report Page 3

STAFF COMMENTS AND RECOMMENDATIONS

The Professional Standards Commission is established through Section 33-1252, Idaho Code. The commission is made up of 18 members appointed by the State Board of Education. Membership is made up of individuals representing the teaching profession in Idaho, including a staff person from the Department of Education and the Division of Career Technical Education. No less than seven members must be certificated classroom teachers, of which at least one must be a teacher of exceptional children and one must serve in pupil personnel services. In addition to making recommendations regarding professional codes and standards of ethics to the State Board of Education, the Commission investigates complaints regarding the violation of such standards and makes recommendations to the Board in areas of educator certification and educator preparation standards.

The Professional Standards Commission report includes the number of requests that were received for Alternate Authorization for Interim Certificates as well as the number of individuals completing Board approved non-traditional preparation programs. There are currently two non-traditional preparation programs approved by the Board, American Board for Certification of Teacher Excellence (ABCTE) and Teach for America (TFA).

Comparison of the 2014-2015 and 2015-2016 reported Alternate Authorizations:

2014-2015		2015-2016	
Authorization	**Number***	**Authorization**	**Number**
Teacher to New Certification/ Endorsement	230/244	Teacher to New Certification/ Endorsement	230/244
Content Specialist Certification/Endorsements	56/64	Content Specialist Certification/Endorsements	348/402
Pupil personnel Services Certification/Endorsements	3/3	Pupil personnel Services Certification/Endorsements	6/6
ABCTE Certification/ Endorsements	103/127	ABCTE Certification/ Endorsements	162/207
TFA Certification/ Endorsements	0	TFA Certification/ Endorsements	11/14

* Individuals may have multiple endorsements on a single certificate.

BOARD ACTION

I move to accept the Professional Standards Commission 2015-2016 Annual Report.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

PROFESSIONAL STANDARDS COMMISSION

ANNUAL REPORT

2015-2016

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INTRODUCTION

The 1972 state legislature established the Professional Standards Commission (PSC). This legislative action combined the Professional Practices Commission, established by the state legislature in 1969, with the Professional Standards Board, an advisory board appointed by the State Board of Education. The Commission consists of 18 constituency members appointed or reappointed for terms of three years:

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- School Board Member (1)
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- Private Higher Education Faculty Member (1)
- Public Higher Education Letters and Sciences Faculty Member (1)
- State Career & Technical Education Staff Member (1)
- State Department of Education Staff Member (1)

For further detail regarding the establishment and membership of the Professional Standards Commission, see Idaho Code §33-1252.

PSC Vision

The PSC will continue to provide leadership for professional standards and accountability in Idaho's schools. We will handle that responsibility with respect and in a timely fashion. We will nurture positive relationships and collaborative efforts with a wide range of stakeholders. We will be a dynamic force and a powerful voice advocating on behalf of Idaho's children.

PSC Mission

The PSC makes recommendations to the State Board of Education and renders decisions that provide Idaho with competent, qualified, ethical educators dedicated to rigorous standards, pre-K-12 student achievement, and improved professional practice.

Statutory Responsibilities of the Professional Standards Commission

1. "The commission shall have authority to adopt recognized professional codes and standards of ethics, conduct and professional practices which shall be applicable to teachers in the public schools of the state, and submit the same to the state board of education for its consideration and approval. Upon their approval by the state board of education, the professional codes and standards shall be published by the board."

   Idaho Code §33-1254

2. "The professional standards commission may conduct investigations on any signed allegation of unethical conduct of any teacher brought by:
   a. An individual with a substantial interest in the matter, except a student in an Idaho public school; or
   b. A local board of trustees."

   Idaho Code §33-1209

3. "The commission may make recommendations to the state board of education in such areas as teacher education, teacher certification and teaching standards, and such recommendations to the state board of education or to boards of trustees of school districts as, in its judgment, will promote improvement of professional practices and competence of the teaching profession of this state, it being the intent of this act to continually improve the quality of education in the public schools of this state."

   Idaho Code §33-1258

Professional Standards Commission Membership

During the 2015-2016 academic year, the PSC met five times: July, October, January, March, and June. The following individuals served as members of the PSC:

1. Clara Allred	Twin Falls SD #411	Special Education Administrator
2. Margaret Chipman	Weiser SD #431	School Board Member
3. Kristi Enger	Career & Technical Education	Idaho Career & Technical Education
4. Dr. Deborah Hedeen	Idaho State University	Public Higher Education
5. Esther Henry, Chair	Jefferson County Joint SD #251	Secondary Classroom Teacher
6. Dr. Dana Johnson	Brigham Young University – Idaho	Private Higher Education
7. Pete Koehler	Department of Education	Idaho State Department of Education
8. Charlotte McKinney	Mountain View SD #244	Secondary Classroom Teacher
9. Dr. Becky Meyer	Lake Pend Oreille SD #84	Secondary School Principal
10. Kim Mikolajczyk	Moscow SD #281	School Counselor
11. Dr. Laural Nelson	Idaho Digital Learning Academy	Superintendent
12. Mikki Nuckols, Vice Chair	Bonneville Joint SD #93	Secondary Classroom Teacher
13. Dr. Tony Roark	Boise State University	Public Higher Education – Letters and Sciences
14. Dr. Elisa Saffle	Bonneville Joint SD #93	Elementary School Principal
15. Donna Sulfridge	Mountain Home SD #193	Elementary Classroom Teacher
16. Dr. Heather Van Mullem	Lewis-Clark State College	Public Higher Education
17. Virginia Welton	Coeur d'Alene SD #271	Exceptional Child Teacher
18. Kim Zeydel	West Ada SD #2	Secondary Classroom Teacher

Lisa Colón served as administrator for the PSC from July 1, 2015, to June 30, 2016.

INTERNAL OPERATION OF THE COMMISSION

The PSC has five standing committees that have specific duties. Below is a summary of the main duties for each of the standing committees.

1. **Authorizations Committee**
   - Reviews and makes recommendations to the PSC regarding:
     - Approval of alternative authorizations to teach, serve as an administrator, or provide pupil personnel services;
     - Policies and procedures for alternative authorizations;
     - The development and publishing of certification reports as needed.
2. **Budget Committee**
   - Develops a yearly budget;
   - Monitors and makes recommended revisions to the annual budget.
3. **Executive Committee**
   - Reviews, maintains, and revises the Code of Ethics for Idaho Professional Educators as needed;
   - Determines if there is probable cause to pursue discipline against a certificated educator for alleged unethical conduct.
4. **Professional Development Committee**
   - Develops recommendations for the professional development of certified educators in the state of Idaho.
5. **Standards Committee**
   - Develops recommendations for preservice educator standards for consideration by the State Board of Education;
   - Develops and/or maintains standards and review processes for educator preparation programs including:
     - Annual review of approximately 20 percent of state educator preparation standards, certificates and endorsements;
     - Coordination of national recognition and national program accreditation (Council for the Accreditation of Educator Preparation or CAEP) along with state review to assure graduates of the program meet the state preparation standards;
   - Develops and gives recommendations to the PSC for educator assessment(s) and qualifying scores;
   - Develops and gives recommendations to the PSC for educator certificate and endorsement requirements for consideration by the State Board of Education.

ALTERNATIVE AUTHORIZATIONS

Local school districts, including charter schools or other educational agencies, may request approval of an alternative authorization for an individual to fill a certificated position when he/she does not presently hold an appropriate Idaho educator certificate/endorsement. The alternative authorization request shall be made only after a reasonable effort has been made by the district to find a competent, certificated individual to fill the position. The individual must have a plan that leads to certification in the assigned area.

For further detail regarding alternative authorizations, see http://www.sde.idaho.gov/cert-psc/cert/alt-auth.html.

Authorization Type	Number of Authorizations
Teacher to New Certification/Endorsement	230
Content Specialist	348
Pupil Personnel Services	6
Non-Traditional Route - ABCTE	162
Non-Traditional Route – TFA	11
TOTAL	**757**

There were 18,442 total certificated educators employed statewide during the 2015-2016 school year. The percentage of educators working with an alternative authorization was 4.10 percent.

REQUESTS FOR TEACHER TO NEW CERTIFICATION/ENDORSEMENT AUTHORIZATIONS

The purpose of this authorization is to allow an Idaho school district/charter to hire a candidate who holds a valid Idaho credential to serve in an assignment for which the candidate does not hold the appropriate certificate/endorsement. The district must show that the candidate is uniquely qualified to serve in the assignment while the candidate works toward obtaining the applicable certificate/endorsement. There were 230 Teacher to New Certification authorizations with 244 total endorsements issued during the 2015-2016 school year as follows:

Number Issued	Endorsement
1	Agricultural Science & Technology 6/12
11	All Subjects K/8
2	American Government/Political Science 6/12
2	Art K/12
12	Biological Science 6/12
6	Birth through Grade 3
5	Business Technology Education 6/12
5	Chemistry 6/12
1	Consulting Teacher
6	Director of Special Education
1	Drama 6/12
7	Early Childhood Special Education Pre-K/3
2	Earth Science 6/12
3	Economics 6/12
4	English 6/12
2	English 6/9
4	English as a New Language K/12
3	Family & Consumer Sciences 6/12
1	French 6/12
1	French K/12
46	Generalist K/12
1	Geography 6/12
5	Gifted & Talented K/12
7	Health 6/12
6	Health K/12
1	Deaf/Hard of Hearing K/12
2	History 6/12
2	Literacy K/12
1	Marketing Technology Education 6/12
10	Mathematics 6/12

Number Issued	Endorsement
1	Mathematics 6/9
4	Mathematics-Basic 6/12
1	Music K/12
6	Natural Science 6/12
1	Natural Science 6/9
2	Physical Education 6/12
1	Physical Education K/12
5	Physical Science 6/12
3	Physics 6/12
1	Psychology 6/12
7	School Counselor K/12
22	School Principal Pre-K/12
1	Sociology 6/12
6	Spanish 6/12
2	Spanish K/12
1	Sports Medicine/Athletic Trainer
15	Superintendent
5	Teacher Librarian K/12

REQUESTS FOR CONTENT SPECIALIST AUTHORIZATIONS

The purpose of this authorization is to allow an Idaho school district/charter to hire a candidate who does NOT hold a valid Idaho credential to serve in an assignment that requires certification/endorsement. The district must show that the candidate is uniquely qualified to serve in the assignment while the candidate works toward obtaining the applicable certificate/endorsement. There were 348 Content Specialist authorizations with 402 total endorsements issued during the 2015-2016 school year as follows:

Number Issued	Endorsement
1	Agricultural Science & Technology 6/12
99	All Subjects K/8
4	American Government/Political Science 6/12
1	American Sign Language 6/12
3	Art 6/12
7	Biological Science 6/12
2	Birth through Grade 3
2	Building Trades Construction
8	Business Technology Education 6/12
1	Cabinet & Millwork
4	Chemistry 6/12
3	Communications 6/12
2	Deaf/Hard of Hearing K/12
1	Drafting
4	Drama 6/12
2	Early Childhood Special Education Pre-K/3
4	Earth Science 6/12
3	Economics 6/12
23	English 6/12
2	English 6/9
1	English as a New Language K/12
11	Family & Consumer Science 6/12
2	French 6/12
1	General Engineering
75	Generalist K/12
4	Health 6/12
1	Health K/12
8	History 6/12
1	Literacy K/12
2	Mathematics - Basic 6/12
1	Mathematics - Basic 6/9

Number Issued	Endorsement
24	Mathematics 6/12
2	Microcomputer Applications
3	Music 6/12
13	Music K/12
18	Natural Science 6/12
2	Nursing Assistant
2	Orientation Health Occupations
1	Physical Education K/12
5	Physical Education 6/12
4	Physical Science 6/12
1	Physics 6/12
1	Psychology 6/12
13	School Counselor K/12
8	School Psychologist K/12
2	School Social Worker
2	Social Studies 6/12
1	Social Studies 6/9
6	Spanish 6/12
2	Spanish K/12
3	Speech Language Pathologist
1	Superintendent
1	Teacher Librarian K/12
2	Technology Education 6/12
1	TV Production/Broadcasting
1	Visual Impairment K/12

REQUESTS FOR PUPIL PERSONNEL SERVICES AUTHORIZATIONS

The purpose of this authorization is to allow an Idaho school district/charter to hire a candidate who does NOT hold a valid Idaho credential to serve in an assignment that requires the Pupil Personnel Services Certificate. The authorization allows the candidate to serve in the assignment while working toward obtaining the Pupil Personnel Services Certificate and the applicable endorsement. There were 6 Pupil Personnel Services authorizations with 6 total endorsements issued during the 2015-2016 school year as follows:

Number Issued	Endorsement
4	School Social Worker
2	School Counselor K/12

REQUESTS FOR NON-TRADITIONAL AUTHORIZATIONS (ABCTE AND TFA)

The purpose of the non-traditional programs is to provide an alternative for individuals to become certificated teachers in Idaho without following a standard teacher education program. There are two State Board-approved, non-traditional programs:

- **American Board for Certification of Teacher Excellence (ABCTE)**
  This is a computer-based route designed as an avenue to enter the teaching profession or to add additional certificates or endorsements to an already existing Idaho teaching credential. The candidate must first hold a bachelor's degree.
- **Teach For America (TFA)**
  Teach for America is a program designed to enlist college graduates with a bachelor's degree to teach in low-income communities for two years.

There were 162 Non-Traditional – ABCTE authorizations with 207 total endorsements issued during the 2015-2016 school year as follows:

Number Issued	Endorsement
96	All Subjects K/8
16	Biological Science 6/12
1	Chemistry 6/12
16	English 6/12
42	Generalist K/12
8	History 6/12
2	Literacy K/12
17	Mathematics 6/12
9	Natural Science 6/12

There were 11 Non-Traditional – TFA authorizations with 14 total endorsements issued during the 2015-2016 school year as follows:

Number Issued	Endorsement
1	All Subjects K/8
1	Basic Mathematics 6/12
2	Biological Science 6/12
1	Earth Science 6/12
2	English 6/12
4	Generalist K/12
2	Mathematics 6/12
1	Physical Science 6/12

EXECUTIVE COMMITTEE ACTIVITIES

Under Idaho Code §33-1208 and §33-1209, the PSC has the responsibility for suspending, revoking, issuing letters of reprimand, or placing reasonable conditions on any certificate for educator misconduct. The administrator of the PSC, in conjunction with the deputy attorney general and PSC staff, conducts a review of the written allegation using established guidelines to determine whether to open an investigation or remand the issue to the school district to resolve locally. The Executive Committee considers the allegation(s) and all additional relevant information to determine whether probable cause exists to warrant the filing of an administrative complaint. If probable cause is determined, the Executive Committee recommends disciplinary action to be taken against a certificate. Once an administrative complaint is filed, a hearing may be requested.

During 2015-2016, the PSC received 85 written complaints of alleged educator ethical misconduct, out of which 58 cases were opened. In addition, there were 59 cases closed during 2015-2016. Three (3) of the 59 closed cases were for educators employed as an administrator. The data below represents the cases that were closed.

2015-2016 Closed Ethics Cases

Case Number	Category of Ethics Violation	Probable Cause Found	Disciplinary Action
21323	Breach of Contract	Yes	Revocation
21327	Inappropriate Conduct with Student	Yes	Suspension
21336	Substance Abuse	Yes	Revocation
21410	Inappropriate Conduct with Student	Yes	Revocation
21414	Substance Abuse	Yes	Suspension
21428	Application Discrepancy	No	
21429	Theft-Fraud	Yes	Letter of Reprimand
21430	Application Discrepancy	Yes	Letter of Reprimand
21434	Application Discrepancy	Yes	Letter of Reprimand
21436	Application Discrepancy	Yes	Letter of Reprimand
21437	Application Discrepancy	Yes	Letter of Reprimand
21440	Application Discrepancy	Yes	Letter of Reprimand
21441	Application Discrepancy	No	
21443	Application Discrepancy	Yes	Letter of Reprimand
21450	Application Discrepancy	Yes	Letter of Reprimand
21502	Miscellaneous	Yes	Letter of Reprimand
21504	Application Discrepancy	Yes	Letter of Reprimand
21506	Inappropriate Conduct	Yes	Letter of Reprimand
21508	Breach of Contract	Yes	Letter of Reprimand
21509	Breach of Contract	Yes	Letter of Reprimand
21510	Substance Abuse	Yes	Suspension

Case Number	Category of Ethics Violation	Probable Cause Found	Disciplinary Action
21513	Miscellaneous	Yes	Letter of Reprimand
21514	Inappropriate Conduct with Student	Yes	Suspension
21516	Theft-Fraud	No	
21519	Substance Abuse	Yes	Suspension
21520	Application Discrepancy	Yes	Letter of Reprimand
21521	Inappropriate Conduct	Yes	Letter of Reprimand
21524	Miscellaneous	No	
21525	Miscellaneous	No	
21527	Inappropriate Conduct with Student	Yes	Suspension
21529	Miscellaneous	Yes	Letter of Reprimand
21530	Miscellaneous	No	
21531	Miscellaneous	Yes	Letter of Reprimand
21532	Application Discrepancy	Yes	Letter of Reprimand
21533	Inappropriate Conduct with Student	Yes	Revocation
21534	Inappropriate Conduct with Student	Yes	Revocation
21540	Miscellaneous	No	
21541	Application Discrepancy	Yes	Letter of Reprimand
21542	Application Discrepancy	Yes	Letter of Reprimand
21543	Breach of Contract	No	
21544	Application Discrepancy	Yes	Letter of Reprimand
21545	Application Discrepancy	No	
21546	Application Discrepancy	Yes	Letter of Reprimand
21547	Application Discrepancy	No	
21548	Application Discrepancy	No	
21549	Application Discrepancy	Yes	Voluntary Surrender
21551	Application Discrepancy	Yes	Letter of Reprimand
21552	Sexual Misconduct with a Student	Yes	Voluntary Surrender
21553	Inappropriate Conduct with Student	Yes	Suspension
21555	Application Discrepancy	No	
21556	Application Discrepancy	No	
21558	Miscellaneous	No	
21560	Breach of Contract	No	
21562	Application Discrepancy	No	
21601	Inappropriate Conduct with Student	Yes	Suspension
21602	Application Discrepancy	No	
21606	Inappropriate Conduct with Student	No	
21608	Application Discrepancy	No	
21613	Miscellaneous	No	

2015-2016 Aggregate Data of Closed Ethics Cases Where Probable Cause Was Found

During 2015-2016 the PSC finalized disciplinary action in 39 cases. The disaggregated data is shown below. The first table shows the data by the category of the ethics violation. The second table displays the data by the type of disciplinary action.

Category of Ethics Violation	Number of Cases Closed	Percent of Cases Closed
Application Discrepancy	16	41%
Breach of Contract	3	8%
Felony (Other)	0	0%
Felony (Violent)	0	0%
Inappropriate Conduct	2	5%
Inappropriate Conduct with Student	8	21%
Miscellaneous	4	10%
Misdemeanor	0	0%
Sexual Misconduct Not with a Student	0	0%
Sexual Misconduct with a Student	1	3%
Substance Abuse	4	10%
Theft-Fraud	1	3%

Type of Disciplinary Action	Number of Cases Closed	Percent of Cases Closed
Conditioned Certificate	0	0%
Letter of Reprimand	24	62%
Reinstatement	0	0%
Revocation	5	13%
Revocation (Permanent)	0	0%
Suspension	8	21%
Voluntary Surrender	2	5%

STANDARDS COMMITTEE ACTIVITIES

The Standards Committee is responsible for completing educator preparation standards reviews and educator preparation program reviews and making recommendations to the full PSC. The PSC reviews the recommendations of the Standards Committee and makes recommendations to the State Board of Education for approval consideration.

EDUCATOR PREPARATION STANDARDS REVIEWS

The purpose of educator preparation standards reviews is to define and establish rigorous and research-based standards that better align with national standards and best practices. The standards provide requirements for educator preparation programs to ensure that future educators acquire the knowledge and performance standards to best meet the needs of students.

IDAPA 08.02.02.004 directs that the PSC continuously review/revise 20 percent of the standards per year. The review process involves teams of content area experts from higher education faculty and educators in K-12 Idaho schools. The standards are then reviewed and presented to the State Board of Education for approval. Once approved, they are reviewed and approved by the legislature and become an incorporated-by-reference document in State Board rule.

The following standards were reviewed by the PSC during the 2015-2016 school year:

- Elementary Education
- Mathematics
- Pre-Service Technology
- Science (Biology, Chemistry, Earth and Space Science, Natural Science, Physical Science, and Physics)
- Visual/Performing Arts (Music, Theater Arts, Visual Arts)

EDUCATOR PREPARATION PROGRAM REVIEWS

Each teacher preparation program will undergo a state program approval process that is designed to assure that graduates meet the Idaho standards for beginning teachers and other professional educators. The PSC follows the national accreditation council model by which institutions pursue continuing approval through a full program review every seven (7) years. Additionally, the PSC conducts State-Specific Requirement Reviews, not to exceed every third year following the full program review. The requirements are defined in IDAPA 08.02.02.100: Rules Governing Uniformity and the CAEP standards.

The process for teacher preparation program approval is specifically defined in the Manual of Instruction for State Approval of Idaho Teacher Preparation Programs on file at the State Department of Education, Certification/Professional Standards.

The standards for evaluating teacher preparation programs are found in the Idaho Standards for Initial Certification of Professional School Personnel as updated and approved by the State Board of Education. For review purposes, pertinent rubrics accompanying these standards are on file in the office of the State Department of Education, Certification/ Professional Standards.

These documents are also available for review on the State Department of Education website: http://sde.idaho.gov/cert-psc/psc/standards.html

Current CAEP standards can be reviewed on the following CAEP website: http://caepnet.org/

Current PSC materials, reports, and resources are also available on the State Department of Education website at: http://sde.idaho.gov/cert-psc/psc/

The following educator preparation programs were reviewed by the PSC during the 2015-2016 school year:

- **Northwest Nazarene University**

  A state/NCATE on-site program review visit was held at Northwest Nazarene University (NNU) on February 28 – March 3, 2015. The team reports from that on-site visit were subsequently submitted to the PSC at its May 19-20, 2015, meeting. The reports were considered, and the PSC recommended that the State Board of Education accept the recommendations in those reports.

  The Idaho State Board of Education, at its June 15-16, 2016, meeting, approved the Northwest Nazarene University state team report resulting from the on-site visit. Conditionally approved programs are subject to a focused revisit within three years following the on-site visit to determine if specific standards are met.

  Specific information regarding the Idaho State Board of Education's review of these documents can be found on the State Board's website at the following address: https://boardofed.idaho.gov/meetings/board/archive/2016/0615-1616/index.asp

- **Idaho State University**

  A state/NCATE on-site program review visit was held at Idaho State University (ISU) on September 20 – 22, 2015. The team reports from that on-site visit were subsequently submitted to the PSC at its March 31 – April 1, 2016, meeting. The reports were considered, and the PSC recommended that the State Board of Education accept the recommendations in those reports.

