Louisiana Believes

Louisiana Student Standards for Science
Identifying High-Quality Science Curriculum
November 2017

DEPARTMENT of EDUCATION

Purpose

Participants will:

- evaluate key criteria on the instructional materials review (IMR) rubric
- use the IMR rubric to analyze instructional materials
- analyze how the IMR rubric is supporting the key instructional shifts in science
- analyze how the IMR rubric and the shifts are supporting the science assessment
- understand the LDOE plan of action on identifying and piloting a high-quality curriculum

Schedule

Instructional Materials Review

Quality Science Curriculum

Connecting to the Instructional Shifts

Connecting to the Assessment

LDOE Implementation Plan and Support

Next Steps

Instructional Materials Review

The Department is currently reviewing science instructional materials to determine the degree of alignment to Louisiana Student Standards for Science. This information is provided to help school systems make informed purchases of instructional materials. Programs receive a tier 1, 2 or 3 rating.

Tier 1	Exemplifies Quality: Meets all non-negotiable criteria and scored the best possible on all indicators of superior quality.
Tier 2	Approaching Quality: Meets all non-negotiable criteria and some indicators of superior quality.
Tier 3	Not Representing Quality: Does not meet non-negotiable criteria.

Instructional Materials Review

The following timeline details the next few months of reviews.

Program	Publisher	Projected Posting Date	Rating
Living By Chemistry 2nd Edition	Bedford, Freeman, & Worth	20-September	Tier 3
FOSS Next Generation, Gr K-5	Delta Education	22-November	Review in Progress
Delta Education: Physics	Delta Education	18-December	Review in Progress
Delta Education: Physical Education	Delta Education	18-December	Review in Progress
KnowAtom TM, Gr 6-8	KnowAtom	20-December	Review in Progress
STEMscopes, K-5	Accelerate Learning, Inc.	10-January	Review in Progress

Schedule

Instructional Materials Review

Quality Science Curriculum

Connecting to the Instructional Shifts

Connecting to the Assessment

LDOE Implementation Plan and Support

Next Steps

Quality Science Curriculum

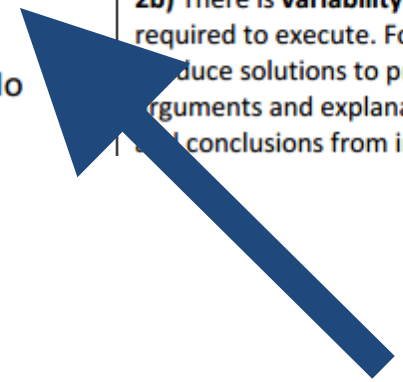
Because districts and schools are committed to getting a high quality curriculum for their students and teachers, it is crucial to understand what separates high quality from low quality. The following three (of 4) non-negotiable indicators should be the highest priority when looking at materials:

- Three dimensional learning
- Alignment and accuracy
- Disciplinary literacy

Today, we will dive deeper into each of these indicators.

Quality Science Curriculum: 3D Learning

CRITERIA	INDICATORS OF SUPERIOR QUALITY	MEETS METRICS (YES/NO)	JUSTIFICATION/COMMENTS WITH EXAMPLES
SECTION I: NON-NEGOTIABLE CRITERIA: Submissions must meet all of the non-negotiable criteria in order for the review to continue.			
Non-Negotiable **2. THREE-DIMENSIONAL LEARNING:** Students have multiple opportunities throughout each unit to develop an understanding and demonstrate application of the three dimensions. ☐ Yes ☐ No	**REQUIRED** **2a)** Materials teach the science and engineering practices, crosscutting concepts and disciplinary core ideas separately when necessary but they are most often integrated to support deeper learning. Assessment items and tasks are structured on integration of the **three-dimensions**.		
	2b) There is **variability** in the tasks that students are required to execute. For example, students are asked to duce solutions to problems, models of phenomena, rguments and explanations of theory development, conclusions from investigations.		



Discuss: What does this indicator mean?

Quality Science Curriculum: 3D Learning

2a) Materials teach the science and engineering practices, crosscutting concepts and disciplinary core ideas separately when necessary but they are most often integrated to support learning. Assessment items and tasks are structured on integration of the three-dimensions.

Exercise:

- Review the performance expectations for Activity 1 (6-MS-PS1-1 and 6-MS-PS1-2)
- Review Activity 1 (Matter and Its Interactions)
  - Review the performance expectation for Activity 2 (6-MS-LS2-2)
  - Review Activity 2 (Disruptions in Ecosystems Activity 1.2)

Discuss:

- Do Activities 1 and 2 align with indicator 2a? Use evidence from the Activities to support your response.

Quality Science Curriculum: 3D Learning

2a) Materials teach the science and engineering practices, crosscutting concepts and disciplinary core ideas separately when necessary but they are most often integrated to support learning. Assessment items and tasks are structured on integration of the three-dimensions.

Activity 1 (expert response)

The instructional materials do not fully address 6-MS-PS1-1 and 6-MS-PS1-2. The crosscutting concepts, disciplinary core ideas, and science and engineering practices are not interwoven to support a depth of understanding. The materials do not address the crosscutting concepts- scale, proportion and quantity and systems and system models. Although, the reading article on page 21 partially addresses the disciplinary core ideas, chemical and physical properties, it fails to address the science and engineering practices, construct an explanation and design solutions and/or develop and use models. Although, the materials incorporate a scientific investigation on page 23, the questions on 9 on page 23, do not require students to engage in the practices and disciplinary core ideas.

Quality Science Curriculum: 3D Learning

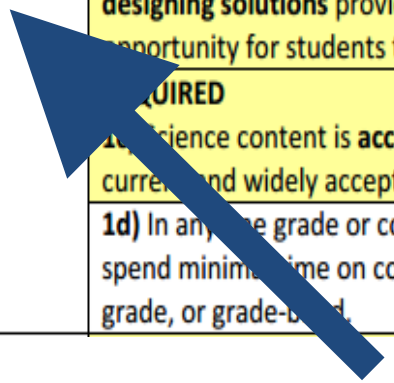
2a) Materials teach the science and engineering practices, crosscutting concepts and disciplinary core ideas separately when necessary but they are most often integrated to support learning