  The Idaho State Board of Education, at its June 15-16, 2016, meeting, approved the Idaho State University state team report resulting from the on-site visit.

Conditionally approved programs are subject to a focused revisit within three years following the on-site visit to determine if specific standards are met.

Specific information regarding the Idaho State Board of Education's review of these documents can be found on the State Board's website at the following address: https://boardofed.idaho.gov/meetings/board/archive/2016/0615-1616/index.asp

PROFESSIONAL STANDARDS COMMITTEE MEETING SUMMARY

1. Standards reviews were conducted in the following content areas: Elementary Education; Mathematics; Technology (pre-service); Science (Biology, Chemistry, Earth/Space Science, Natural Science, Physical Science, and Physics); and Visual/Performing Arts (Theatre Arts, Music, and Visual Arts).
2. The Commission funded the participation of various Commission staff members in the National Association of State Directors of Teacher Education and Certification (NASDTEC) Professional Practices Institute (PPI); the NASDTEC Winter Symposium; and the NASDTEC Annual Conference.
3. As of July 1, 2015, Professional Standards Commission and Certification funds were combined, thus sustaining both programs for a longer period of time without raising certification fees.
4. The Teacher Preparation Program Approval Review Schedule (2013-2027) was revised and posted to the Commission website; it now includes the reviews of non-traditional educator preparation programs (American Board for the Certification of Teacher Excellence or ABCTE and Teach For America or TFA).
5. The Commission passed the Standards Committee's recommendation to replace the Technology Education Praxis II test with the Computer Science Praxis II test with a cut score of 171 for the Computer Science endorsement candidates; that cut score was later decreased to 160.
6. Commission program approval review teams began providing justification/rationale for any performance indicator/standard rated as Unacceptable, thus helping those who review the materials and the institution in terms of knowing how to improve the standard.
7. Commission program approval review teams began holding institutions accountable for (piloted for now) state-specific requirements that will eventually be part of program approval reviews; these requirements focus on clinical practice as well as other components of effective teaching practices determined by legislation or Department of Education mandate.
8. The Commission funded Idaho's annual $4,000 membership in NASDTEC and Idaho's annual $3,977 annual membership in CAEP.
9. Commission staff conducted two certification application denial hearings and one ethics hearing during the 2015-2016 academic year.
10. The Commission paid $5,692 for contracted investigative services during the 2015-2016 academic year.
11. The Commission accepted proposed language to be added to the Commission Procedures Manual to post disciplinary-complaint disposition documents to the Commission website beginning July 1, 2016; ethics cases will not be posted retroactively; settlement agreements will now include language explaining the practice of possible posting.
12. During the academic year, the Commission was updated on the work of the Indian Education Committee and the academic gaps in Idaho between all students and American Indian students; the PSC will now make Native American tribes and other

groups in the state aware of representation vacancy opportunities on the Commission and on Commission-related committees.

13. The Commission was informed of the transition from the No Child Left Behind (NCLB) Act of 2001 to the new Every Student Succeeds Act (ESSA) of 2015, including the removal of the highly qualified requirement for certificated educators and the move, for all states, to one system that meets applicable state certification and licensure requirements, including requirements for alternative certification routes.
14. The Commission conducted regional career fairs in Nampa, Pocatello, Coeur d'Alene, Moscow, and Twin Falls; the fairs provided an opportunity where teacher education candidates could meet with district superintendents who were seeking to fill teaching positions within their districts.
15. Commission members were informed that as of September 1, 2015, individuals renewing or applying for certification (online and paper) must submit official transcripts.
16. The Authorizations Committee began compiling a break out by regions of total alternative authorizations during a given year.
17. The Commission offered an Educational Testing Service (ETS) Data Manager Tool Training to teacher preparation program representatives in the state; this allowed for analysis of the types of questions missed on Praxis exams that teacher preparation program candidates must take.
18. The Standards Committee received a draft of the Idaho Indian Education 2016-2021 strategic plan and a recommendation to incorporate culturally relevant pedagogy (specific to American Indian history and culture) into Idaho Core Teaching Standards.
19. The 2014-2022 schedule for teacher preparation standards reviews was revised (adding new endorsements such as computer science, engineering, and consulting teacher; moving the Administrator Standards to 2016-2017; moving the Teacher Leader Standards to 2017-2018; and moving the Online Teaching Standards to 2017-2018) and posted to the Commission website.
20. The Commission was presented with revised language for the certification application form; the deputy attorney general to the Commission developed the proposed language; the revised language intended to clarify how an applicant should answer on the form if he/she had been involved in any past legal action.
21. The Commission accepted and supported the proposal by State Board of Education staff to use, for the current Title II reporting year, Idaho's existing program review process as criteria for the identification of Low-Performing and At-Risk-for-Low-Performing institutions; as such, a "Conditionally Approved" university program would be "At-Risk-for-Low-Performing" and a "Not Approved" university program would be "Low-Performing".
22. The Commission passed the Standards Committee's recommendation to conditionally approve the Brigham Young University-Idaho Special Education – K/12 Generalist Teacher new program proposal.
23. The Commission, after consideration of ISU's planned revisions for its English as a New Language, Economics, and English Language Arts programs, passed the Standards

Committee's recommendation to approve the ISU program review state team report as written with a change in status from Not Approved to Conditionally Approved for the following programs: English as a New Language; Economics; English Language Arts.

24. The Commission passed the Standards Committee's recommendation to approve the revised Program Review Manual for use, with minor technical changes as necessary by staff, for implementation during 2016-2017; the manual covers the full unit review, state-specific requirements, and focused visits.
25. The Commission passed the Standards Committee's recommendation to encourage the training of Department of Education program approval state team members by CAEP to review the educator preparation programs of Idaho institutions that do not participate in CAEP; each of those institutions will cover the cost of the CAEP portion of their program review.
26. The Commission passed the Standards Committee's recommendation to approve the Mathematics Standards and Mathematics Endorsement as written.
27. The Commission passed the Standards Committee's recommendation to approve the Biology, Chemistry, Earth/Space Science, Natural Science, Physical Science, and Physics Standards as written and to approve the Biology, Chemistry, Earth/Space Science, Natural Science, Physical Science, and Physics Endorsements with the change to remove capitalization in text when referring to content, not a specific course name.
28. The Commission passed the Standards Committee's recommendation to approve the Pre-Service Technology Standards as written.
29. The Commission passed the Standards Committee's recommendation to approve the Visual/Performing Arts Standards and the Visual/Performing Arts Endorsement as written.
30. The Commission accepted its FY2017 proposed budget.
31. The Commission passed the Executive Committee's recommendation to add subpoint e. to Principle VI in the *Code of Ethics for Idaho Professional Educators* to read as follows: "e. Keeping for oneself donations, whether money or items, that were solicited or accepted for the benefit of a student, class, classroom, or school."
32. The Commission administrator was given discretion to deny in first-time certification application discrepancies, explain that application questions must be answered correctly, and report the denial to NASDTEC. In second-time application discrepancies, the administrator will be able to deny and open an ethics case. In this way, those with an application discrepancy the first time will be reported to NASDTEC only once.
33. In a ballot election for 2016-2017 Commission officers, Charlotte McKinney was elected chair and Donna Sulfridge was elected vice-chair.

APPENDIX

FISCAL YEAR 2016 BUDGET EXPENDITURES

PSC Revenue/Expense details FY 2016				**Index Code 2003**				(Budget: Approved 5-30-2015)						
	Jul 15	**Aug 15**	**Sept 15**	**Oct 15**	**Nov 15**	**Dec 15**	**Jan 16**	**Feb 16**	**Mar 16**	**Apr 16**	**May 16**	**June 16**			
Revenue (actual)	**$78,756**	**$78,985**	**$46,090**	**$24,720**	**$16,150**	**$15,660**	**$30,790**	**$37,195**	**$34,845**	**$33,800**	**$64,530**	**$115,140**	**$576,661**	**$0**	
Cash needed to balance FY2016													**$0**		
Cash balance 6/30/2015													**$446,455**		
													Actual FY16	**Budget Amt**	**% Remain of budget**
PERSONNEL															
Salaries, benefits	$49,131	$30,779	$30,926	$32,946	$31,583	$44,267	$31,612	$31,501	$31,607	$36,821	$34,710	$36,950	$422,830	$400,000	-5.71%
OPERATING															
PSC-Commission Work							$701		-$701						
PSC Mtg Travel/meals	$180	$5,578	$247	$5,546	$100	$413	$6,631	$237	$100	$5,907	$140	$556	$25,636	$39,000	34.27%
Public relations/hearings													$0	$0	N/A
Commission Prof Dev & Training													$0	$2,500	100.00%
Governmental Overhead													$0	$13,000	100.00%
Legal Services													$0	$0	N/A
Committee Work															
Leadership Team													$0	$0	N/A
Strategic Planning													$0	$0	N/A
SBOE Meetings													$0	$0	N/A
Exec. - Printing (brochure/poster)													$0	$0	N/A
Investigations/hearings/training			$85				$26	$127		$266	$962	$66	$1,533	$6,000	74.44%
Contract investigative services	$936		$1,066		$1,422	$2,269							$5,692	$15,000	62.05%
NASDTEC Professional Pract.		$2,730	$44	$1,920	$445								$5,140	$7,500	31.47%
NASDTEC Dues										$4,000			$4,000	$4,000	0.00%
Authorizations													$0	$0	N/A
Alternate Routes													$0	$0	N/A
Teacher Licensure/Comp													$0	$0	N/A
Standards													$0	$0	N/A
Standards Maintenance				$150	$3,288	$4,056	$4,943	$4,498	$1,328	$2,516			$20,778	$11,000	-88.89%
Praxis													$0	$0	N/A
Prep Program Review Re-write													$0	$0	N/A
Prep Program Review & Focus visits (PPR) & Training		-$50	$4,436	$2,506					$350	$3,224			$10,465	$15,000	30.23%
CAEP (NCATE) Partnership dues												$3,977	$3,977	$4,000	0.58%
Prof Development Committee													$0	$0	N/A
Communication	$186	$1,653	$887	$1,005	$1,225	$424	$454	$206	$607	$710	$787	$331	$8,475	$12,000	29.38%
Employee Development								$65					$65	$1,000	93.50%
Prof. Services-Consultant													$0	$0	N/A
Repairs and Maintenance Svcs.& supplies						$90							$90	$1,000	91.05%
Admin. services	$127	$115	$213	$210	$90	$279	$282		$117	-$10	$115	$69	$1,607	$2,800	42.59%
Computer services													$0	$250	100.00%
Employee Travel Costs	$362		$15	-$15	$309	$739	$746	$1,004	$406	$2,330	-$545	$1,390	$6,740	$12,500	46.08%
Admin. Supplies (Office supplies)	$61	$2,176	$236	$97	$1,712	$80	$183	$36	$10	$94	$13	$38	$4,737	$7,000	32.32%
Computer Supplies													$0	$250	100.00%
Insurance		$204											$204	$800	74.44%
Rentals & operating leases		$4,718						$4,741					$9,459	$10,000	5.41%
Payroll/Accounting		$1,797											$1,797	$2,000	10.15%
CAPITAL															
Computer equipment			$4,928										$4,928	$2,000	-146.41%
Office equipment													$0	$1,000	100.00%
TOTALS	**$50,982**	**$49,702**	**$43,083**	**$44,364**	**$40,174**	**$52,616**	**$45,578**	**$42,415**	**$33,823**	**$55,858**	**$36,182**	**$43,377**	**$538,155**	**$569,600**	**$0**
Revenue less expenses	$27,774	$29,283	$3,007	($19,644)	($24,024)	($36,956)	($14,788)	($5,220)	$1,022	($22,058)	$28,348	$71,763	$38,506		

SUBJECT

Emergency Provisional Certificates

APPLICABLE STATUTE, RULE, OR POLICY

Sections 33-1201 and 33-1203, Idaho Code

BACKGROUND/DISCUSSION

Emergency provisional applications were received by the State Department of Education from the following school districts:

Jerome School District #261

Applicant Name: Colby Argyle
Content & Grade Range: All Subjects (K-8)
Declared Emergency: August 23, 2016 Jerome School District Board of Trustees declared an area of need exists for the 2016-2017 school year
Summary of Recruitment Efforts: Position was advertised using various methods beginning July 2016. Two applications were received which included Colby Argyle and a district music teacher.
Years of Education or Degrees Attained: Associates Degree, Baccalaureate Degree.

Applicant Name: Roxana Camacho
Content & Grade Range: All Subjects (K-8)
Declared Emergency: August 23, 2016 Jerome School District Board of Trustees declared an area of need exists for the 2016-2017 school year
Summary of Recruitment Efforts: Position was advertised using various methods. Active recruitment for Spanish bi-literate elementary teacher applicants was conducted. Ten (10) applications were received:

- Four (4) were incomplete applications.
- One (1) received very poor recommendations from previous supervisors.
- One (1) was offered the position, but declined.
- One (1) was offered another position in the district.
- One (1) did not hold a degree or credits towards an education degree.
- One (1) had no indication of bi-literacy or references.

Years of Education or Degrees Attained: Associates Degree

Applicant Name: Jonathan Sheen
Content & Grade Range: Health (6-12)
Declared Emergency: September 27, 2016 Jerome School District Board of Trustees declared an area of need exists for the 2016-2017 school year
Summary of Recruitment Efforts: Position was advertised using various methods beginning August 2016 as that is when the position became open due to the teacher choosing to leave the district after three days on contract. Three applications were received which included Jonathan Sheen. One of the other applications had a total of 12 credits earned, and the other had no education listed.

Years of Education or Degrees Attained: Associates Degree, Baccalaureate Degree.

Madison School District #321
Applicant Name: Joshua Spencer
Content & Grade Range: All Subjects (K-8)
Declared Emergency: July 21, 2016 Madison School District Board of Trustees declared hiring emergency of Joshua Spencer
Summary of Recruitment Efforts: Position was advertised from May 27, 2016 to June 6, 2016. Prior to hiring Mr. Spencer, the district had filled six (6) positions in grades 5-6 interviewing approximately eighteen (18) applicants.
Years of Education or Degrees Attained: Master's Degree.

Mountain Home School District #193
Applicant Name: Nathan Bundy
Content & Grade Range: Mathematics (6-12)
Declared Emergency: District declared emergency in October 2016
Summary of Recruitment Efforts: Position was advertised using various methods beginning April 2016. There were two applicants; one was certified the other was not. The district hired the certified teacher. On August 1st, the districts discovered that Mr. Bundy (who was already a certificated employee) had not passed the Praxis for Secondary Math. There were no other applicants in the pool.
Years of Education or Degrees Attained: Baccalaureate Degree.

West Jefferson School District #253
Applicant Name: Paiten Morton
Content & Grade Range: All Subjects (K-8)
Declared Emergency: August 11, 2016 West Jefferson School District Board of Trustees declared emergency openings.
Summary of Recruitment Efforts: Position was advertised beginning June 2016. District "had a very difficult time finding applicants or qualified people to hire"
Years of Education or Degrees Attained: Over two (2) years.

IMPACT

If emergency provisional certificates are not approved, the school districts will have no certificated staff to serve in these classrooms.

ATTACHMENTS

Attachment 1 – Application Packet for Emergency Provisional Certificate Page 5

STAFF COMMENTS AND RECOMMENDATIONS

Section 33-1203, Idaho Code requires, except in the limited fields, for all standard certificate holders prohibits the Board from authorizing standard certificates to individuals who have less than four (4) years of accredited college

training and allows the Board to authorize in emergencies, which must be declared, provisional certificates based on not less than two (2) years of college training. Each of the applicants have at least two (2) years of training from an accredited postsecondary institution.

BOARD ACTION

I move to approve one year emergency provisional certificates for Colby Argyle, Roxana Camacho, Jonathan Sheen, Joshua Spencer, Nathan Bundy, and Paiten Mortan to teach the content area and grade ranges at the specified school districts as provided herein.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

OR

I move to approve one year emergency provisional certificates for Colby Argyle, to teach all subjects kindergarten through grade eight in the Jerome School district #261.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

I move to approve one year emergency provisional certificates for Roxana Camacho, to teach all subjects kindergarten through grade eight in the Jerome School district #261.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

I move to approve one year emergency provisional certificates for Jonathan Sheen to teach Health in grades six through twelve in the Jerome School district #261.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

I move to approve one year emergency provisional certificates for Joshua Spencer to teach all subjects kindergarten through grade eight in the Madison School District #321.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

I move to approve one year emergency provisional certificates for Nathan Bundy to teach Mathematics in grades six through twelve in the Mountain Home School District #193.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

I move to approve one year emergency provisional certificates for Paiten Morton to teach all subjects kindergarten through grade eight in the West Jefferson School District #253.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

APPLICATION PACKET
FOR
STATE BOARD OF EDUCATION EMERGENCY PROVISIONAL CERTIFICATE
2016-2017

REVISED
MAY 2016

TITLE 33
EDUCATION

CHAPTER 12
TEACHERS

33-1203. ACCREDITED TEACHER TRAINING REQUIREMENTS. Except in the limited fields of trades and industries, and specialists certificates of school librarians and school nurses, the state board shall not authorize the issuance of any standard certificate premised upon less than four (4) years of accredited college training, including such professional training as the state board may require; but in emergencies, which must be declared, the state board may authorize the issuance of provisional certificates based on not less than two (2) years of college training.

History:
[33-1203, added 1963, ch. 13, sec. 145, p. 27.]

STATE BOARD OF EDUCATION - EMERGENCY PROVISIONAL CERTIFICATE

INFORMATION:

- The State Board of Education (SBOE) will now review all applications for one-year emergency provisional certification. The Professional Standards Commission will continue to review all applications for the Alternative Authorization-Teacher to New, Content Specialist, and Pupil Personnel Services.

- **Emergency Provisional Certificate** application allows a district/charter to request one-year emergency certification for a candidate who does not hold a current Idaho certificate/credential, but who has strong content background and some educational pedagogy, to fill an area of need that requires certification/endorsement.

- **Emergency Provisional Certificate** is a district request, and the application must be submitted as one complete packet.

- The district/charter must provide documented proof that an emergency exists.

- The candidate for whom the authorization is being requested must have at least two (2) years of college training.

- In order to determine what endorsement is needed for specific assignments, please access the annual SDE Assignment Credential Manual which is posted under the ISEE Manuals drop down toward the bottom of the following ISEE website: http://sde.idaho.gov/tech-services/isee/index.html

- The SBOE will review the application(s) submitted. The SBOE will review only complete packets. If approved, the emergency provisional certification will be valid for the school year for which the application is submitted and approved.

- The candidate for whom the **Emergency Provisional Certificate** is approved can teach under the emergency provisional certification one time only. If the candidate wishes to continue teaching with a district/charter the following school year, the candidate must be enrolled in an educator preparation program and be eligible for the Alternative Authorization-Teacher to New, Content Specialist, or Pupil Personnel Services.

- Candidates who have previously taught under the Provisional Authorization and/or Alternative Authorization-Content Specialist are not eligible for emergency provisional certification.

- While the candidate is under emergency provisional certification, no financial penalties will be assessed to the hiring district.

- Review of all applications for emergency provisional certificates will adhere to the SBOE's formal meeting schedule.

- Applications for emergency provisional certificates will be reviewed within two SBOE meetings (i.e., if the application does not make it onto the agenda for the upcoming SBOE meeting, it will be put on the agenda for the next SBOE meeting).

IMPORTANT: The emergency provisional **cannot be used for Special Education**, per IDEA.

A COMPLETE APPLICATION MUST INCLUDE THE FOLLOWING (use this as a checklist):

1. 1. Completed and signed *District Request for State Board of Education – Emergency Provisional* ☐

- This form is located in the packet and is to be completed by the District Administrator of the school you will be teaching in.

2. Declaration ☐

- Include a declaration by the local school board, documented in board minutes that an area of need exists in the district for this particular position. An agenda for the next school board meeting can be used in lieu of board minutes in an emergency situation, but minutes must follow as soon as available..

3. Letter from the district ☐

- A letter from the district that details how the vacancy was advertised
- How many applicants the district had for the vacancy
- How many applicants were interviewed
- Why the district has chosen the candidate for whom the emergency provisional certification is being requested.

4. Copy of the advertised vacancy announcement ☐

- This should be an actual screen shot of the vacancy announcement.
- Include the length of time the vacancy was advertised.

5. Form B1-A ☐

- This form is located in the packet and must be completed and signed by the individual for which the request is for.

6. Official transcripts ☐

- Attach transcripts verifying at least two (2) year of college training.

7. Completed fingerprint card and forms for a Criminal History Check, if applicable ☐

- Include a completed fingerprint card, the associated forms, and the applicable $32.00 fee. An Idaho certificate/credential will not be issued unless the applicant has cleared a Criminal History Check.

- Fingerprint cards are **NOT** available on the State Department of Education website. Please contact fingerprintrequest@sde.idaho.gov to obtain the fingerprint card, forms, and instructions or call (208) 332-6883 or further information regarding fingerprint requirements.

- Packets will be considered incomplete and returned to the district if it does not contain a new fingerprint card, forms, and fees. Please review all guidelines by accessing the following website: http://www.sde.idaho.gov/cert-psc/cert/background-check.html

8. Criminal History Check fee - $32.00*, if applicable ☐

9. Application fee - $100* ☐

- Checks and money orders are to be made payable to the *State Department of Education*. Credit cards are not accepted. Cash in the exact amount will be accepted for walk-ins. Payment is non-refundable.

*One check or money order for both fees is acceptable.

STATE DEPARTMENT OF EDUCATION
DECEMBER 15, 2016
DISTRICT REQUEST FORM
FOR APPROVAL OF
STATE BOARD OF EDUCATION – EMERGENCY PROVISIONAL CERTIFICATE

(TO BE FILLED OUT BY A DISTRICT ADMINISTRATOR – Please make sure all items are completed.)

1. This request for approval of an **Emergency Provisional Certificate** is being made by:

School District/Charter Name and District # (or other Educational Agency) | **Name of Superintendent**

Name of Contact Person | **Email Address** | **Phone #**

Mailing Address or PO Box #

City, State, and Zip Code

2. This request for an **Emergency Provisional Certificate** is being made on behalf of:

Last Name | **First Name** | **Middle Initial** | **EDUID #**

Date of Birth | **Email Address** | **Phone #**

Mailing Address or PO Box #

City, State, and Zip Code

3. What is the specific school year for which the request is being made?

_____

4. What is the certificate/endorsement for which this request is being made?

☐ Elementary Endorsement(s) _____
☐ Secondary Endorsement(s) _____
☐ Exceptional Child Endorsement(s) _____
☐ Other (Administrator, Pupil Personnel, etc.)
Endorsement(s)_____

5. What is the specific ISEE assignment code and assignment title for which this request is being made? (Please consult the current Assignment Credential Manual at http://sde.idaho.gov/tech-services/isee/index.html)

_____
_____

6. Who will be the designated supervisor/mentor and what is the title of the mentor (e.g. Teacher-Math, Principal, Director of Special Education, etc.)

_____

_____

7. Have you verified there is a copy of the school board minutes indicating emergency with the application packet?
☐ **YES** ☐ **NO**

8. Is a letter from the district that details how the vacancy was advertised, how many applicants the district had for the vacancy, how many applicants were interviewed, and why the district has chosen the candidate for whom the emergency certification is being applied included in the application packet? ☐ **YES** ☐ **NO**

We, the undersigned, have:

a. declared an area of emergency need exists in our district for this particular position and included necessary documentation demonstrating the measures taken to hire the appropriately certificated and endorsed person;
b. recorded this declaration in official minutes of the Board of Trustees meeting; and,
c. included a copy of the board minutes and a letter from the district with this application (**must be included or packet will be returned**).

Printed name of Chairperson of the Local School Board or Educational Agency

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Signature of Chairperson of the Local School Board or Educational Agency **Date**

Printed name of Superintendent/Charter Administrator

Signature of Superintendent /Charter Administrator **Date**

FORM B1-A

APPLICATION

FOR

Alternative Authorization - Teacher to New Certificate/Endorsement, Content Specialist, Provisional (Emergency) and Interim ABCTE, School Nurse or Speech Language Pathologist

THIS SECTION FOR OFFICIAL USE ONLY	Fee	Date Paid	Check #	Date Entered	Date Issued	Date Expired	FP Status

Item #1 Indicate Type of Application: Please check the one which applies.

☐	Alternative Authorization – Teacher to New Certificate/Endorsement (the request is for an individual who already holds a current valid Idaho certificate/credential and is will to work toward meeting the requirements of an additional certificate/endorsement).
☐	Alternative Authorization – Content Specialist (the applicant has a baccalaureate degree or higher and has a letter from a college or university indicating the completion of 8-16 weeks of pedagogy and the passage of the appropriate Praxis II assessment).
☐	Alternative Authorization – Pupil Personnel Services Certificate (the applicant has a master's degree and a valid license from the Bureau of Occupational License in the area they are seeking a certificate/endorsement).
☐	Interim ABCTE (applicant has a valid ABCTE certificate and is applying for the Idaho interim certificate).
☐	Interim School Nurse (applicant has a current valid Idaho professional nursing (RN) license but has not completed a school nurse program).
☐	Emergency Provisional Certificate (Emergency Use ONLY) - applicant has at least two (2) years college training.
☐	Postsecondary Specialist (applicant is a current faculty member at an Idaho university/college and is teaching in the content area for which certification is desired.)
☐	Interim Speech Language Pathologist (applicant has bachelor's degree in speech /language pathology but has not completed an SLP master's program)

Item #2 Personal Information: Please enter your name exactly as you want it to appear on the certificate.

Legal Name		**Last 4 digits of SS#**	
Maiden/Other Name		**EDU ID #**	
Email Address		**Birth Date**	
Street or PO Box #		**Phone #**	
City, State, Zip Code		**Gender** ☐ **MALE** ☐ **FEMALE**	

Item #3 Certificates: List the certificate(s) for which you are applying **(i.e., Elementary, Secondary, Administration etc.).**

Certificate # 1		**Certificate # 3**	
Certificate # 2		**Certificate # 4**	

Item #4 Endorsements: List the educational endorsement(s) for which you are applying **(i.e., English, Principal, etc.).**

Endorsement # 1		**Endorsement # 4**	
Endorsement # 2		**Endorsement # 5**	
Endorsement # 3		**Endorsement # 6**	

Item #5 Educational Institutions: List the colleges/universities you have attended (start with the most recent). You will need to include official transcripts from each institution listed, (if not already on file).

	College/University Name	Course Title	Semester Attended	Credits Earned
a.				
b.				
c.				

Item #6 Teaching Assignment: List the employing school district(s)/educational agency(s) and the assignment

	School District Name	Assignment
a.		
b.		

Item #7 Assessment(s): Attach verification of the Praxis II score(s), if applicable (i.e., photocopy of score sheet) OR the notarized photocopy of the ABCTE certificate of completion. (Not required for Emergency Provisional applications)

Item #8 Consortium: List the name, title and phone number of the consortium members, if applicable. (Not applicable for Emergency Provisional applications)

Consortium Member	Name	Title	Phone #
College/university contact (NA for ABCTE)			
School District Representative (Principal/Administrator)			
Mentor			

continued on next page

Item #9 Licensing and Legal History:

Important note: For each question under Item 8, you must answer "yes" to each question that applies to you, *even if* you have already answered "yes" in a previous application. Answering "yes" to a question does not lead to the automatic denial of your application.

1. Have you ever had a professional license or certificate (such as a teacher certificate) denied by any professional licensing authority, whether federal, state, local, or tribal?

Check one ☐ **YES** ☐ **NO**

2. Have you ever had disciplinary action taken against, or in lieu of disciplinary proceedings have you ever voluntarily relinquished a professional license or certificate (such as a teacher certificate) that you hold or have held, issued by a federal, state, local, or tribal licensing authority? Disciplinary action includes revocation, suspension, probation, letters of reprimand or conditions.

Check one ☐ **YES** ☐ **NO**

3. Is there an action or investigation (that you know of) pending against a professional license or certificate held by you from any professional licensing authority, whether federal, state, local, or tribal?

Check one ☐ **YES** ☐ **NO**

Required documentation if you answer "yes" to question 1, 2, or 3

All applicants answering yes - Include a detailed written explanation of each licensing issue. If you have provided a written explanation with a previous application, you do not need to re-submit a written statement, even though you must answer yes to the question.

4. Have you ever been investigated for (that you know of), arrested for, taken into custody for, cited for, charged with, indicted for, tried for, pleaded guilty to, or were convicted of a felony or misdemeanor, or found to have committed a probation or parole violation? Exclude minor traffic violations such as infractions, parking tickets, and speeding tickets.

In responding to this question, include any pending investigation (that you know of) or charge. Include all cases from federal, state, tribal, and military tribunals. You must also include all cases that were dismissed, settled, sealed, expunged, closed by a withheld judgment or through retained jurisdiction, etc., or handled through juvenile proceedings. Even if you pleaded nolo contendere (no contest) or entered an *Alford* plea, you must disclose this.

Check one ☐ **YES** ☐ **NO**

Required documentation if you answer "yes" to question 4

All applicants answering yes - Include a detailed written explanation of each criminal issue indicating what happened, date of arrest/conviction and what the final disposition was. If you have provided a written explanation with a previous application, you do *not* need to re-submit a written statement, even though you must answer yes to the question.

Applicants with a misdemeanor conviction - If you were convicted of a misdemeanor and the conviction occurred less than five years ago from the date of this application; you must include a copy of the judgment of conviction. If you have provided the judgment with a previous application, you do *not* need to re-submit the judgment, even though you must answer yes to the question.

Applicants with a felony conviction - If you were convicted of a felony, at any time, you must include a copy of the judgment of conviction. If you have provided the judgment with a previous application, you do not need to re-submit the judgment, even though you must answer yes to the question.

NOTE: A printout from the State Judiciary repository will NOT be accepted as relevant court documents. Please obtain court records from the courthouse.

IMPORTANT: FAILURE TO ANSWER THE ABOVE QUESTIONS COULD RESULT IN DENIAL OF A CERTIFICATE, REVOCATION OR SUSPENSION OF AN EXISTING CERTIFICATE.

I attest and affirm that I have read the *Code of Ethics for Idaho Professional Educators*. (For a copy of the Code of Ethics, go to www.sde.idaho.gov/site/teacher_certification.)

I attest and affirm that all statements made by me on this application are true and correct to the best of my knowledge.

I understand that penalties, which may include revocation, suspensions, denial, or conditions, will be imposed under Section 33-1208, Idaho Code, for making any false statement(s) on this application or required documents.

_____ _____

Signature of Applicant **Date**

RETURN FORM, TRANSCRIPTS AND FEE IN ONE PACKET TO:
SDE

State Department of Education
Teacher Certification/Professional Standards
PO Box 83720
Boise, ID 83720-0027

SUBJECT

Idaho Bias and Sensitivity Committee recommendations to remove items from the 2017 Idaho Standards Achievement Test (ISAT) administration

REFERENCE

November 2014	The Board appointed thirty (30) committee member for a two (2) or four (4) year term. A list of ninety (90) additional members were appointed to do a one-time review.
February 2015	The Board approved the removal of an audio clip and associated items per the recommendation of the committee members.
August 2016	The Board appointed new committee members.

APPLICABLE STATUTE, RULE, OR POLICY

Section 33-134, Idaho Code – Assessment Item Review Committee

BACKGROUND/DISCUSSION

In accordance with Section 33-134, Idaho Code, the Board approved a review committee of thirty (30) individuals from each of the six (6) educational regions in the state, representing parents of students, teachers, administrators, and school board members in Idaho's public education system. The committee reviews the computer adaptive test questions on the summative ISAT developed by Smarter Balanced, in ELA/Literacy and Math, for bias and sensitivity.

The committee is authorized to make recommendations to the Board and the State Department of Education to revise or eliminate summative computer adaptive test questions from the assessment forms. The Board shall make the final determination regarding the adoption or rejection of the committee's recommendations.

The Bias and Sensitivity Committee is recommending the removal of the following items from the 2017 ISAT by Smarter Balanced Assessment:

- Three (3) ELA items
- One (1) grade 11 passage with five (5) associated items
- One (1) grade 8 passage with eleven (11) associated items
- One (1) grade 6 math items

IMPACT

If any or all items/passages are approved for removal by the Board, this action will require a new and separate item configuration for the online delivery of both the ELA and Math assessments for the state of Idaho. The work required to generate the separate test configuration will carry a one-time financial impact of $57,000.

Additionally, the grade 8 passage ID 1507 appears on the accommodated paper test form. If this passage is approved for rejection, there will be an estimated $30,000 cost associated with having to produce a new accommodated grade 8 ELA form. The Smarter Balanced Consortium would also need to be involved in this effort.

ATTACHMENTS

STAFF COMMENTS AND RECOMMENDATIONS

Pursuant to Section 33-134, Idaho Code, the Bias and Sensitivity Committee is charged with reviewing any new test items that have been added to any summative computer adaptive test, this includes the Idaho Standards Achievement Test for English Language Usage and Mathematics. Following the review process the committee may make recommendations to the Board for removal of any test questions that the committee determines may be bias or unfair to any group of test takes, regardless of differences in characteristics, including, but not limited to disability status, ethnic group, gender, regional background, native language or socioeconomic status.

BOARD ACTION

I move to approve the removal of the three (3) ELA items, one (1) grade 11 passage with five (5) associated items, one (1) grade 8 passage with eleven (11) associated items, and one (1) grade 6 math item, as submitted.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

OR

I move to reject the recommendation from the Assessment Review Committee and the removal of the three (3) ELA items, one (1) grade 11 passage with five (5) associated items, one (1) grade 8 passage with eleven (11) associated items, and one (1) grade 6 math item, as submitted.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

Bias and Sensitivity

Review Committee Recommendations

September 2016

Background and Introduction

In accordance with Idaho Code § 33-134 – Assessment Item Review Committee, the American Institutes for Research (AIR) and the Idaho State Department of Education (SDE) established a review committee intended to ensure that stakeholders of Idaho's public education system (parents, teachers, administrators, and school board members) have the opportunity to review the types of questions that are being used on Idaho state assessments. The law requires that a committee of thirty individuals representing each of the six education regions of the state annually review all summative computer adaptive test questions for possible issues of bias and sensitivity. The committee is authorized to make recommendations to the State Board of Education and the State Department of Education regarding the revision or elimination of summative computer adaptive test questions from the state assessments. According to the law, the committee is to consist of 30 Idaho residents and shall include the following members from the six regions of Idaho and shall be appointed by the State Board of Education: two parents of public school or public charter school students; one public school or public charter school teacher; one member who is an administrator of a school district or public charter school; and one member from the district board of trustees or public charter school board of directors.

In 2016, pursuant to this law, 798 items (515 English Language Arts/Literacy and 283 Mathematics) items required committee review. Following recommendations by the Idaho Technical Advisory Committee (TAC), a process was established by which each item was reviewed by three committee members, chosen at random from the overall committee pool. Small group discussions ensued for items that were "flagged" as displaying bias and sensitivity issues by 2/3^{rds} of the committee members. General, large group discussions ensued for items that were "flagged" as displaying bias and sensitivity issues by 1/3rd of the small group discussion participants.

After being trained by AIR staff in how to identify items displaying bias and sensitivity concerns (Attachments 1 and 2), committee participants were asked to call out ("flag") items for possible small group discussion. Figure 1 illustrates the Content Rater Interface (a software application) in which panelists would view the item, "flag" it if necessary, and add a comment. In Round Two, the panelists discussed the multi-flagged items in small groups and then the panelists individually voted on the items again. Items which were flagged by 2/3 (18 members) of the committee moved onto Round Three, which consisted of large group discussions designed to determine the final list of items that would be recommended to the State Board of Education for their review. The State Board would consider rejecting these flagged items from the spring 2017 summative computer adaptive tests.

This year's committee of twenty-seven (27) members included six (6) teachers, six (6) administrators, eleven (11) parents and four (4) school board members.

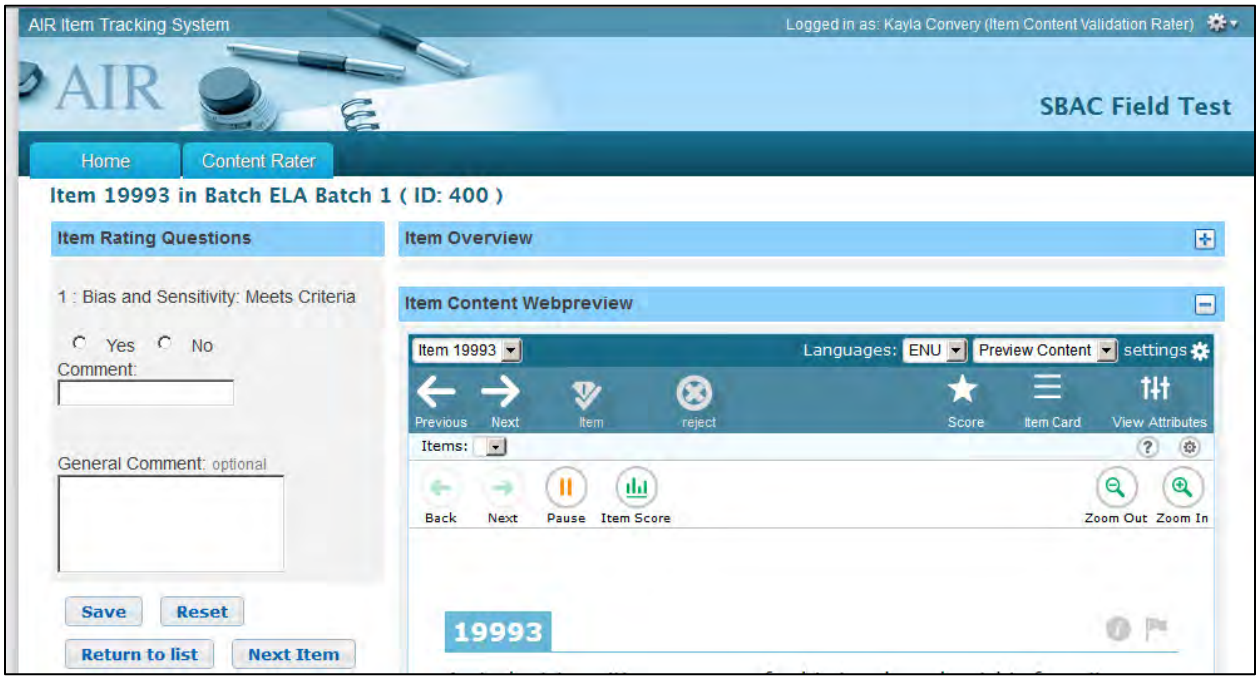
Process and Training

For ease of assignment and review by the committee, AIR organized the items into batches broken down by subject. There were 35 English Language Arts/Literacy (ELA/L) batches and 18 Mathematics batches were created by AIR prior to the committee meeting. The 515 ELA/L items were assembled into thirty-five batches. Each batch contained between 13 and 19 items. Each of the 35 ELA/L batches was then assigned to three different committee members at random. The 283 Mathematics items were assembled into eighteen batches. Each batch contained between 12 and 17 items. Each of the eighteen Mathematics batches was then assigned to three different committee members at random.

AIR configured its' Item Tracking System software to create a "Bias and Sensitivity (BnS) Survey" in its Content Rater application so that committee members could submit electronic feedback about each item in real time. As shown in Figure 1, the user interface for Content Rater displayed each item with a "click-to-enlarge" box that contained the "Item Rating Question" (with comment boxes for feedback), an "Item Overview" dialog pane, which included information about the content alignment of the item, and an "Item Content Web Preview" dialog pane, which presents a rendering of the item as it would appear to a student taking an actual administration. The Content Rater application contained a single question for the committee to answer: "Bias and Sensitivity: Meets Criteria." A response of "Yes" or "No" was required for this question on each item that an individual reviewed. If a participant determined that the item did not meet the Bias and Sensitivity criteria as outlined in the training presentation, and as per standing AIR L.A.B.S. guidelines (i.e., the item **did** display a bias and sensitivity concern; see Attachment 3), then the panelist would select "No." A "No" response from a panelist would require a comment explaining the panelist's reasoning.

Prior to the committee meeting, AIR created usernames and passwords for each committee member within the Item Tracking System. AIR loaded and pre-assigned (randomly) several batches for each committee member to review. Participants were instructed to ask for additional batches as they completed and submitted their initial assignments.

Figure 1. Content Rater Interface



In order to train the committee on identifying possible bias and sensitivity concerns in items, AIR created and presented the "Idaho Bias & Sensitivity Review" PowerPoint presentation that is shown in Attachment 2. Additionally, AIR provided a handout entitled "Summary of Language Accessibility, Bias, and Sensitivity (L.A.B.S.) Guidelines" (Attachment 3) that committee members were able to reference during their reviews.

Upon completion of the Bias and Sensitivity training, the committee was trained on how to log into the Item Tracking System to use Content Rater to submit their feedback on each item electronically.

Round One—Specific Procedure and Results

AIR set up computers in a classroom-style room arrangement in order to facilitate individual reviews by the panelists. In order to monitor the committee's progress, AIR provided daily progress reports to SDE for review each morning. At the conclusion of Round One, all 798 items were reviewed by at least three committee members. In order to determine which items would move on to Round Two for small group discussion, AIR identified which Item ID's had been flagged by two or more committee members. Specifically, an item was flagged when a committee member answered "No" to the "Bias and Sensitivity: Meets Criteria" question. Therefore, an item with "Zero Flags" means that none of the committee members answered "No." An item with "One Flag" means that one of the committee members answered "No." An item with "Two Flags" means that two of the committee members answered "No." An item

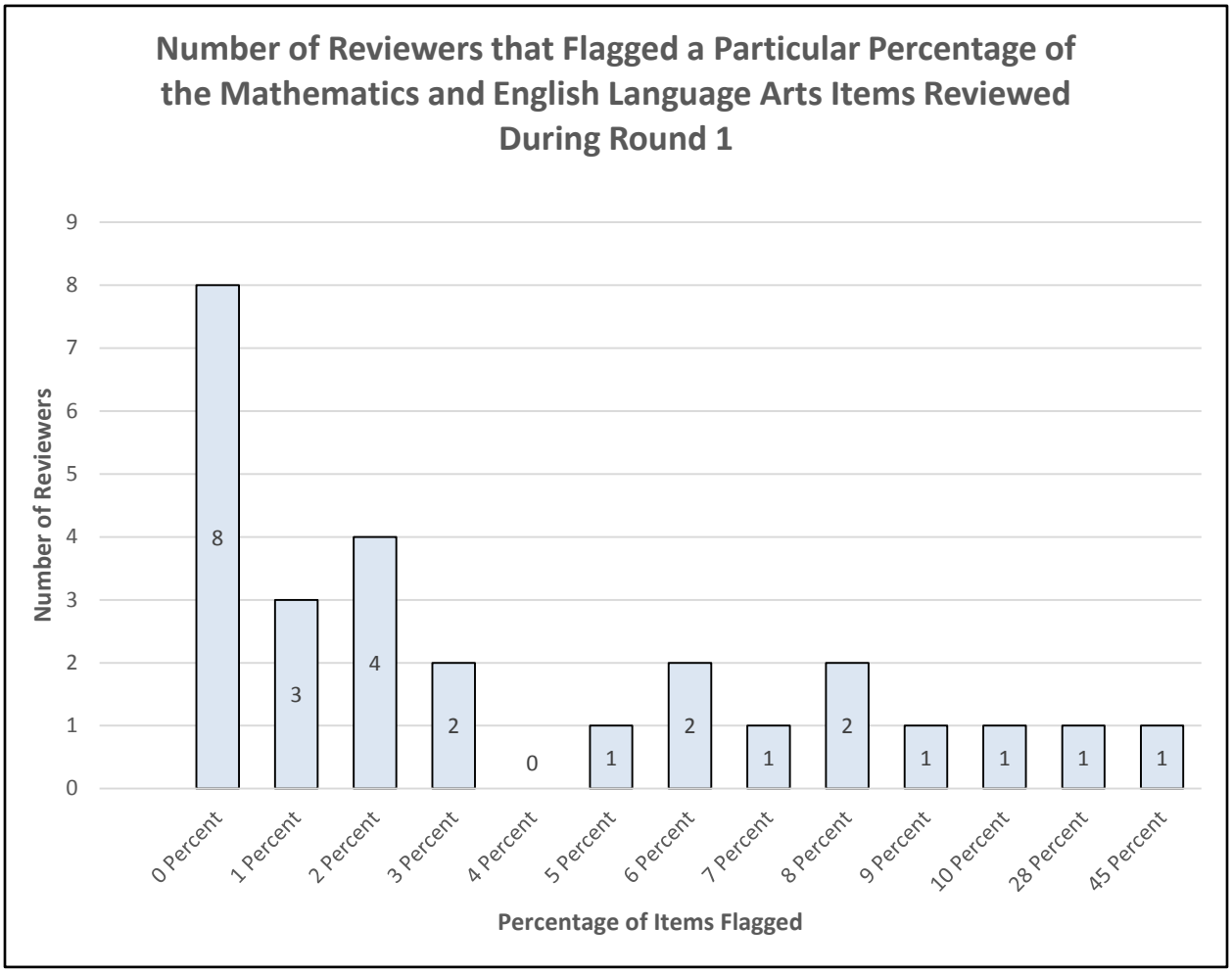
with “Three Flags” means that three of the committee members answered “No.” As advised by Idaho’s TAC, only the items with two or more flags would move on to Round Two. A detailed summary of results of Round One is given below in Table 1.

Table 1. Results of Round One

	Total Items Reviewed	Number of Items with Zero Flags	Number of Items with One Flag	Number of Items with Two Flags	Number of Items with Three Flags
ELA	**515**	427	84	4	0
MATH	**283**	263	19	1	0
TOTAL	**798**	**690**	**103**	**5**	**0**

Figure 2 below is a graph of the number of reviewers that flagged a particular percentage of the ELA/L and Mathematics items they reviewed during Round One. From the graph, it can be noted that a significant majority flagged between zero and one percent of the items (8 and 3 panelists, respectively). One reviewer flagged 45% of all of the Mathematics and English Language Arts/Literacy items he/she reviewed.

Figure 2. Number of Reviewers that Flagged a Particular Percentage of Items



Round Two—Specific Procedure and Results

For Round 2, the committee was asked to conduct another individual review on each item that was flagged by two or more members from Round 1 then discuss the item(s) in small group break-out session. Prior to the small group discussions, all committee members were given the opportunity to view each item/passage that was advanced to Round 2. At the end of the small group discussions, the committee members were asked to vote individually on the multi-flagged items a second time. Round 1 had multi-flagged a total of 7 ELA items, 4 ELA passages and one math item for review by the smaller group and a batch of the one multi-flagged item was created. The small group committee members used the same Content Rater Interface and were asked to answer the same "Bias and Sensitivity: Meets Criteria" question. A response of "Yes" or "No" was required for each item; if individuals determined the item did not meet the Bias and Sensitivity criteria as outlined in the training presentation and the

L.A.B.S. guidelines, then he/she answered the "Bias and Sensitivity: Meets Criteria" question "No," and entered a comment explaining his/her reasoning.

A detailed summary of the results of Round 2 is below in Table 2 (ELA) and Table 3. (Math).

Table 2. Results of Round Two Analysis – ELA Items and Passages

ID BnS Item Review – ELA Round 2 Results

	ELA	
Item ITS ID	**Yes**	**No**
123955	18	9
124164	12	15
124233	9	18
124251	20	7
123757	13	14
123751	12	15
26534	20	7
	ELA	
Passage ITS ID	**Yes**	**No**
1586	17	10
1598	12	15
4439	19	8
1507	24	3

Table 3. Results of Round Two Analysis – Math Items

ID BnS Item Review – Math Round 2 Results

	Math	
Item ITS ID	**Yes**	**No**
42953	19	9

Following the same 1/3rd vote rule that was established for moving items from Round Two to Round Three as was implemented during last year's Bias and Sensitivity Committee Review, AIR analyzed the multi-flagged items that were flagged by 1/3rd of all committee members after Round Two. Based on this information, the group of 27 committee members, as required by law, would review 5 ELA items, 3 ELA passages and one math item during Round Three.

Round Three—Specific Procedure and Results

During Round Three, the committee reconvened in a large group setting to discuss the 6 multi-flagged items and 3 multi-flagged ELA/L passages. Items that received a 2/3rd vote at the end of this final round were sent to the State Board of Education for consideration in removing from the summative computer adaptive test as required by Idaho Code § 33-134. As detailed in below in Table 3, the committee found Bias and Sensitivity concerns with the 3 ELA/L items, two ELA/L passages and one math item. However, please note that the ELA/L passages have 16 associated items (5 associated to stimulus ID 1586 and 11 associated to stimulus ID 1507) that all passed the committee's review without concern.

Table 4. Results of Round 3 Analysis - ELA Items and Passages

ID BnS Item Review – ELA Round 3 Results

	ELA	
Item ITS ID	**Yes**	**No**
123955	14	13
124164	13	14
124233	5	22
123757	5	22
123751	4	23
	ELA	
Passage ITS ID	**Yes**	**No**
1586	5	22
1598	10	17
1507	3	24

Table 5. Results of Round Three Analysis – Math Items

ID BnS Item Review – Math Round 2 Results

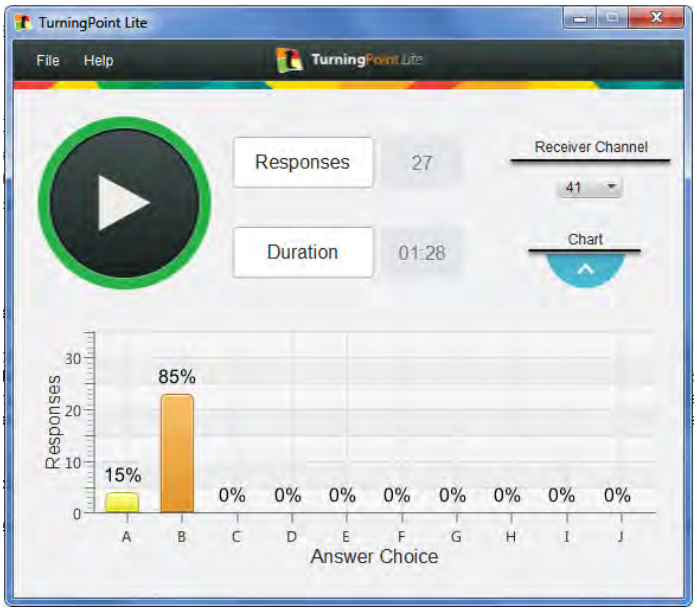
	Math	
Item ITS ID	**Yes**	**No**
42953	9	18

Final Result

Of the 798 items that required review by this committee per Idaho Code § 33-134, 3 ELA items (one grade 4, one grade 7, & one grade 8), one ELA grade 11 passage that has 5 associated items, and one ELA grade 8 passage that has 11 associated items, and one grade 6 math item were determined as having concerns with Bias or Sensitivity according to a 2/3rd committee vote although the passage passed committee reviewed last year. These items, passages, and all associated items have been sent to the Idaho State Board of Education for consideration of rejection from the operational 2017 Grade 4, Grade 7, Grade 8 and Grade 11 ELA assessments and 2017 Grade 6 Math assessment. Details results for each item/passage are presented below.

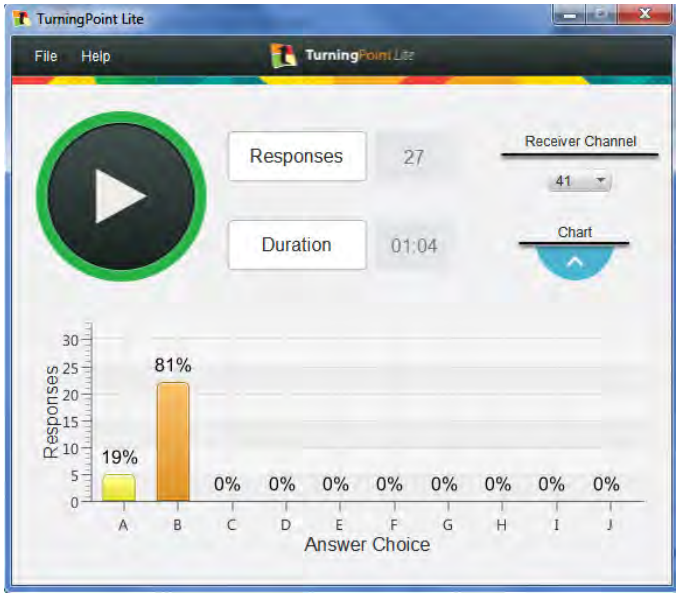
The committee determined the ELA/L grade 4 item ID 123751 did not pass guidelines #2 (sensitive or controversial subjects) and #3 (advice). As seen in Figure 3, the committee voted 4 to 23 that this item does not meet the Bias and Sensitivity guidelines.

Figure 3. Round 3 Poll Results for ELA/L item 123751



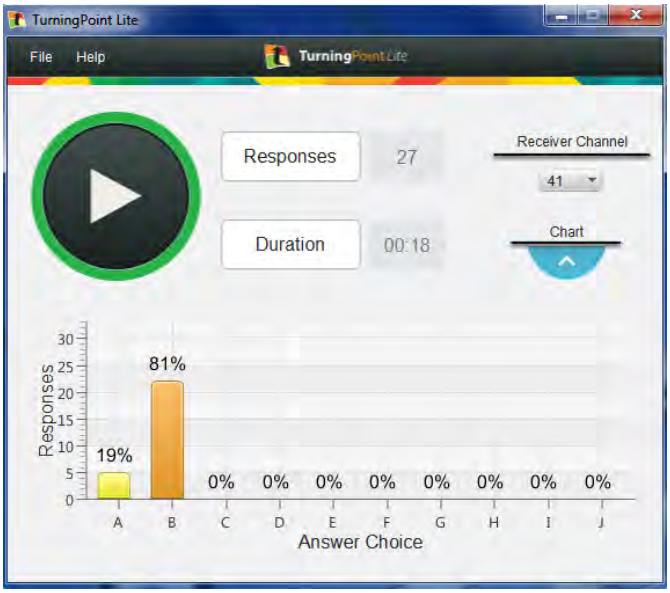
The committee determined ELA/L grade 7 item ID 123757 did not pass guideline #2 (sensitive or controversial subjects). As seen in Figure 4, the committee voted 5 to 22 that this item does not meet the Bias and Sensitivity guidelines.

Figure 4. Round 3 Poll Results for ELA/L item 123757



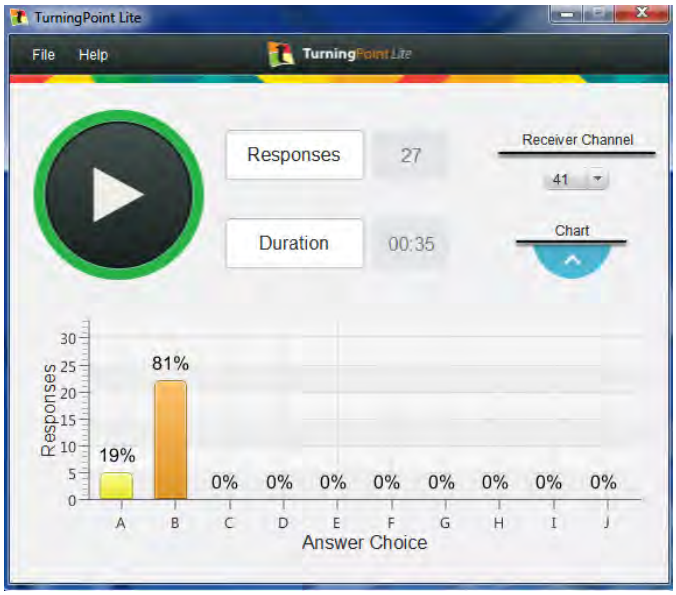
The committee determined ELA/L grade 8 item ID 124233 did not pass guidelines #4 (dangerous activities), #2 (sensitive or controversial subjects), and #3 (advice). As seen in Figure 5, the committee voted 5 to 22 that this item does not meet the Bias and Sensitivity guidelines.

Figure 5. Round 3 Poll Results for ELA/L item 124233



The committee determined ELA/L grade 11 passage ID 1586 “Horseman” did not pass guidelines #1 (stereotyping) and #2 (sensitive or controversial subjects). As seen in Figure 6, the committee voted 5 to 22 that this item does not meet the Bias and Sensitivity guidelines. This passage is associated to 5 items that were previous reviewed by this committee and all associated items have passed the committee without concern.

Figure 6. Round 3 Poll Results for ELA/L passage 1586

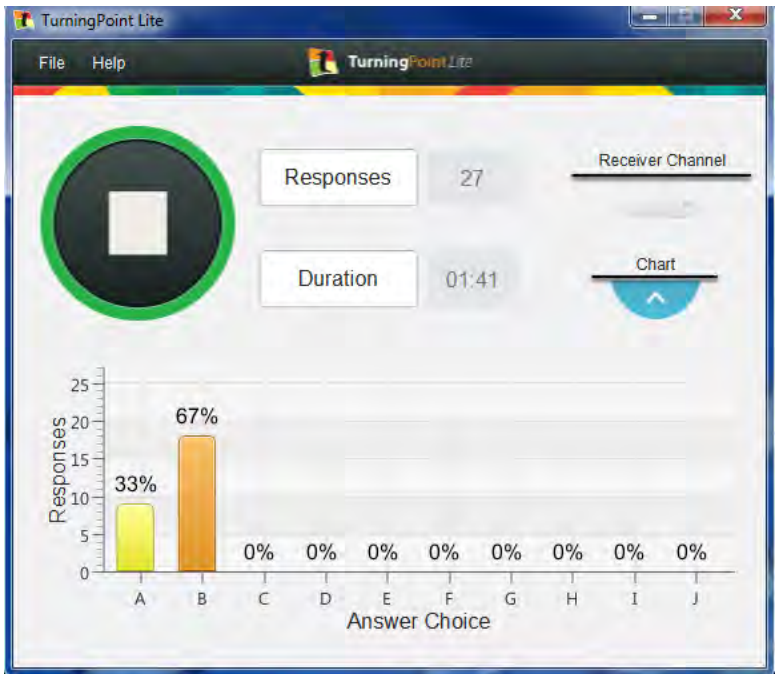


The committee determined ELA/L grade 8 passage ID 1507 “On One Occasion” did not pass guidelines #7 (language accessibility), #2 (sensitive or controversial subjects) and #1 (stereotyping). As seen in Figure 7, the committee voted 3 to 24 that this item does not meet the Bias and Sensitivity guidelines. This passage is associated to 11 items that were previous reviewed by this committee and all associated items have passed the committee without concern.

Figure 7. Round 3 Poll Results for ELA/L passage 1507

The committee determined math grade 6 item ID 42953 did not pass guidelines #1 (stereotyping). As seen in Figure 8, the committee voted 9 to 18 that this item does not meet the Bias and Sensitivity guidelines.

Figure 8. Round 3 Poll Results for math item 42953



Implications of Rejecting All Proposed Items/Passages

AIR has completed the analysis of the impacted Item Bank pools to determine risks associated with rejecting all the items and passage identified by the 2016 Bias and Sensitivity Committee. It is AIR's recommendation that if any or all items/passages are approved for rejection by the State Board of Education, that this action will require a new and separate item configuration for the online delivery of both the ELA and Math assessments for the state of Idaho. The work required to generate the separate test configuration will carry a one-time financial impact of $57,000.

Additionally, the grade 8 passage ID 1507 appears on the accommodated paper test form. If this passage is approved for rejection, there will be an estimated $30,000 cost associated with having to produce a new accommodated grade 8 ELA form. The Smarter Balanced Consortium would also need to be involved in this effort.

For additional questions, please contact Karlynn Laraway, Interim Director of Assessment, at the Idaho State Department of Education, 208-332-6976, or klaraway@sde.idaho.gov.

Idaho Bias & Sensitivity Review

Mathematics & English Language Arts/ Literacy
Wednesday, September 28 and Thursday, September 29, 2016
Boise, Idaho

Introductions

- SDE Personnel
  - Karlynn Laraway
  - Nancy Thomas Price
  - Stephanie Lee
  - Heidi Arrate
  - Beverly Bracewell
- AIR Personnel
  - David Eberhart
  - Kayla Convery
  - Kevin Chandler
  - Josh Smith
  - Eric Rose

What is Bias & Sensitivity Review?

- The committee, known as the Bias and Sensitivity Committee, was created by the Idaho Legislature in 2014 through Idaho Code 33-133.
  - SB1396. Adds to existing law to establish a review committee and to provide that the committee will review certain test questions and make recommendations.
- The review increases test validity by removing features of a test that are construct-irrelevant, that is, features that could unfairly interfere with a test-taker's performance.

AIR Fairness Guidelines

1. Stereotypes
2. Inflammatory or Controversial Material
3. Advice
4. Dangerous Activities
5. Population Diversity
6. Topic Familiarity
7. Language Inclusiveness
8. Linguistic Features/ Language Accessibility

1. Stereotypes

- Tests must not use stereotypes, which are standardized mental pictures help about members of a group that represent an oversimplified opinion, affective attitude, or uncritical judgment.

Examples of Stereotyping

- Boys outscoring girls in math & reading
- Men hunting & women cooking
- Men as doctors & women as nurses
- African Americans as urban dwellers
- Asian Americans as restaurant owners

"Loaded" Words to Avoid

- Backward
- Crafty
- Inscrutable
- Miserly
- Savage
- Superstitious

Example Item - Stereotyping

There are 15 boys and 10 girls in Mr. Granger's math class. On the last test, 87% of the boys and 20% of the girls received an A.

How many students in all received an A?

A. 10
B. 15
C. 20
D. 25

2. Inflammatory or Controversial Material

- Tests must avoid topics that are upsetting, divisive, and unrelated to the content under measurement.

Emotional Topics to Avoid

- Abortion
- AIDS/ other STDs
- Animal Rights/ Abuse
- Birth Control
- Car Accidents
- Child Abuse
- Colonialism
- Death
- Divorce
- Drugs/ Alcohol/ Tobacco
- Euthanasia
- Gambling
- Gangs
- Guns/ Gun Control
- Hate
- Homelessness
- Hunting
- Incest
- Murder
- Nuclear Energy
- The Occult
- Oppression
- Politics
- Racism
- Rape
- Religion
- Religious Holidays
- Sex/ Sexuality
- Sexual Preference/ Orientation
- Slavery
- Suicide
- Teen Pregnancy
- Terrorism
- Torture
- Violence
- War

Examples of Specific Topics to Avoid

- Racial composition of a team or a classroom
- Descriptions of physical characteristics of students (e.g., eye color, weight)
- Descriptions of car accidents
- Units of food offered or served
- Graphic descriptions of specific weather or other natural disasters

Example Item - Inflammatory or Controversial Material

Mark created a survey to see whether the war in Iraq or the American economy is most important in determining a candidate for the upcoming election.

Which sample should Mark use to get the most valid results?

A. All registered Republicans
B. All registered Democrats
C. All registered voters
D. All war veterans

3. Advice

- Tests must not advise on matters pertaining to health and well-being about which there is not universal agreement.

Examples of Advice to Avoid

- Diet
- Health
- Religion
- Sex
- Wellness

Example Item - Advice

Mary is 5 foot 6 inches tall and weighs 175 pounds. She should weigh 145 pounds.

If Mary can lose 1 pound every 2 days. How long will it take for Mary to reach her target weight?

4. Dangerous Activities

- Tests must not contain content that portrays people engaged in, or explains how to engage in, dangerous activities.

Examples of Dangerous Activities to Avoid

- Binging and purging
- Drinking alcohol to excess
- Driving while intoxicated
- Not using a car seatbelt
- Riding a bicycle without a helmet
- Smoking
- Using legal or illegal drugs (marijuana, prescriptions)
- Using weapons

Example Item – Dangerous Activities

Martina's bathroom is very dirty. To get it as clean as possible, she is mixing in a bucket her glass cleaning liquid with a tile cleaner.

What kind of change is taking place with the liquids?

5. Population Diversity

- Tests should reflect in a positive fashion the racial and ethnic composition of the testing population.
- Tests must avoid ethnocentrism.

Reflect the Diversity of the Population

- Use materials written by members of diverse groups.
- Use material that reflects the experiences of diverse groups.
- Portray people in positive, nontraditional roles.
- Be accurate when referring to population subgroups.
- Consider factors such as names, cultural references, pictures, and roles.

Appropriate References

- Be as specific as possible.
- Use the term people use to refer to themselves.

6. Topic Familiarity

- Tests must avoid words, phrases, concepts, and beliefs that are irrelevant to the testing domain and are likely to be differentially familiar to groups (gender, racial, geographical, socioeconomic, religious, ethnic, disability) of the testing population.

Examples of Topics with Differential Familiarity

- Agriculture
- Construction
- Finance
- Law
- Military
- Politics
- Sports
- Technology
- Transportation

Socioeconomic Status-Related Concerns

- Possessions
- Financial concepts
- Leisure activities
- Social functions

However, incidental reference to commonly accessible, middle-class concepts (car, TV, cell phone, home computer) are permitted.

Regional Concerns

- Weather
- Geographical features
- Occupations
- Ethnic groups

Underlying Assumptions

- Be aware of cultural assumptions that underlie the content of a passage or an item.

Example Item - Topic Familiarity

According to the passage, buying stocks, bonds and commodities in one market and selling them to traders at an increased price in **another** is known as arbitrage.

What does the word **another** refer to?

A. stocks
B. commodities
C. traders
D. market

7. Language Inclusiveness

Language must be inclusive as possible.

Avoid "man" words

- Generic "he"
- Mankind
- Known to man
- Manmade
- manpower

And Female Stereotypes

- Old maid
- Old wives' tale
- Pollyanna

Use Equal Pairs

- Husband and wife (*not* man and wife)
- John and Abigail Adams (*not* John Adams and his wife)
- Condoleezza Rice and John Kerry (*not* Rice and Kerry)

Avoid Regional Vocabulary

- Soft drink (*not* pop, soda, or tonic)
- Sandwich (*not* submarine, hoagie, hero or grinder)
- Water fountain (*not* bubbler)
- Stream (*not* brook, creek or rill)
- Mountain lion (*not* cougar, panther, or puma)

8. Linguistic Features/ Language Accessibility

- Tests must be free of language that could unfairly hinder the performance of nonnative speakers of nonstandard dialects of English, and people with language disorders.

Three Categories

- Style
- Grammar
- Vocabulary

Style Issues to Avoid

- Wordiness
- Multiple Subordinate Clauses
  - A group of words that has both a subject and a verb but (unlike an independent clause) cannot stand alone as a sentence.
  - e.g., She said that I don't know what I want Bill to do.
- Unnecessary and unclear passive construction
  - A passive construction occurs when you make the object of an action into the subject of a sentence.
  - e.g., Why was the road crossed by the chicken?

Style Issues to Avoid

- Unnecessary conditionals
  - The conditional mood of the verb.
  - e.g., Water boils when it will reach 100°C.
- Idioms
  - a group of words established by usage as having a meaning not deducible from those of the individual words
  - e.g., raining cats and dogs

Style Issues to Avoid

- Too many words between subject and verb
  - e.g., Farmers that understand the difference between the soil requirements of plants when they are seedlings and their requirements when they are mature are in high demand.
- Negative stems
  - e.g., Which organism would *not* live in a forest ecosystem?

Grammar Issues to Avoid

- Rarefied structures
- Missing or unclear antecedents
  - an expression (word, phrase, clause, etc.) that gives its meaning to a pro-form (pronoun, pro-verb, pro-adverb, etc.).
- Grammatical double negatives
- Incorrect grammar

Vocabulary to Avoid

- Inappropriate register
  - e.g., academic language, language that is too familiar or conversational
- Unnecessary jargon
- Long compound nouns and adjectives
- Gratuitous synonyms

Vocabulary to Avoid

- Words with several meanings
- Unusual or low-frequency words
- Dialect and regionalisms
- Words, phrases, and names with secondary meanings that are sexual or naughty

In Conclusion

- Questions about Policy for SDE
  - Record on 3x5 Index Cards in Rooms
  - Submit to SDE for Answering at Later Time
- Paperwork
  - Sign Non-Disclosure & Submit to Room Leader **Before** Starting
  - Submit Remaining Paperwork to Cathy Salas
- Small Group Trainings on How to Use System
  - Is the next training in this room

STATE DEPARTMENT OF EDUCATION
DECEMBER 15, 2016
SUMMARY OF LANGUAGE ACCESSIBILITY, BIAS, AND SENSITIVITY GUIDELINES

1. STEREOTYPING

Testing materials should not present persons stereotyped according to the following characteristics:

- Age
- Disability
- Gender
- Race/Ethnicity
- Sexual orientation

2. SENSITIVE OR CONTROVERSIAL SUBJECTS

Controversial or potentially distressing subjects should be avoided or treated sensitively. For example, a passage discussing the historical importance of a battle is acceptable whereas a graphic description of a battle would not be. Controversial subjects include:

- Death and Disease
- Gambling*
- Politics (Current)
- Race relations
- Religion
- Sexuality
- Superstition
- War

(References to gambling should be avoided in Mathematics items related to probability.)

3. ADVICE

Testing materials should not advocate specific lifestyles or behaviors except in the most general or universally agreed upon ways. For example, a recipe for a healthful fruit snack is acceptable but a passage recommending a specific diet is not. The following are categories of advice to be avoided completely:

- Religion
- Sexual preference

4. DANGEROUS ACTIVITIES

Care should be taken not to present dangerous activities in such a way as to make them seem appealing or acceptable.

5. POPULATION DIVERSITY, REPRESENTATIVENESS, AND ETHNOCENTRISM

Testing materials should:

- Reflect the diversity of the testing population
- Use stimulus materials (such as works of literature) produced by members of minority communities
- Use personal names from different ethnic origin communities
- Use pictures of people from different ethnic origin communities
- Avoid ethnocentrism (the attitude that all people should share a particular group's language, beliefs, culture, or religion)

6. DIFFERENTIAL FAMILIARITY: ELITISM AND DIF

Specialized concepts and terminology extraneous to the core content of test questions should be avoided. This caveat applies to terminology from the fields of:

- Construction
- Finance
- Sports
- Law
- Machinery
- Military topics
- Politics
- Science
- Technology
- Agriculture

7. LANGUAGE ACCESSIBILITY

Language should be as direct, clear, and inclusive as possible. The following should be avoided or used with care:

- Passive constructions
- Idioms
- Multiple subordinate clauses
- Pronouns with unclear antecedents
- Multiple-meaning words
- Nonstandard grammar
- Dialect
- Jargon

8. GRAPHICS

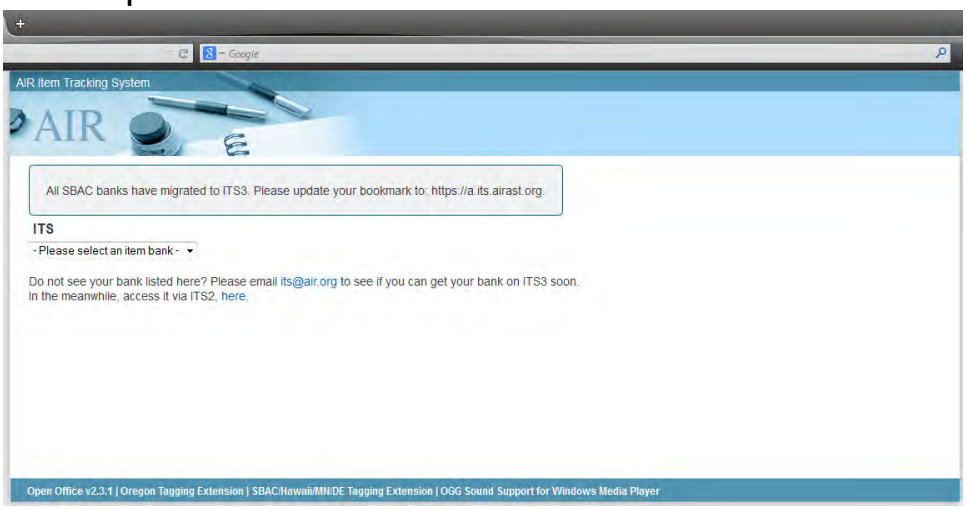
All of the relevant foregoing standards apply to graphics.

SBAC Field Test Content Rater

Idaho Parent Bias & Sensitivity Meeting
Wednesday, September 28 – Thursday, September 29, 2016

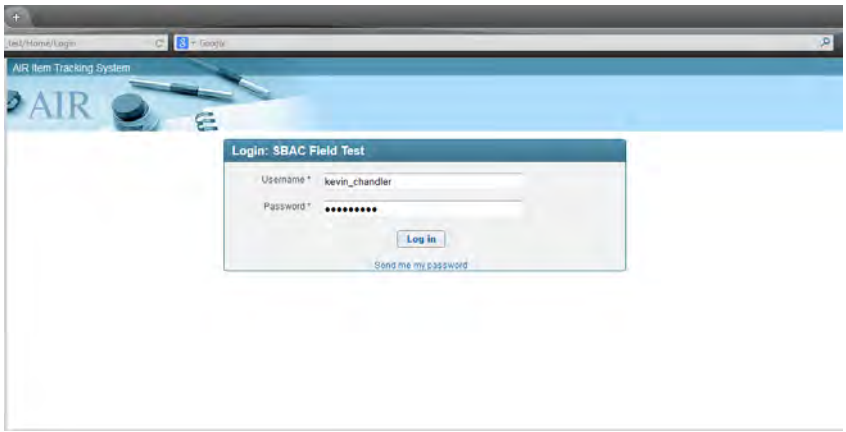
Idaho Parent Bias & Sensitivity Meeting

- Open Mozilla Firefox to SBAC Item Banks



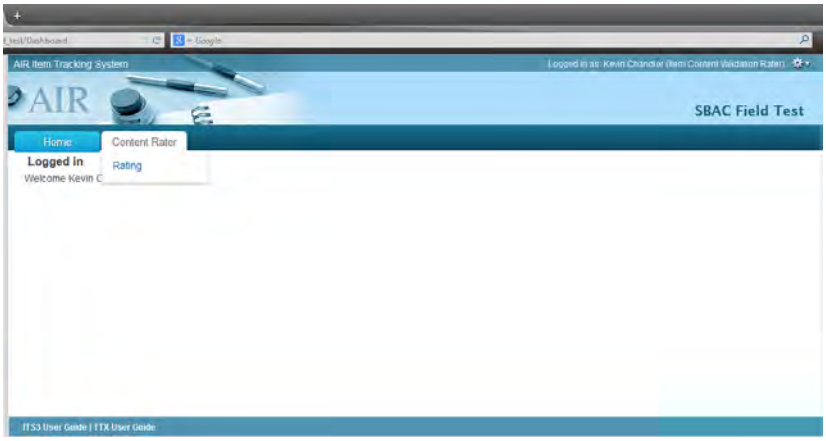
Idaho Parent Bias & Sensitivity Meeting

- Choose “SBAC Field Test” Bank
- Log-In using Credentials on Name Tag



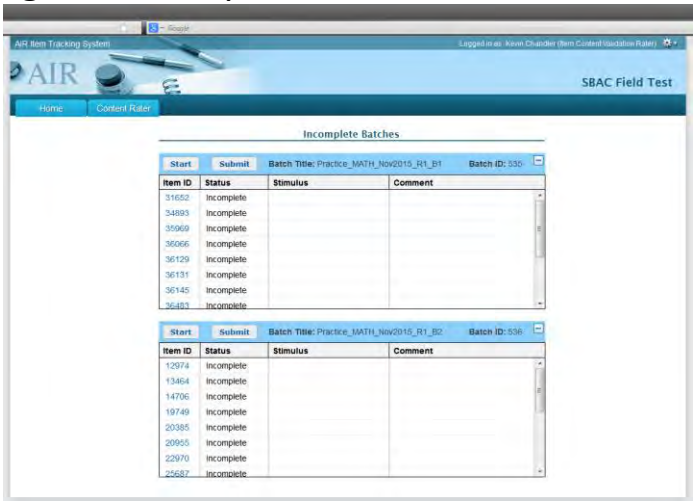
Idaho Parent Bias & Sensitivity Meeting

- “Item Content Validation Rater” access
- Content Rater > Rating



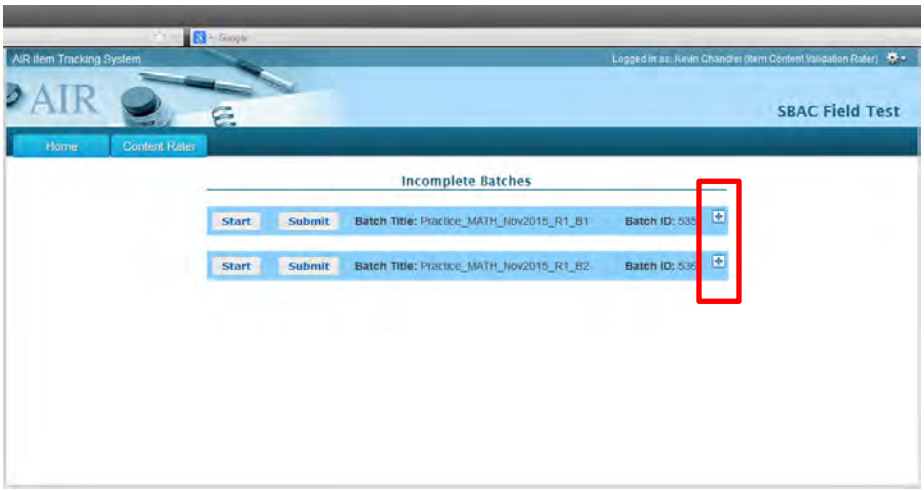
Idaho Parent Bias & Sensitivity Meeting

- Assigned Incomplete Batches Shown



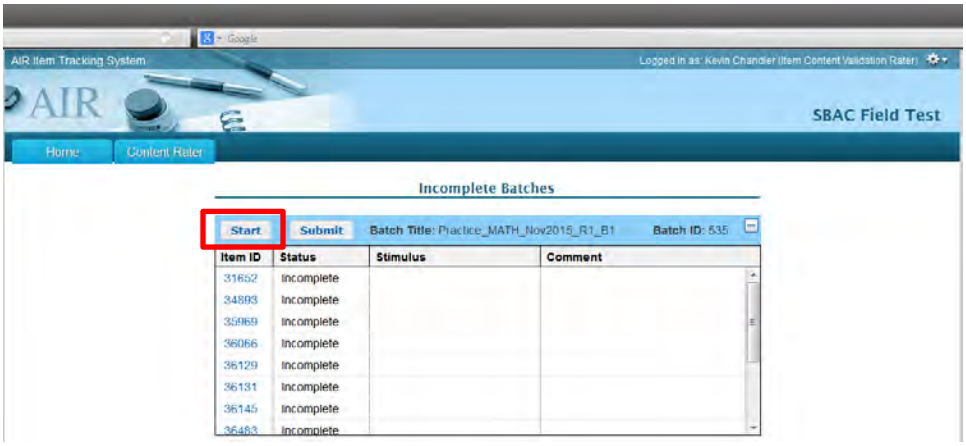
Idaho Parent Bias & Sensitivity Meeting

- Minimize

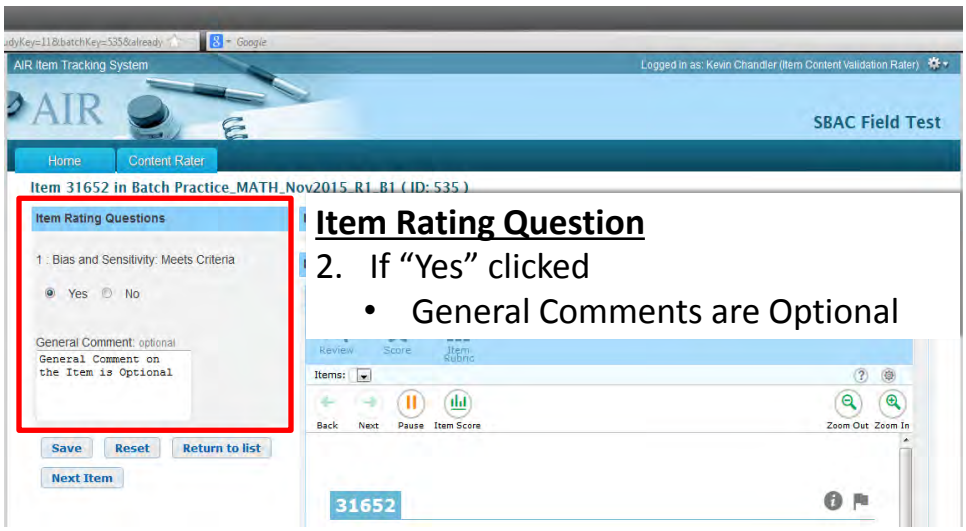


Idaho Parent Bias & Sensitivity Meeting

- Click Start



Idaho Parent Bias & Sensitivity Meeting



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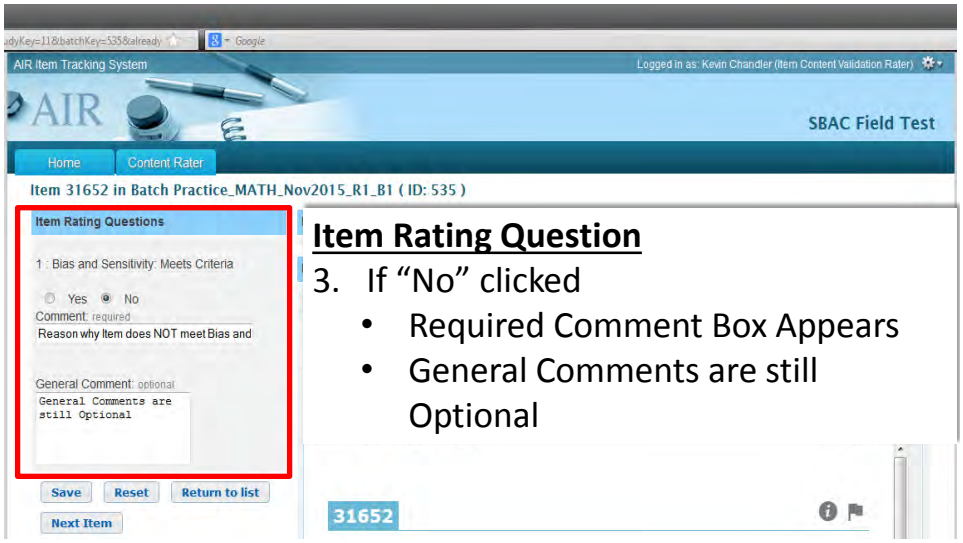
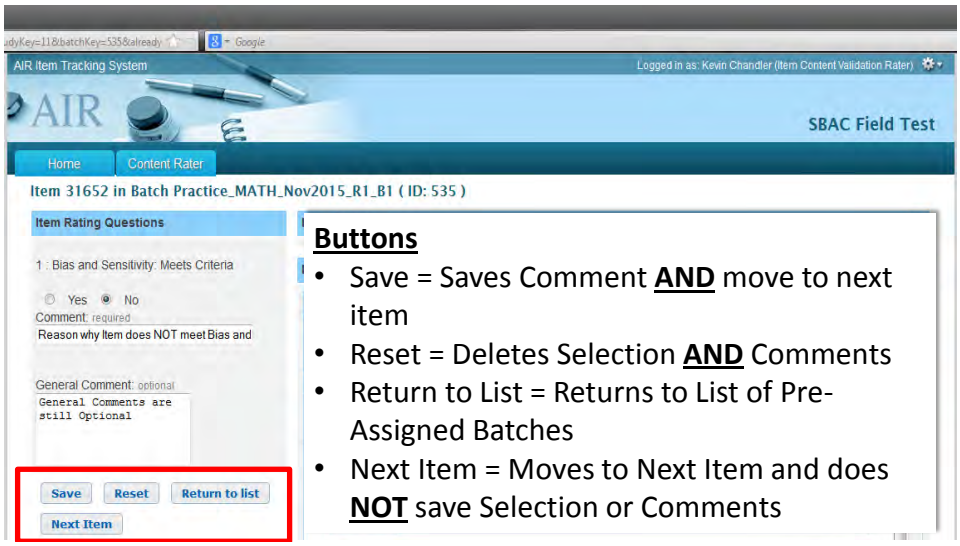


Item Rating Question

3. If "No" clicked
   - Required Comment Box Appears
   - General Comments are still Optional

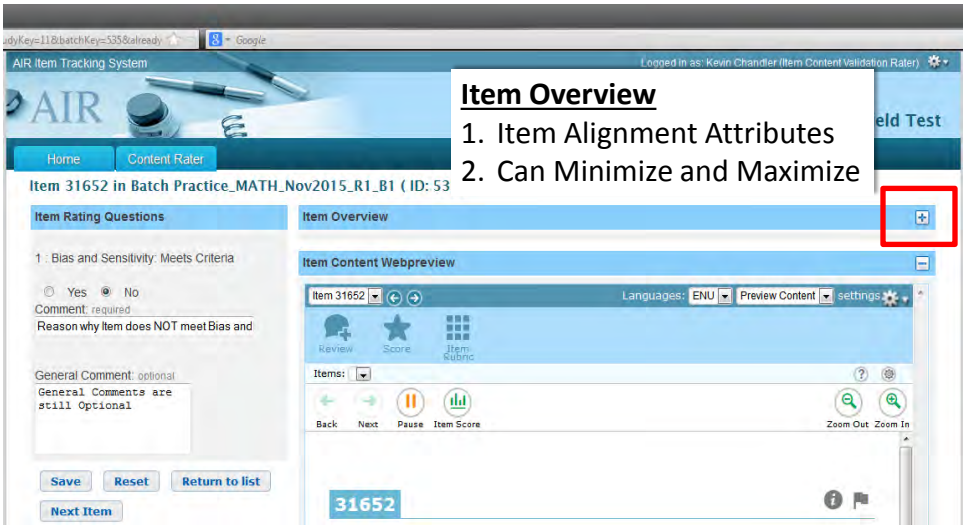
Idaho Parent Bias & Sensitivity Meeting



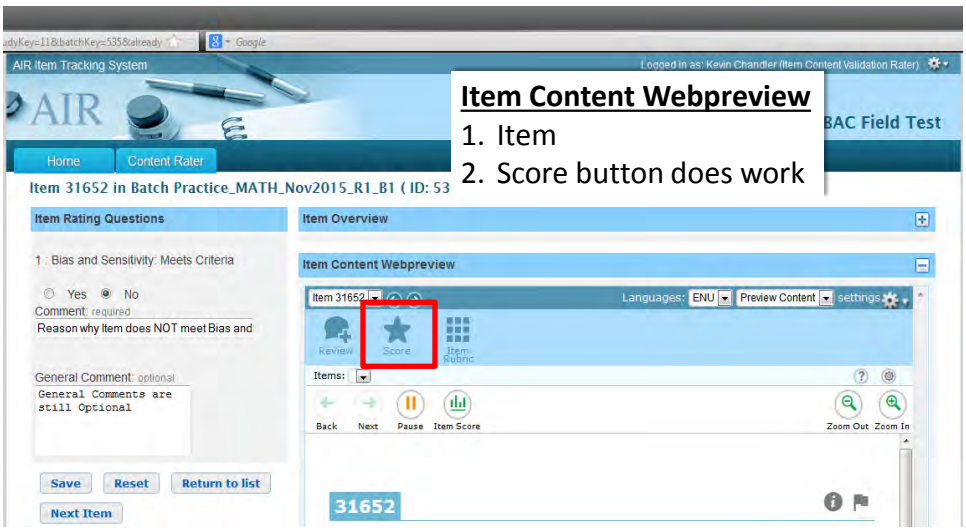
Buttons

- Save = Saves Comment **AND** move to next item
- Reset = Deletes Selection **AND** Comments
- Return to List = Returns to List of Pre-Assigned Batches
- Next Item = Moves to Next Item and does **NOT** save Selection or Comments

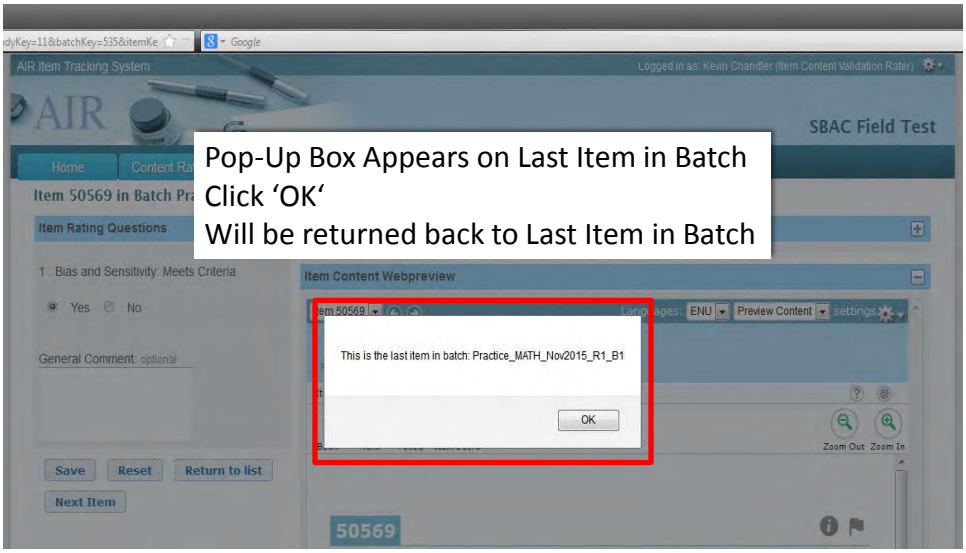
Idaho Parent Bias & Sensitivity Meeting



Idaho Parent Bias & Sensitivity Meeting

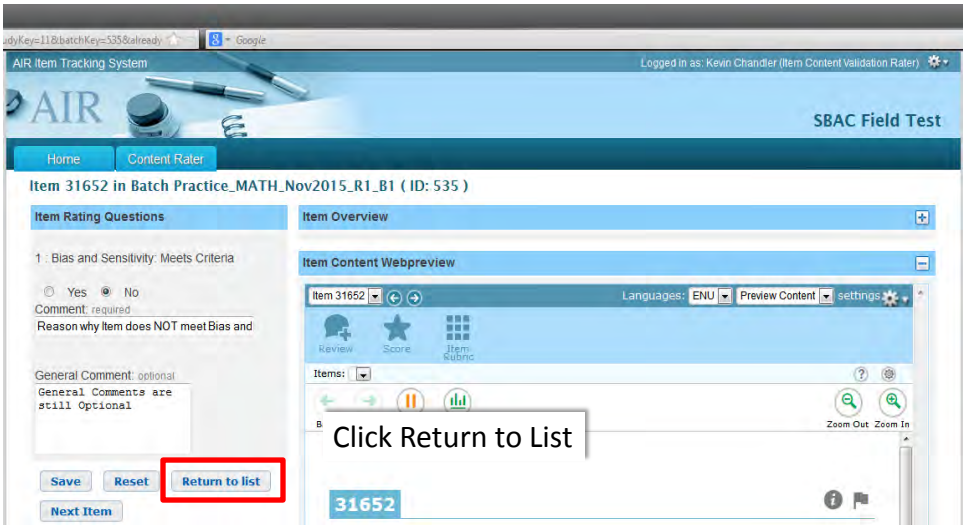


Idaho Parent Bias & Sensitivity Meeting



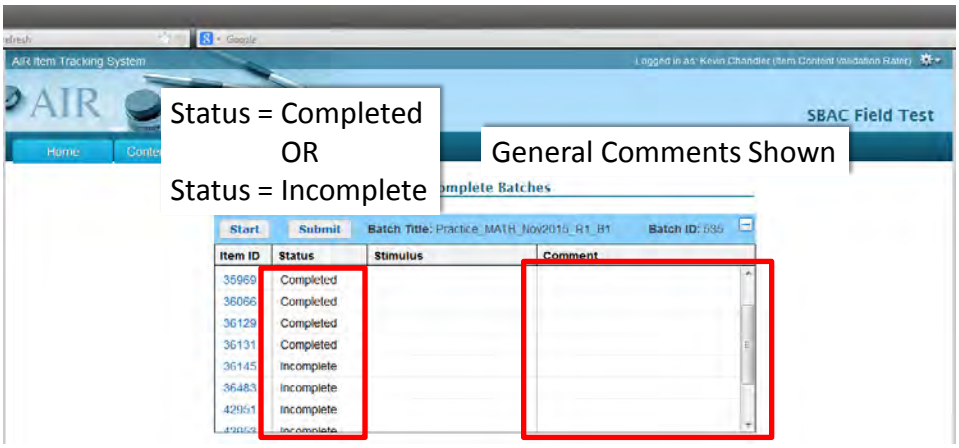
Pop-Up Box Appears on Last Item in Batch
Click 'OK'
Will be returned back to Last Item in Batch

Idaho Parent Bias & Sensitivity Meeting

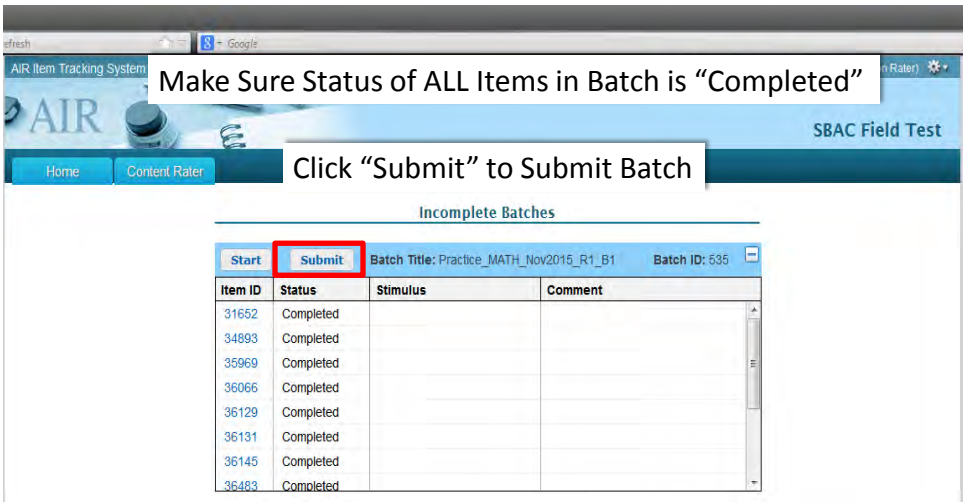


Click Return to List

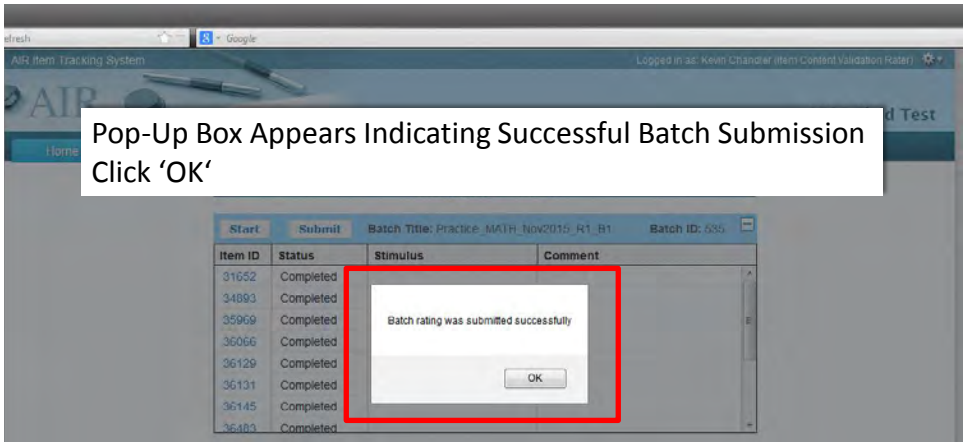
Idaho Parent Bias & Sensitivity Meeting



Idaho Parent Bias & Sensitivity Meeting

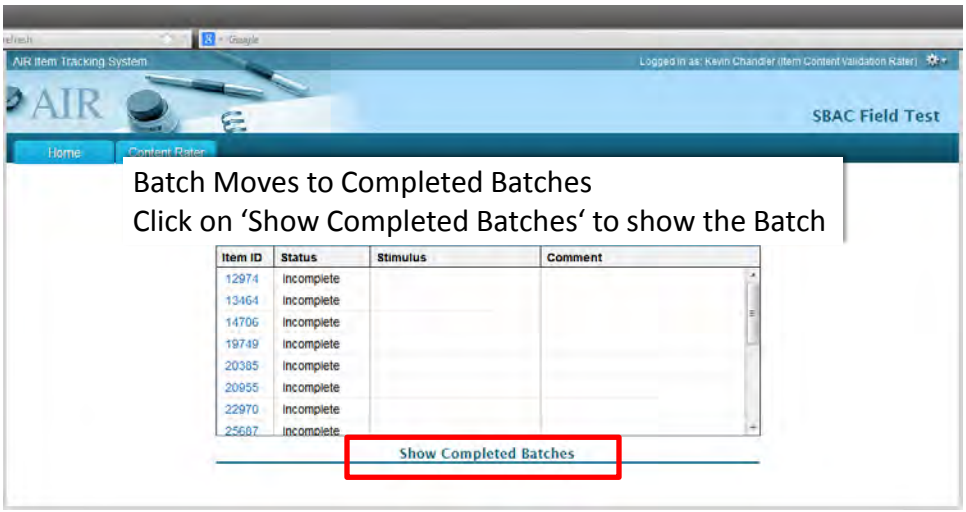


Idaho Parent Bias & Sensitivity Meeting



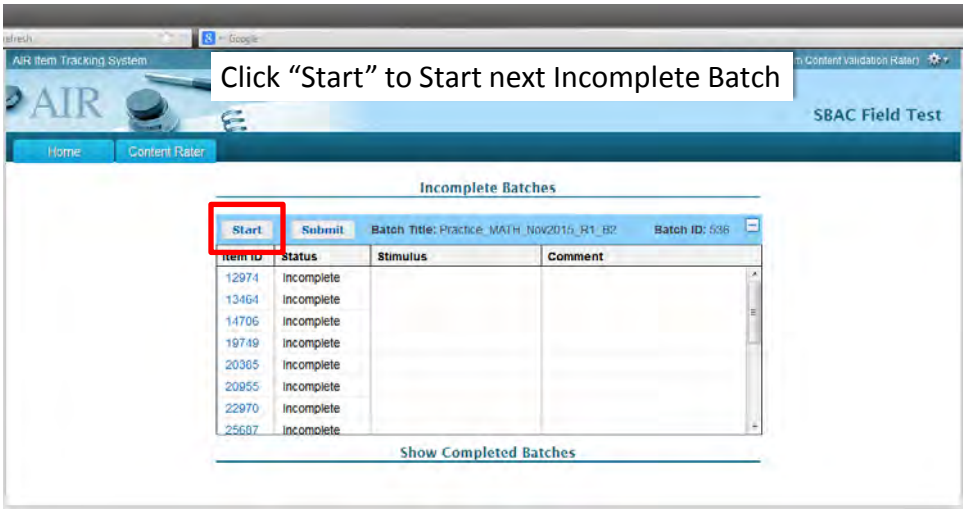
Pop-Up Box Appears Indicating Successful Batch Submission
Click 'OK'

Idaho Parent Bias & Sensitivity Meeting

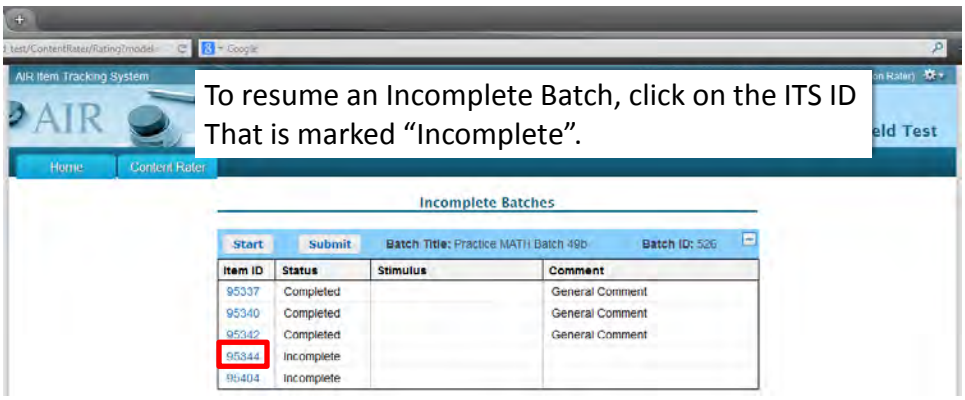


Batch Moves to Completed Batches
Click on 'Show Completed Batches' to show the Batch

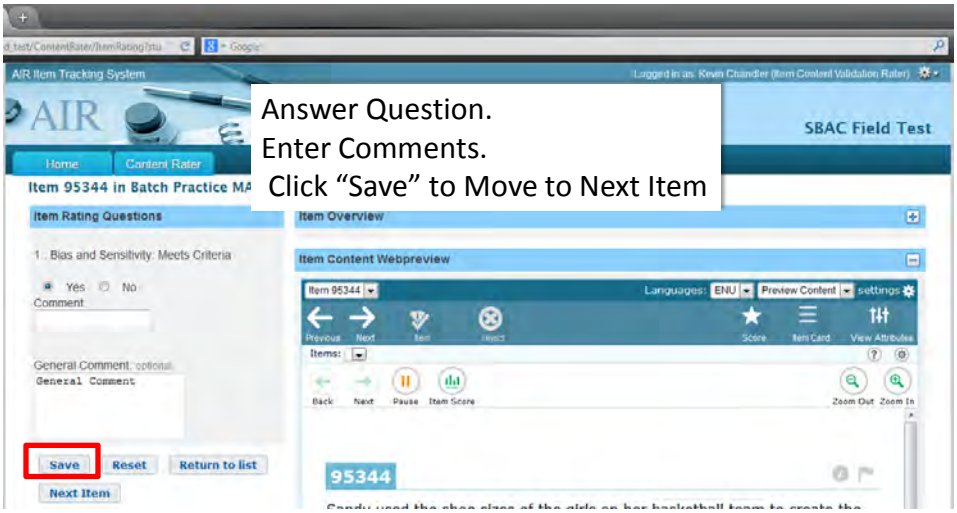
Idaho Parent Bias & Sensitivity Meeting



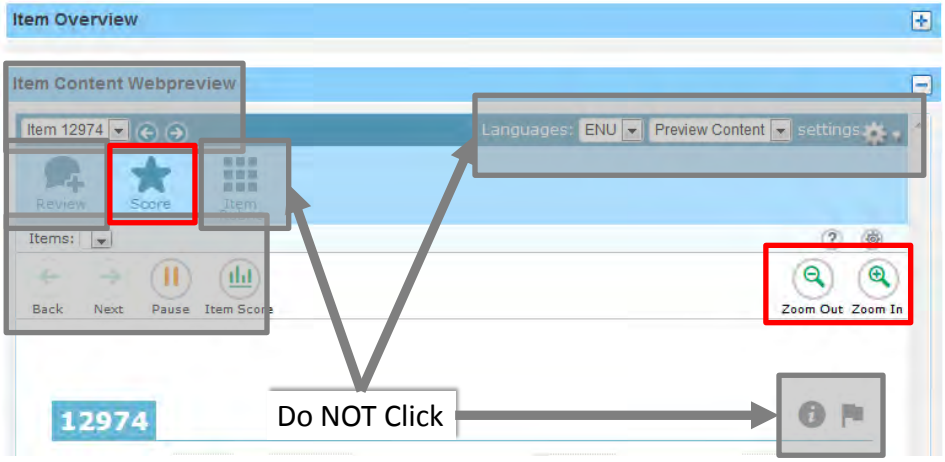
Idaho Parent Bias & Sensitivity Meeting



Idaho Parent Bias & Sensitivity Meeting



Idaho Parent Bias & Sensitivity Meeting



Idaho Parent Bias & Sensitivity Meeting

Questions about Content Rater?

Idaho Parent Bias & Sensitivity Meeting – Process & Procedures

September 2016

Idaho Parent Bias & Sensitivity Meeting – Round 1 Batches

- English Language Arts (ELA) Batches
  - 515 Items
    - 299 Discrete Items & 216 Passage Associated Items
  - 35 Batches Total
    - Batches of 13 to 19 Items
  - Each ELA Batch Reviewed by 3 Reviewers
    - All Reviewers will review at least 1 ELA Batch
  - Batches Organized by Passage NOT Grade
  - All ELA Batches Reviewed First

Idaho Parent Bias & Sensitivity Meeting – Round 1 Batches

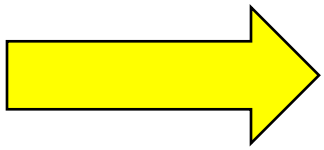
- Mathematics (MATH) Batches
  - 283 Items
    - 283 Discrete Items
  - 18 Batches Total
    - Batches of 12 Items to 17 Items
  - Each MATH Batch Reviewed by 3 Reviewers
    - All Reviewers will review at least 1 MATH Batch

Idaho Parent Bias & Sensitivity Meeting – Round 1 Process

- Individual Review
- Three Reviewers for Each Item (Item & Passage)
  - **Yes** = Meets Bias & Sensitivity Criteria
  - **No** = Does NOT Meet Bias & Sensitivity Criteria
- IF Two (or More) Reviewers Answer 'No' for an item THEN that item is 'Flagged' and will move on to Round 2

Idaho Parent Bias & Sensitivity Meeting – Moving from Round 1 to Round 2

During Round 1 ≥ 2 Individual Reviewers Answer 'No' to 'Meets Criteria' Question



Round 2

Idaho Parent Bias & Sensitivity Meeting – Round 2 Process (If Necessary)

- Small Group Review
- Three Small Groups of ~10 Reviewers
- Each Small Group Reviews ALL Items that were Flagged in Round 1 in Content Rater
  - **Yes** = Meets Bias & Sensitivity Criteria
  - **No** = Does NOT Meet Bias & Sensitivity Criteria

Idaho Parent Bias & Sensitivity Meeting – Round 2 Process (If Necessary)

- Review & Discuss ALL Items in Small Group
- Each Member of the Group Individually Votes on the Item in Content Rater
- IF 1/3 (or More) of Total Number of Reviewers Answer 'No' for an item THEN that item is 'Flagged' and will move on to Round 3

Idaho Parent Bias & Sensitivity Meeting – Moving from Round 2 to Round 3

During Round 2 ≥ 1/3 Total Number of Reviewers Answer 'No' to 'Meets Criteria' Question

Round 3

Idaho Parent Bias & Sensitivity Meeting – Round 3 Process (If Necessary)

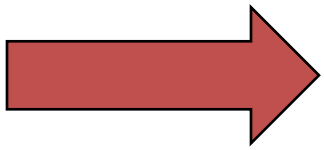
- Large Group Review
- One Large Group of ALL Reviewers
- Large Group Reviews ALL Items that were Flagged in Round 2
  - **Yes** = Meets Bias & Sensitivity Criteria
  - **No** = Does NOT Meet Bias & Sensitivity Criteria

Idaho Parent Bias & Sensitivity Meeting – Round 3 Process (If Necessary)

- Items Presented on Projector
- Review & Discuss ALL Items in Large Group
- Each Member of the Group Individually Votes on the Item with "Clicker"
- Results Presented to Large Group
- IF 2/3 (or More) of Total Number of Reviewers Answer 'No' for an item THEN that item is 'Flagged' and will Recommend to BoE for Rejection

Idaho Parent Bias & Sensitivity Meeting – Moving from Round 3 to Board of Education

During Round 3 ≥ 2/3 Total Number of Reviewers Answer 'No' to 'Meets Criteria' Question



Recommend Rejection to BoE

Idaho Parent Bias & Sensitivity Meeting

Questions about the Process & Procedures?

Idaho Parent Bias & Sensitivity Meeting

Additional Questions about the Idaho Parent Bias & Sensitivity Meeting can be directed to Idaho State Department of Education

User Name: ID_ReviewerX

Password: IDBNS10X

User Name: ID_Reviewer34

Password: IDBNS134

SBAC Field Test Content Rater

Idaho Community Bias & Sensitivity Meeting
Thursday, September 29, 2016

Results – Items & Passages Moving to Round 2

- Math = 1 Item
- ELA = 7 Items
- ELA = 4 Passages

Round 2 Process

- Individual Review of ALL items and passages in Content Rater
  - Vote & Record Notes on the items and passages
  - **Do Not Submit**
- Small Group Review of ALL items and passages
  - Share your Opinions on the Items & Passages
  - Identifying Specific Guidelines IF Not Met
- Individual Voting of ALL items and passages in Content Rater
  - Submit Batches when done

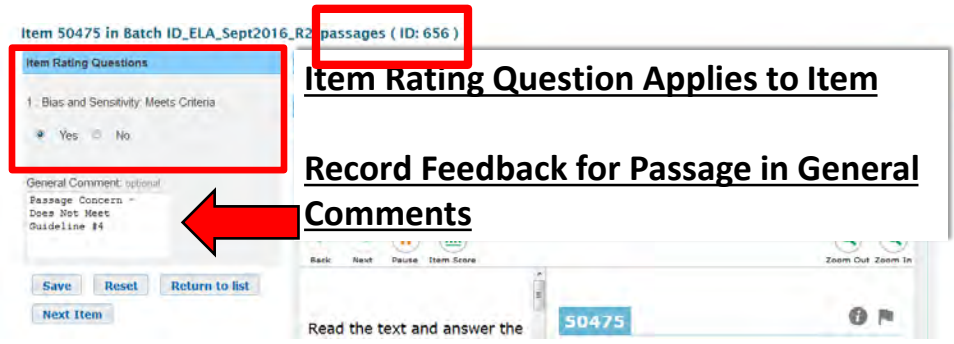
Reviewing PASSAGES Batch

Incomplete Batches

Start | Submit | **Batch Title:** ID_ELA_Sept2016_R2_passages | **Batch ID:** 652

Item ID	Status	Stimulus	Comment
50475	Incomplete	1586: 8487	
50726	Incomplete	1598: 8514	
123897	Incomplete	4439: 41IS2_A Place for Butterflies	
63305	Incomplete	1507: 8449	

Idaho Parent Bias & Sensitivity Meeting



Item Rating Question Applies to Item

Record Feedback for Passage in General Comments

SBAC Field Test Content Rater

Idaho Community Bias & Sensitivity Meeting
Thursday, September 29, 2016

Results – Items & Passages Moving to Round 3

- Math = 1 Item
- ELA = 5 Items
- ELA = 3 Passages

Round 3 Process

- Display MATH Item on Projector
- Large Group Discussion
- Individual Vote with Clickers
  - 1/A. Yes = Meets Bias & Sensitivity Criteria
  - 2/B. No = Does NOT Meet Bias & Sensitivity Criteria
- Show Results on Projector

Round 3 Process

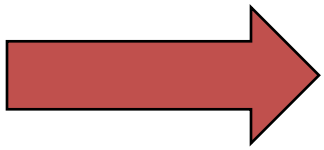
- Display ELA Item on Projector
- Large Group Discussion
- Individual Vote with Clickers
  - 1/A. Yes = Meets Bias & Sensitivity Criteria
  - 2/B. No = Does NOT Meet Bias & Sensitivity Criteria
- Show Results on Projector
- Go to Next ELA Item & Repeat Process

Round 3 Process

- Display ELA Passage on Projector
- Large Group Discussion
- Individual Vote with Clickers
  - 1/A. Yes = Meets Bias & Sensitivity Criteria
  - 2/B. No = Does NOT Meet Bias & Sensitivity Criteria
- Show Results on Projector
- Go to Next ELA Passage & Repeat Process

Idaho Parent Bias & Sensitivity Meeting – Moving from Round 3 to Board of Education

During Round 3 ≥ 2/3 Total Number of Reviewers (**18 People**) Answer 'No' to 'Meets Criteria' Question



Recommend Rejection to BoE

Clicker Instructions

- Press “Ch” (Channel)
- Press “4/D”
- Press “1/A”
- Press “Ch” (Channel) Again
- Press “1/A” or “2/B” to vote
  - 1/A. Yes = Meets Bias & Sensitivity Criteria
  - 2/B. No = Does NOT Meet Bias & Sensitivity Criteria

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Smarter Balanced Assessment Consortium:
Bias and Sensitivity Guidelines

Developed by ETS
April 16, 2012

Table of Contents

Smarter Balanced Assessment Consortium:
Bias and Sensitivity Guidelines

Introduction

Purpose

The purpose of the *Smarter Balanced Assessment Consortium Bias and Sensitivity Guidelines* (hereafter referred to as "the *Guidelines*") is to help ensure that the Smarter Balanced assessments are fair for all groups of test takers, despite differences in characteristics including, but not limited to, disability status, ethnic group, gender, regional background, native language, race, religion, sexual orientation, and socioeconomic status.

The goal of fairness in assessment can be approached by ensuring that test materials are as free as possible of unnecessary barriers to the success of diverse groups of test takers. Those unnecessary barriers can be reduced by following some fundamental rules:

- Do not measure irrelevant knowledge or skill.
- Do not anger, offend, upset, or otherwise distract test takers.
- Treat all groups of people with appropriate respect in test materials.

This document describes in detail how to follow these rules for the Smarter Balanced assessments of the Common Core State Standards in English language arts and mathematics. Some aspects of the *Guidelines*, such as the rule dealing with evolution, are not appropriate for tests of specific subjects such as biology or psychology.

Uses

Though many people think of bias and sensitivity guidelines as applying primarily to the review of test items after they have been written, fairness must be considered in all phases of test development and use.

The intended use of the *Guidelines* is in the development of the Smarter Balanced assessments, particularly in item writing and review. This document describes the rules agreed upon by the Smarter Balanced Assessment Consortium states for achieving fairness in test content and will help reduce subjectivity in evaluating test items for fairness. Only items that are in compliance with the *Guidelines* will be included in the Smarter Balanced assessments. The *Guidelines* will help ensure

that the test content is fair for test takers as well as acceptable to the many stakeholders and constituent groups within the Smarter Balanced states.[1]

Use of the *Guidelines* will help the Smarter Balanced assessments comply with Standard 7.4 of the *Standards for Educational and Psychological Testing*:

> Test developers should strive to identify and eliminate language, symbols, words, phrases, and contents that are generally regarded as offensive by members of racial, ethnic, gender, or other groups except when judged to be necessary for adequate representation of the domain (AERA, APA, & NCME, 1999, p. 82).

Link to ECD

The Smarter Balanced assessments are developed using the principles of Evidence-Centered Design (ECD). Three basic elements of ECD are: 1) stating the claims to be made about test takers, 2) deciding what evidence is required to support the claims, and 3) administering test items that provide the required evidence (Mislevy, Steinberg, & Almond, 1999). ECD provides a chain of evidence-based reasoning linking test performance to the claims to be made about test takers. Fair assessments are essential to the use of ECD. If the items are not fair, then the evidence they provide means different things for different groups of test takers. Under those circumstances, the claims cannot be equally well-supported for all test takers. Appropriate use of the *Guidelines* helps to ensure that the evidence provided by the items means the same thing for various groups of test takers and allows ECD to work as intended.

Defining Validity, Bias, Sensitivity, and Fairness

Validity

To define "fairness" and "bias" for the purposes of the *Guidelines*, it is necessary to understand the meaning of "validity." Validity is the extent to which the inferences and actions made on the basis of test scores are appropriate and backed by evidence (Messick, 1989). More simply, validity can be thought of as the extent to which test scores accurately reflect the relevant knowledge and skills of test takers. For the Smarter Balanced assessments, the relevant knowledge and skills are defined by the Common Core State Standards.

Bias and sensitivity

According to the *Standards for Educational and Psychological Testing*, "bias in tests and testing refers to construct-irrelevant [i.e., invalid] components that result in systematically lower or higher scores for identifiable groups of examinees" (AERA, APA, & NCME, 1999, p. 76). "Sensitivity" is used to refer to an awareness of the need to avoid bias in assessment. In common usage, reviews of tests for bias and sensitivity are reviews to help ensure that the test items and stimuli are fair for various groups of test takers.

Fairness

"Fairness" is a more difficult word to define because, as indicated in the *Standards for Educational and Psychological Testing* (AERA, APA, & NCME, 1999, p. 74), "*fairness* is used in many different

[1] The Consortium is committed to addressing concerns that have been raised regarding some special populations (including indigenous populations and Native Americans) and will continue to collaborate on finding practicable resolutions to the issues.

ways and has no single technical meaning." For an extensive discussion of the meanings of "fairness" in assessment, see Camilli, 2006. A useful definition of fairness for the purposes of the *Guidelines* is the extent to which the test scores are valid for different groups of test takers. For example, a math item may contain difficult language unrelated to mathematics. If the language interfered about equally with all test takers, validity would be reduced for all test takers, but the item would not necessarily be unfair. If, however, the language were a bigger barrier for students who are not native speakers of English than for other students, then the item would be unfair.

Even if the items are more difficult for some groups of students than for other groups of students, the items may not necessarily be unfair. For example, if an item were intended to measure the ability to comprehend a reading passage in English, score differences between groups based on real differences in comprehension of English would be valid and, therefore, fair. As Cole and Zieky (2001, p. 375) noted, "If the members of the measurement community currently agree on any aspect of fairness, it is that score differences alone are not proof of bias."

Fairness does not require that all groups have the same average scores. Fairness requires any existing differences in scores to be valid. An item would be unfair if the source of the difficulty were not a valid aspect of the item. For example, an item would be unfair if members of a group of test takers were distracted by an aspect of the item that they found highly offensive. But if the difference in difficulty reflected real and relevant differences in the group's level of mastery of the tested Common Core State Standards, the item would be fair.

Judgmental and Empirical Evaluations of Fairness

Judgmental evaluations

No quantitative indicator of fairness can replace human judgment in evaluations of fairness. Issues that may affect fairness are often too subtle to be captured by any statistic. Therefore, the first line of defense against the inclusion of unfair materials in the Smarter Balanced assessments is the judgment of trained test developers who follow these *Guidelines.* Judges may, however, miss potential fairness issues that sophisticated statistical analyses later find (Bond, 1993). Therefore, both judgmental and statistical evaluations of fairness are required.

Empirical evaluations

In addition to judgmental reviews for fairness, items in the Smarter Balanced assessments receive an empirical check for fairness. Items in the assessments are field tested to see how well they work before they are used to evaluate students. At that stage, a statistic called Differential Item Functioning (DIF) is used as a statistical indicator of fairness. DIF studies are required by Standard 7.3 of the *Standards for Educational and Psychological Testing* (AERA, APA, & NCME, 1999, p. 81).

Merely calculating differences between groups in the difficulty of items is not a useful indicator of fairness because the differences may be valid. That is, the groups may actually differ on relevant knowledge that is supposed to be measured by the item. Though the statistics involved may be considered complicated, DIF is based on the straightforward concept that people who know the same amount about a subject should perform similarly on test items concerning that subject, regardless of differences in such factors as gender or race. Deciding which people know the same amount is most often done on the basis of test scores. People with the same or very similar scores are considered to be "matched." Significant differences in the difficulties of test items for matched people in different groups result in elevated values of the DIF statistic.

DIF alone, however, is not proof of bias. No test is perfect. Therefore, no matching of test takers on the basis of test scores can be perfect. A fair item may show DIF merely because the test scores

have not matched people well on the particular knowledge or skill validly measured by the item. (See Holland & Thayer, 1988; Dorans, 1989; and Zieky, 1993, for more information about DIF and its uses in test development.)

Combinations of evaluations

Neither DIF nor any other statistic can be considered proof that an item is either fair or biased, but appropriate statistics can help identify any potentially unfair items. Using a combination of judgmental reviews and statistical data on the performances of matched test takers in different groups is the best method available to help ensure the fairness of the Smarter Balanced assessments.

Proper Balance in Interpreting the *Guidelines*

An overly zealous interpretation of the *Guidelines* can be as harmful as an overly lax interpretation. Critics have responded very negatively to what they consider the excesses of some bias and sensitivity reviews. For example, with respect to what she considered rampant over-generalizations of bias and sensitivity guidelines, Diane Ravitch (2003, p. 4) wrote, "What began with admirable intentions has evolved into an increasingly broad and increasingly bizarre policy of censorship that has gone far beyond its original scope."

The position of the Consortium and other professionals in the field of measurement is that, when done appropriately, bias and sensitivity reviews are not a "bizarre policy of censorship" but are instead a sincere attempt to make fair and valid tests. It is not true that anything that anybody might possibly object to in test materials is necessarily judged to be unfair. In fact, one purpose of using written guidelines such as the ones in this document is to limit overly broad, idiosyncratic judgments about the fairness of test materials. There must be a balance between striving to ensure fairness and the ability to measure the full range of the Common Core State Standards with authentic and interesting materials. Proper use of the *Guidelines* will help maintain that balance.

Issues Often Confused with Fairness

Difficulty of items

The difficulty of items should not be confused with fairness. A difficult item is not necessarily unfair if the sources of difficulty are valid. For example, the Common Core State Standards call for students to read documents important in the history of the United States. Some of those documents are difficult to read, and valid items will appropriately reflect that difficulty.

Overextending guidelines

Reviewers should avoid overextending the *Guidelines* to contrive situations in which an innocuous topic is judged to be unfair. That practice inappropriately limits test content because any topic can be judged to be potentially upsetting in some set of circumstances for some test takers. For example, a reviewer might say that an innocuous depiction of a mother with her child might upset a test taker who is an orphan. A topic that is upsetting on its face is probably unfair, but an innocuous topic that might possibly be upsetting for some atypical test taker(s) under some particular set of circumstances is not necessarily unfair.

Content and Language that Is Fair to Include in Smarter Balanced Assessments

Fairness of content

With respect to the validity and fairness of the Smarter Balanced assessments, any content that is required by the Common Core State Standards, consistent with the Consortium's item specifications guidelines and reviewed through the processes described by the Consortium's item review procedures, may be included in the Smarter Balanced assessments. In addition, state laws and state policies in one or more of the states may also affect the content of the assessments that states present to their students. For example, a state law may require the inclusion of content based on the achievements of specific groups. Any content required by state law or state policy may be administered during the same test event as a Smarter Balanced assessment but will need to conform to the Consortium's policies regarding the addition of state-specific content. These policies may include, at a minimum, the ability to derive a score that excludes the additional state content such that a comparable score may be reported for all students taking a Smarter Balanced assessment.

Exposure to information

Stimuli for English language arts items have to be about some topic. Mathematics problems are often placed in real-world contexts. The Common Core State Standards cover only mathematics and English language arts. They do not include all of the content areas from which topics and contexts must be drawn. Which topics and contexts are fair to include in the Smarter Balanced assessments? One fairness concern is that students differ in exposure to information through their life experiences outside of school. For example, some students experience snow every winter, and some have never experienced snow. Some students swim in the ocean every summer, and some have never seen an ocean. Some students live in houses, some live in apartments, some live in mobile homes, and some are homeless.

Even though curricula differ, the concepts to which students are exposed in school tend to be much more similar than are their life experiences outside of school. If students have become familiar with concepts through exposure to them in the classroom, the use of those concepts as topics and contexts in test materials is fair, even if some students have not been exposed to the concepts through their life experiences. For example, a student in grade 4 should know what an ocean is through classroom exposure to the concept, even if he or she has never actually seen an ocean. A student does not have to live in a house to know what a house is, if there has been classroom exposure to the term. Similarly, a student does not have to be able to run in a race to know what a race is. Mention of snow does not make an item unacceptable for students living in warmer parts of the country if they have been exposed to the concept of snow in school.

Information in the stimulus

A major purpose of reading is to learn about new things. Therefore, it is fair to include material that may be unfamiliar to students if the information necessary to answer the items is included in the tested material. For example, it is fair to test the ability of a student who has never been in a desert to comprehend an appropriate reading passage about a desert, as long as the information about deserts needed to respond to the items is found in the passage.

Students with disabilities

A similar issue arises for students with disabilities. Is it fair to include material about the visual arts or music for students who cannot experience them directly? Is it fair to include passages about physical activities for students who cannot participate in them? As noted above, it is acceptable to include material that may be unfamiliar to some students through life experiences, as long as the information necessary to answer the items is included in the stimuli or is part of the information

expected from classroom exposure. For students with certain disabilities, it is necessary to add the provision that the information necessary to answer the items does not need to be obtained through direct, personal experience. For example, a high school student who is deaf could fairly be expected to know what a bell is, but could not fairly be expected to know what a bell sounds like.

English language learners

Unnecessarily difficult language can be a source of unfairness when the language itself is not the focus of measurement. This is particularly true for English language learners. The language in mathematics items should not be a barrier to a correct answer for people who could do the required mathematics. For mathematics assessments, therefore, nonmathematical language should be targeted no higher than the grade level below the tested grade level. For English language arts (ELA) assessments, the focus is on the use of language. Valid assessment of the ELA Common Core State Standards requires the use of language targeted at the tested grade level. In general, when the language itself is not being tested, the clearest language consistent with validity should be used. For more detail on appropriate language for English language learners, see the *Smarter Balanced Assessment Consortium Accessibility Guidelines for English Language Learners* (2012*)*.

Barriers to Fairness

Fairness review is intended to remove barriers to valid measurement that may affect different groups of test takers in different ways. There are three major types of barriers related to fairness.

Barriers related to invalid knowledge

Barriers related to invalid knowledge occur when uncommon information—not reasonably expected of some group(s) of students and not related to the Common Core State Standards—is required to answer a test item. For example, assuming a student knows what a “foyer” is would be unfair because the term: 1) is more likely to be known by some groups of students than by other groups of students, 2) is not required by the Common Core State Standards, and 3) is not likely to have been routinely used in the classroom.

Barriers related to emotional reactions

Barriers related to emotional reactions may occur if language or images cause strong emotional reactions among members of some groups of test takers and those reactions potentially interfere with test performance. For example, if a passage advocates for one position of a controversial issue such as gun control, a student who is a strong supporter of the opposite position may be disadvantaged by having to put his or her beliefs aside to respond correctly to items.

Even if the performances of students are not directly affected, the presence of offensive, inflammatory, controversial, upsetting, or disrespectful material in tests will lower the confidence of students, parents, politicians, educators, and other community members in the test.

Barriers related to physical abilities

Barriers related to physical abilities occur if test takers have difficulty seeing or hearing the test materials or have physical difficulty responding to the test under standard conditions (e.g., manipulating a computer mouse). The Consortium uses the principles of Universal Design (Thompson, Johnstone, & Thurlow, 2002) to help reduce physical barriers to valid measurement, but some accommodations for students with disabilities and modifications to test materials will still be necessary.

The Consortium has decided that accessibility concerns are best conveyed in a separate document. See the *Smarter Balanced Assessment Consortium General Accessibility Guidelines* (2012) for information about how to ensure that the Smarter Balanced assessments are as accessible as possible for all students, including students with disabilities.

Avoidance of Invalid Knowledge

It is necessary to avoid unfair barriers to success based on group differences in knowledge unrelated to the purpose of the test. Requiring specialized invalid knowledge to answer a test item is unfair. For example, requiring prior knowledge of the number of people on a soccer team to answer an item in the Smarter Balanced assessments is unfair because people who know the valid content may not have the invalid knowledge of soccer needed to answer the item. (Note that testing specialized knowledge is appropriate when that knowledge is valid. Requiring knowledge about the number of people on a soccer team may be perfectly appropriate on a physical education test.) This guideline prohibits the testing of specialized knowledge when that knowledge is not relevant to the purpose of the test. Specialized knowledge that is explained in the stimulus material or can be inferred by contextual clues is acceptable, however, if the understanding of such explanations or the making of such inferences is supposed to be tested.

The following topics have been common sources of specialized invalid knowledge in tests like the Smarter Balanced assessments. Familiarity with these topics and other similarly specialized knowledge—when unrelated to the purpose of the test—should not be required to answer items, unless the necessary information is provided in the stimulus material.

Regionalisms

Avoid requiring knowledge of words and phenomena limited to a region or certain regions of the country and words that carry different meanings in different regions (e.g., “hero” for “sandwich,” “snow days” at school, “tonic” or “pop” for “soda,” “muffler” as an article of clothing, “bubbler” for “water fountain.”)

Religion

Avoid requiring knowledge of any particular religion. For example, to say that something is “as colorful as an Easter egg” may be an unfamiliar comparison for some students.

Occupational and technical information

Avoid requiring knowledge of specialized information and terminology—not related to the purpose of the test—that is associated with a particular occupation or field of knowledge such as agriculture, law, mechanics, military, science, sports, technology, transportation, or weapons. For example, avoid requiring irrelevant knowledge of the purpose of a silo, the less common names for tools, the chain of command in military organizations, the functions of parts of weapons, the scoring systems or rules of play in various sports, the uses of a flange, or the meaning of “lumen.”

The point at which words become too specialized is a matter of judgment and will vary with the grade level of the students who are being tested. The best judges of the appropriateness of words associated with a particular field of knowledge are experienced teachers of students at the tested grade level.

Idioms

Avoid requiring understanding of idioms and figures of speech unless understanding them is called for by the Common Core State Standards, as in some English language arts items (e.g., spill the beans, hit the hay, fly in the ointment, flash in the pan).

Topics to Avoid

Certain topics are extremely controversial, upsetting, inflammatory, and often judged by parents and communities to be inappropriate for children. Such topics should be excluded from the Smarter Balanced assessments unless required to measure the Common Core State Standards. The goal is to avoid material that may cause extreme negative emotions in test takers because such emotions have the potential to interfere with test performance. It is best not to include materials that may cause strong negative emotions such as anger, disgust, fear, hatred, or sadness.

The following list is intended to indicate the nature of topics that should be excluded from Smarter Balanced assessments, but the list is not exhaustive. Current events may add topics that are so problematic that they should be excluded from the assessments. Topics to be avoided include, for example:

- abortion
- abuse of people or animals
- contraception
- deportation of immigrants
- experimentation on people or animals that is dangerous or painful
- killing of animals for sport
- the occult, witches, ghosts, vampires
- pregnancy of human beings
- rape
- sexual behavior or sexual innuendo
- suicide
- torture

Other issues have become so sensitive that the topics are difficult to treat in a way that does not cause fairness problems. It is safest not to include topics such as the following in Smarter Balanced assessments:

- euthanasia
- gun control
- climate change caused by human behavior
- prayer in school
- current or recent partisan political issues, ethnic conflicts, and religious disputes

Topics to Be Treated with Care

Other sensitive but less upsetting topics may be included in Smarter Balanced assessments. Such topics must, however, be treated carefully to minimize potential fairness issues. Guidelines that forbid a topic are easy to apply. Guidelines that require treating a topic with care are more difficult to apply because different people will have different opinions about what is acceptable.

When making judgments about the suitability of materials on topics such as those listed below, it is important to keep in mind that the Smarter Balanced assessments must not only be fair and valid for test takers, they must also appear to be fair and valid in the opinions of various constituencies within the Consortium. It is counterproductive to use test materials that various groups within the Consortium will consider inappropriate for their children.

Accidents and natural disasters

Mention of these topics or general, objective discussions may be acceptable, but avoid a focus on suffering, destruction, or graphic, gruesome details that may upset or frighten students.

Advocacy

The Smarter Balanced assessments should not support one side on a controversial issue unless it is necessary to do so for validity, as in presenting an argument for test takers to evaluate. Avoid advocacy when possible because test takers with opposite views may be disadvantaged. If, however, advocacy is required to measure a Common Core State Standard, indicate that the material does not necessarily represent the views of the Consortium. Do not use brand names to avoid the impression that the Consortium is advocating use of a particular brand. Avoid advocating for or against a political party unless doing so is important to measure a Common Core State Standard.

Alcohol, tobacco, and illegal drugs

The goal is to avoid giving any impression of approval of these substances. It is best to avoid depictions of people using these substances. In particular, do not depict use of these substances as pleasurable, alluring, or as signs of sophistication and maturity. Warnings against the use of these substances may be acceptable for students in middle or high school.

Animals that are frightening to children

Younger students are more likely to be upset by certain dangerous animals than are older students. Depictions of spiders and poisonous snakes have been cited as causing problems for some children and are best avoided. Objective depictions of a food chain or nonthreatening descriptions of animals are acceptable, but avoid depicting predators engaged in violent, threatening behavior. For example, a discussion of how members of a wolf pack interact with each other is likely to be acceptable. A depiction of a wolf ripping the entrails from a fawn or attacking a child should be avoided.

Antisocial, criminal, or inappropriate behaviors

(e.g., bullying, cheating, cutting school, joining gangs, fighting, lying, stealing). One goal is to avoid modeling inappropriate or bad behavior for students. It is particularly important to avoid making such behavior appear to be attractive, fun, glamorous, sophisticated, or something to be emulated. Another goal is to avoid upsetting students who may have been the victims of such behavior by others.

Biographical materials

Take care in selecting biographical materials. Some biographical materials may be controversial because different groups of people may view the individuals depicted very differently. For example, one group's heroic freedom fighter is another group's cowardly terrorist. A possible concern with the use of biographical material about living people is that a person who is widely admired at the time he or she is included in test materials may become involved in a highly publicized scandal before the test is administered.

Dancing

Allow all forms of dance except couples social dancing, which is the type most likely to draw criticism from some groups.

Dangerous activities

The goal is to avoid modeling behaviors that are inherently dangerous and making dangerous behaviors appear to be attractive, fun, glamorous, or something to be emulated. Particularly for younger children, avoid showing potentially dangerous behavior such as running away from home, going with strangers, or using dangerous tools or weapons without supervision, even if all turns out well. Common actions that are dangerous if done improperly (such as crossing the street, riding a bicycle, hiking, or swimming) are acceptable if depicted as being done properly. Describing dangerous substances or devices such as weapons, poisons, or explosives in ways that make them appear attractive or safe is not acceptable.

Death and dying

Detailed depictions of the death of parents, siblings, contemporaries, and family pets should be avoided unless necessary to measure a Common Core State standard. It is acceptable to mention death (e.g., Dr. Martin Luther King, Jr., died in 1968), but it is not acceptable to depict gruesome details.

Evolution

Evolution of human beings or similarity of human beings to other primates should be avoided as highly controversial for some groups. Evolution within a species (such as evolution of bacteria to withstand antibiotics) is much less problematic and could be allowed if treated with care. Fossils and the age of Earth are acceptable if not linked to evolution of human beings. (In tests intended to measure knowledge of science, any aspect of evolution required for validity is acceptable.)

Family problems

The goal is to avoid upsetting test takers with detailed descriptions of serious family problems such as the loss of a job, divorce, or serious illness of a parent or sibling, except as needed in historical or literary materials to measure Common Core State Standards.

Gambling

Instruments used for gambling such as playing cards and dice may be used as required in math problems, but do not assume that all students will be familiar with them and will know such things as the number of cards in a deck or the maximum number obtainable on a pair of dice. Depictions of people gambling for fun or profit should be avoided.

Holidays and birthdays

Not all test takers will be familiar with every religious or quasi-religious holiday (e.g., Halloween). Not all test takers celebrate birthdays. Mention of holidays and birthdays is acceptable as long as all of the information necessary to answer items is included in the stimulus material. The general need to avoid religious materials would argue against extended discussion of religious holidays.

Homelessness and evictions

These topics may be upsetting to students, particularly those who have direct experience with them or fear having a future experience with them. If the inclusion of any of these topics is important to measure a Common Core State Standard, the topic must be treated factually rather than emotionally and must not focus on anguish and distress.

Immigration

Immigration has become very controversial. If the inclusion of the topic is important to measure a Common Core State Standard, the topic must be treated factually and objectively.

Junk food

The goal is to avoid modeling unhealthy behavior by showing excessive consumption of junk food or the selection of junk food in preference to more healthful food. However, it is acceptable to mention eating a cookie, for example, or to use the sharing of a pie to illustrate a fraction.

Luxuries

The goal is to avoid elitism and the impression that ordinary people are excluded from the test materials. However, test materials do not have to be limited to what is affordable by the least affluent of families. Luxuries such as servants, mansions, and yachts should be avoided except as needed in literary or historical materials to measure the Common Core State Standards. Avoid more common luxuries such as ski trips and private tennis lessons. Avoid depicting expenditures that most people would consider excessive. For example, in a math item, do not have a man purchase three suits at $1500 per suit.

Medicines, including diet supplements

Treatments for serious illnesses may be upsetting to some students and should be avoided. Do not model the use of drugs, even prescription drugs, as a way to solve problems. Some groups are opposed to medical treatment, so it is best to avoid the topic unless it is important for the measurement of a Common Core State Standard.

Obesity and body-image problems

The goal is to avoid upsetting children who depart from the norm in height, weight, or other physical attributes with negative depictions of people who depart from the physical norm. A wide range of body types should be represented in any pictorial material, but stereotypes and negative depictions of people with atypical body shapes should be avoided.

Personal questions

Items must not invade the privacy of students by asking them to divulge personal or family issues such as religion, political preference, or antisocial or criminal behavior. For example, do not use an item that asks a test taker to describe a time when he or she was caught doing something wrong. It

is best to avoid constructed-response items that require students to reveal how they would act in situations contrary to their beliefs about appropriate behavior.

Religion

Religion was cited previously as a source of information that is not common to all students. Religion is cited here as a topic best treated with great care in Smarter Balanced assessments. Some people will see even an objective description of a religion as proselytizing. However, it is acceptable to mention religion. For example, mentioning that Buddhism is one of the main religions in Singapore is acceptable. Going into detail about the practices of adherents of Buddhism is not acceptable. In particular, avoid praising or criticizing the practices of a religion. Also avoid references to God, euphemisms for God, or Creationism except in historical or literary documents important for the measurement of the Common Core State Standards.

Serious illnesses

Serious illnesses include mental as well as physical illnesses. Illnesses that primarily affect certain groups, such as some genetic diseases, may be particularly problematic. Mention of serious illnesses may be acceptable, but avoid a focus on suffering or graphic, gruesome details that may upset students.

Slavery

This topic may be included in historical or literary documents if important for the measurement of the Common Core State Standards. A focus on graphic, upsetting aspects of slavery should be avoided.

Terrorism, wars, violence, suffering

These topics may be included in historical or literary documents if important to measure the Common Core State Standards. A focus on graphic, upsetting, or frightening aspects of the topics should be avoided.

Avoidance of Stereotypes

Materials in Smarter Balanced assessments should not reinforce stereotypes. It is acceptable to show traditional behavior (e.g., a woman caring for children), but traditional behaviors must be balanced by depictions of nontraditional behaviors to avoid reinforcing stereotypes. For adaptive tests (assembled by computer as they are administered to a student), balance is best handled at the level of the item pool. To help ensure that the pool is balanced, item writers should produce items showing nontraditional behaviors whenever they produce items showing traditional behaviors that could be considered stereotyped.

All types of stereotypes should be avoided, but the following types have been particularly problematic:

Stereotyped language

Representations of dialect are not acceptable unless in historical or literary material important for the measurement of a Common Core State Standard. Phrases such as “man-sized job,” or “Dutch uncle” should be avoided. Language that uses different terms for the same characteristic in men and women is not acceptable. For example, it is not appropriate to label a man as “forceful” or “assertive” and a woman as “pushy” or “controlling” for exhibiting the same behavior. Language that assumes all members of a profession are one gender is unacceptable (e.g., use “sales representative” instead of “salesman,” “firefighter” instead of “fireman,” “mail carrier” instead of

"mailman"). Some stereotyped language may be acceptable in literary or historical material important for the measurement of a Common Core State Standard.

Stereotyped images

Avoid stereotyped images. For example, do not show all girls in frilly dresses and all boys in jeans. Do not show all White men in suits and ties and all Black men dressed as laborers. If it is impossible to show diversity in a single image, diversity should be shown across images.

Stereotyped social/occupational roles

There should be a mix of genders and races shown in any social or occupational role. For example, do not depict all male doctors with all female nurses. Do not show all Black workers with all White bosses. If it is impossible to show diversity in a single item, diversity should be shown across items.

Stereotyped behaviors and characteristics

Do not treat all members of a gender, sexual orientation, racial, ethnic, national, or other such group as though they all share the same characteristic. For example, do not depict all Native American people as close to nature or all Asian American students as smart. It is particularly important to avoid offensive stereotypes of any such group. For example, do not portray any such group as more (or less) lazy, immoral, primitive, ignorant, prone to crime, gullible, violent, miserly, arrogant, or dirty than any other such group.

Appropriate Labels for Groups

It is very important to avoid derogatory labels for any group. Whenever possible, use the label that the group prefers. History has shown that the following groups have often been mislabeled.

African American people

Use "Black" or "African American." Do not use "Negro" or "Colored" except in the names of institutions, or in historical or literary material important for the measurement of the Common Core State Standards.

Asian American people

When possible, use specific terms such as "Japanese American" or "Chinese American." Terms such as "Pacific Island American," "Native Hawaiian," and "Asian/Pacific Island American" should be used as appropriate. Do not use the word "Oriental" to refer to people except in historical or literary material important for the measurement of the Common Core State Standards.

People with disabilities

Put the person before the disability. For example, use "a person who is blind" rather than "a blind person." In general, avoid using adjectives as nouns for people with disabilities (e.g., "the blind" or "the deaf") except in the names of organizations or in literary or historical material important for measurement of the Common Core State Standards. Avoid euphemisms such as "challenged." Use objective language rather than emotionally loaded terms (e.g., "uses a wheelchair" rather than "confined to a wheelchair"). Do not depict people with disabilities, including people with learning disabilities and people with developmental disabilities, as helpless victims. Terms to be avoided include "dumb" for a person who is mute, "handicapped" for a person with a disability, and "retarded" for a person with a cognitive disability.

Latino/Latina American people

The terms “Latino American” (for men) and “Latina American” (for women) are acceptable. The term “Hispanic American” is also acceptable. When appropriate for the context, it is preferable to use specific group names such as “Cuban American,” “Dominican American,” or “Mexican American.”

Native American people

“Native American” and “American Indian” are both acceptable. When possible, use specific names for peoples such as “Pequot” or “Mohegan.” Some Native Americans prefer the words “nation” or “people” to the word “tribe.”

Older people

It is best to refer to older people by specific ages or age ranges. Minimize the use of euphemisms such as “seniors.”

Women and men

The primary rule is to use parallel terms for men and women. For example, do not use titles for men and first names for women, as in “Dr. Sanchez and his wife, Juanita.” Do not refer to women as “wives” unless men are referred to as “husbands” in the same context. Do not refer to women by physical attributes and to men by accomplishments as in “the successful lawyer and his beautiful wife.” Do not refer to males as “men” and women of similar ages as “girls.” Do not use the generic “he” or “man” to refer to all human beings. Historical or literary material important for the measurement of the Common Core State Standards is acceptable even if it uses outmoded terms and nonparallel language for women and men.

Representation of Diversity

There should be representations of different groups in the pool of items so tests built from the pool will, on average, be appropriately balanced. In items and stimuli that mention people, the following conditions are required in the pool of items and should be reflected in assignments to item writers:

- Males and females should be approximately equally represented.
- People who are members of what are traditionally considered to be minority groups must be represented.
- People of different ages, physical abilities, and social classes should be depicted.
- A wide variety of life situations, living conditions, types of housing, types of families (including single-parent families), regions, and the like should be depicted.

A Final Word

Neither this nor any other set of guidelines can cover all of the possible variations in content that will have to be evaluated for fairness in the Smarter Balanced assessments. Current events (e.g., natural disasters, issues raised during political campaigns, terrorist attacks) can add new topics that may cause fairness problems. Issues that were neutral may become controversial. If the specific guidelines do not offer sufficient guidance in some particular situation, the best practice is to turn to the fundamental rules and ask:

- Do the items measure any irrelevant knowledge or skill? If so, will some group(s) be more greatly affected than others?

- Will any aspect of the test materials anger, offend, upset, or otherwise distract test takers? If so, will some group(s) be more greatly affected than others?
- Do the test materials treat all groups of people with respect? If not, will some group(s) be more greatly offended than others?

If some group(s) will be more greatly affected than others, a potential fairness problem exists. The next step is to determine whether or not the potential problem is a real one. Has difficulty been confused with fairness? Has a guideline been overgeneralized? Has a "treat carefully" guideline been interpreted as a "must avoid" guideline? Has a situation been contrived to make innocuous content seem unfair? Is the material important for valid measurement of the Common Core State Standards?

Finally, it is important to keep in mind that the intent of using the *Guidelines* is to remove unnecessary barriers to the success of diverse groups of test takers. Some potential barriers, such as difficult language in an ELA stimulus based on historical documents, may be necessary to allow valid measurement of the Common Core State Standards and are acceptable.

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Appendix

Examples of Acceptable and Unacceptable Test Materials

Following are excerpts from test items and stimuli. Some of the excerpts illustrate various violations of the guidelines. Others illustrate items that are acceptable in terms of fairness.

Math problems

The first set of examples consists of math problems or excerpts from math problems. Note the tension between adding realistic context to a math problem and avoiding linguistic complexity and irrelevant knowledge requirements.

1. The drawing below shows a roof truss. Highlight the two triangles that are congruent with each other.

    a. **Unacceptable.** Few children are likely to be familiar with a roof truss, and knowledge of a roof truss is not related to the purpose of the question.

2. In the drawing below, highlight the two triangles that are congruent with each other.

    a. **Acceptable.** The reading load is reduced, and there is no unfamiliar context.

3. Shaquan helps assemble food packages for poor people at Christmas. Each box holds 6 cans in a row. There is room for 4 rows in a box. Write the expression that best describes the number of cans in one full box.

    a. **Unacceptable.** The first sentence adds to the reading load of a math question but adds no useful information. The references to “Christmas” and “poor people” are inappropriate and unnecessary.

4. Two people who were conversing at a street corner parted and moved away from the corner in straight lines that are perpendicular to each other. If one person walked at 3 miles per hour and the second person jogged at 4 miles per hour, how far apart would they be after one hour?

    a. **Unacceptable.** The linguistic load is high for a math question. The sentences are long, and the syntax is complicated. “Conversing” is a difficult synonym for “talking,” and the people’s actions before they started to move are not relevant in any case. (“Perpendicular” is acceptable as a valid mathematical term.)

5. Two people stood next to each other. They started walking in straight lines that are perpendicular to each other. One person walked at 3 miles per hour. The other person walked at 4 miles per hour. How far apart are they after one hour?

    a. **Acceptable.** Unnecessary information has been deleted. Two long sentences have been replaced by five shorter sentences. The conditional syntax (“If one person. . .”) has been replaced by brief statements of fact.

6. A modem can send X bits per second. Write the expression that shows how many seconds it would take to send Y bits.

a. **Unacceptable.** The mention of a "modem" and "bits" is irrelevant and is likely to be unfamiliar. A student might skip the item or waste time wondering what "bits" are or what a "modem" is.

7. Lee can walk X miles an hour. Write the expression that shows how many hours it would take Lee to walk Y miles.

   a. **Acceptable.** The context is familiar.

8. If one card is taken at random from a deck of playing cards, what is the probability that the card will be an ace?

   a. **Unacceptable.** The question assumes knowledge of the number of aces and the total number of cards in a deck of playing cards. It is acceptable to ask about probability, and it is acceptable to use playing cards in math problems. According to the guideline about gambling, however, it is not acceptable to assume that test takers have knowledge of the characteristics of a deck of playing cards.

9. There are 4 aces in a deck of 52 playing cards. If one card is taken at random from the deck, what is the probability that the card will be an ace?

   a. **Acceptable.** No knowledge of the characteristics of a deck of cards is required to answer the item.

10. When Ms. Luna pulled her car into the parking garage, the machine at the gate issued a ticket stamped with the time, 11:30 a.m. When she left the garage that afternoon, her ticket was stamped with the time she left, 12:15 p.m. What was the total length of time that Ms. Luna's car was in the parking garage?

    a. **Unacceptable.** The question is very wordy and uses an unfamiliar context for many children. In addition, "pulled her car" is an idiom that children may not know.

11. Sandip went to the library at 11:30 in the morning. He left at 12:15 that afternoon. How long did Sandip stay in the library?

    a. **Acceptable.** The reading load is reduced, and the context is familiar.

12. It takes Sarah an average of 30 minutes to clean her bedroom. She cleans her bedroom once a week. How many hours would Sarah spend cleaning her bedroom in one year? Acceptability depends on the mix of items in the test.

    a. **Unacceptable** if many questions in the test had girls cleaning rooms or doing what was traditionally considered "woman's work," because the test would reinforce a stereotype and be unfair.

    b. **Acceptable** if combined with questions showing women doing nontraditional work. Not all children have their own bedrooms, but the concept that some children have individual bedrooms should be neither strange nor upsetting. Whether or not the required knowledge of the number of minutes in an hour and the number of weeks in a year is fair depends on the grade level of the test takers.

13. According to the graph, the number of unemployed workers was highest in which year?

    a. **Acceptable.** The mere mention of unemployed workers is acceptable.

14. Marisa hit the bull's-eye with her rifle 7 times out of 9 shots. What percent of the time did Marisa hit the bull's-eye?

    a. **Unacceptable.** Students who are not familiar with the phrase "bull's-eye" in the context of a target will have a rather gruesome mental picture of Marisa's shooting. The use of guns tends to be controversial in any case.

15. The data tables below show how long a driver will be impaired based on the consumption of 1, 2, or 3 ounces of alcohol within one hour. Use the data to predict the amount of time a driver will be impaired after consuming 4 or 5 ounces of alcohol in one hour. Explain your reasoning for obtaining the predicted values.

    a. **Unacceptable**. A brief item concerning alcohol might be acceptable in the higher grades in the context of showing impairment, but basing an entire performance item on the topic is excessive. Also, showing consumption of more than 1 or 2 drinks per hour models inappropriate or even dangerous behavior.

16. A pizza is cut into 8 slices. If 5 girls eat one slice each, how many slices will be left?

    a. **Acceptable.** One slice of pizza is not excessive consumption of junk food.

Excerpts from stimuli for English language arts

The next set of examples consists of brief excerpts from ELA stimuli.

1. Wagner used the orchestra to achieve certain effects in much the same way that other composers of operas used the singers.

    a. **Acceptable** if the knowledge needed to answer the questions was included in the passage. The mere mention of opera or a composer does not make the excerpt unfair.

    b. **Unacceptable** if understanding the passage required knowledge of opera and how composers "used" the orchestra or "used" singers.

2. The African Americans living in Middletown tended to be part of households consisting of extended families living together.

    a. **Acceptable.** The statement of fact about a particular group of African American people is acceptable and does not reinforce a stereotype.

3. Cyanide is one of the fastest-acting poisons known to science.

    a. **Unacceptable.** The excerpt violates the guideline about avoiding dangerous actions and substances. Parents are likely to oppose including information about lethal substances in the test.

4. The AIDS epidemic, which has devastated some countries in sub-Saharan Africa, has affected children as well as adults, leaving many children not only orphaned and uncared for, but also malnourished, diseased, and close to death.

    a. **Unacceptable.** Excessive detail about the suffering of children makes the excerpt unacceptable.

5. Harlow was best known for the experiment in which he separated infant monkeys from their mothers shortly after the infants were born.

    a. **Unacceptable.** The excerpt violates the guideline that prohibits inclusion of painful or harmful experimentation. The excerpt would be acceptable in a psychology test, however.

6. I love to make videos! I use the camera in my phone to capture my friends having a good time with their dates at parties and at school dances.

    a. **Unacceptable.** Owning a cell phone with video capabilities is currently a luxury beyond the reach of many test takers. The references to "dates" and "dances" are not in compliance with the guideline concerning social dancing.

7. An ancestor of the modern horse the size of a dog gave rise to progressively larger species.

    a. **Acceptable.** The passage concerns the evolution of horses, which is in compliance with the guideline that identifies the evolution of human beings as the aspect of evolution to avoid.

8. The Japanese immigrants enrolled in Ms. Kubota's class worked very hard.

    a. **Acceptable.** The reference is to a particular group of Japanese immigrants, so it does not stereotype all Japanese immigrants.

9. The amount of caffeine in a cup of coffee can still affect the human body more than three hours after it has been ingested.

    a. **Acceptable.** The mention of caffeine appears to be in an objective discussion of the effects of drinking coffee and would be in compliance with the guideline on harmful substances, if the passage did not encourage the drinking of coffee.

10. People who drive gas-guzzling SUVs contribute to global warming.

    a. **Unacceptable.** This excerpt is a clear violation of the guideline against advocating for one side in a controversial situation.

11. In the 17th century, many convicted criminals were hanged, but some were slowly crushed to death.

    a. **Unacceptable.** Death by slow crushing is clearly out of compliance with the guidelines about death and suffering.

12. A large influx of immigrants will destroy the equilibrium of a neighborhood.

    a. **Unacceptable.** The negative view of immigrants in the excerpt makes it out of compliance with the guideline forbidding offensive stereotypes of any group. The verb "destroy" is particularly harsh in that context.

13. There has been an increase in the number of people who identify themselves as American Indians.

    a. **Acceptable.** Either "American Indian" or "Native American" is appropriate. The fact that more people than before identify themselves as American Indians is not a fairness problem.

14. Surprisingly, a girl won the math contest.

a. **Unacceptable.** By expressing surprise that a girl won the math contest, the excerpt reinforces the stereotype that girls have less quantitative ability than boys.

15. The soldiers and their wives attended the ceremony.

    a. **Unacceptable.** Unless the reference is to a previously specified group of all male soldiers, refer to "the soldiers and their spouses" to avoid the implication that only males are soldiers.

16. …that all men are created equal, that they are endowed by their Creator with certain unalienable Rights…

    a. **Acceptable.** In spite of the use of "men" to refer to all people and in spite of the reference to God, the excerpt is acceptable because it is from an important historical document of the type required by the Common Core State Standards.

17. Bridges with steel frames are more likely to survive an earthquake than are stone bridges.

    a. **Acceptable.** The mention of a natural disaster is acceptable. There is no focus on death and destruction.

18. Lee's father and Juan's father are both policemen.

    a. **Unacceptable.** Even though both officers are male, "police officers" is preferred to "policemen" to avoid the impression that only men are police officers.

19. The ancient Romans played handball and engaged in other sports while nude in the public baths.

    a. **Unacceptable.** Though unintended, "engaged in other sports while nude" could be taken as sexual innuendo.

20. Many of the people in the United States who speak Spanish come from Mexico.

    a. **Acceptable.** The excerpt is a statement of fact and is not a violation of any guideline.

21. He be at work…

    a. **Unacceptable.** The use of dialect is stereotyped language and is in violation of the guideline unless it is important to measure a Common Core State Standard in literary or historical material.

22. The men's room is on the right; the girls' room is on the left.

    a. **Unacceptable.** Parallel language would call for "women" to match "men" or "boy" to match "girl."

23. Some Native Americans claim to be members of the Algonquian tribe, but according to anthropologists, "Algonquian" is a general term applied to many Native American peoples who speak related languages, not the name of any particular tribe.

    a. **Unacceptable.** There is a problem in that the academic definition of "Algonquian" is taken as correct, but the usage of Native Americans about themselves is taken as incorrect. The excerpt is out of compliance with the guideline to call people what they prefer to be called.

24. Frederick Douglass, the great African American abolitionist, was said to be born on Valentine's Day.

    a. **Acceptable.** The excerpt requires no knowledge of how or why Valentine's Day is celebrated, nor any agreement that it should be celebrated.

25. Edward Said and Daniel Barenboim cofounded a children's orchestra.

    a. **Unacceptable.** Though there is nothing overtly problematic about the excerpt, Edward Said was famous as a Palestinian activist and remains a highly controversial figure. He is viewed very positively by some groups and very negatively by other groups. Reviewers who are not familiar with the people depicted in test materials should check reference sources to avoid the inadvertent inclusion of controversial figures.

26. That on the 1st day of January, A.D. 1863, all persons held as slaves within any State or designated part of a State the people whereof shall then be in rebellion against the United States shall be then, thenceforward, and forever free.

    a. **Acceptable.** Mention of slavery is acceptable, and the Common Core State Standards call for the inclusion of documents important in American history, such as the Emancipation Proclamation.

English language arts items

The next set of examples consists of items or parts of English language arts items.

1. According to the passage, how long ago did Homo sapiens evolve into a distinct species?

    a. **Unacceptable.** To answer the question about when human beings evolved implies that human beings evolved from other species. That implication is not in compliance with the guideline regarding evolution.

2. The character delivering the monologue attributes the arrogance of the French to which of the following?

    a. **Unacceptable.** Describing all of the people in a nation as "arrogant" is a clear case of offensive stereotyping. The question is not in compliance with the guideline concerning stereotypes.

3. Describe the changes within the ecosystem portrayed in the video, including the impact of man's activities on weather patterns, and possible solutions to correct ecological problems.

    a. **Unacceptable.** The question uses "man" to refer to all people, which is not in compliance with the guideline on appropriate terminology for men and women. The influence of people on climate change is highly controversial and is out of compliance with the guideline on the avoidance of advocacy.

4. The author compares the artist's use of color to which of the following?

    a. **Acceptable** if direct experience of color is not required to understand the passage and answer the items.

   b. **Unacceptable** if direct experience of color is required. The material would be unfair for students who are blind.

5. Our society stereotypes old people as weak, uninformed, forgetful, and foolish. Discuss the extent to which you agree or disagree with this stereotype.

   a. **Unacceptable.** The question blatantly reinforces stereotypes of a group and invites test takers to agree with the offensive stereotypes.

6. Isaiah wrote, "Woe unto them that are wise in their own eyes." Describe the meaning of that quotation and give two examples of people who are "wise in their own eyes" from your reading or from your personal experience. Explain your choices.

   a. **Unacceptable.** The excerpt violates guidelines about the avoidance of religious material, even though the students are not asked to write directly about religion.

7. In the play, Luz was restricted to a wheelchair for which of the following reasons?

   a. **Unacceptable.** The phrase "was restricted to a wheelchair" should be replaced with more objective terminology such as "began using a wheelchair."

8. According to the newspaper article, Robert died how many years after his brother John?

   a. **Acceptable.** According to the *Guidelines*, it is acceptable to mention death as long as gruesome details are not depicted.

9. It can be inferred from the passage that the spinnaker is most effective during a race when the wind is in which position relative to the boat?

   a. **Unacceptable.** Using sailboats for racing is out of compliance with the prohibition against luxuries. Also, unless "spinnaker" and its use are explained clearly in the passage, the item would depend on invalid specialized knowledge.

10. Based on information in the documentary, which of the following people is most likely to carry the sickle cell trait but show no symptoms of the sickle cell disease?

    a. **Unacceptable.** Diseases that affect particular groups of people are likely to be problematic in terms of fairness. This topic is best avoided.

11. The lecturer stated that among spiders found in many houses in the United States, the bite of which of the following is most likely to cause painful, deep wounds?

    a. **Unacceptable.** The focus on "painful, deep wounds" from spiders "found in many houses" makes the item out of compliance with the guideline regarding animals that are frightening to children.

12. The video excerpt of Baryshnikov dancing in *The Nutcracker* best illustrates which of the following aspects of his work described in the magazine article?

    a. **Acceptable** if all of the information needed to respond to the item is included in the video excerpt and the magazine article.

    b. **Unacceptable** if knowledge of ballet is required to answer the item. Only social dancing of couples is prohibited by the guidelines.

13. Read the excerpt from the diary of a ship captain engaged in transporting slaves and watch the video dealing with the history of slavery in the United States. Imagine that you are a newly captured slave. Describe your experiences on land and on the sea during your journey from Africa to the United States. Use information from both the diary and the video in your description.

    a. **Unacceptable.** Mention of slavery as a topic is acceptable, but forcing test takers to imagine that they personally experienced the transatlantic journey, during which many captives are known to have suffered and died, will be upsetting to some students.

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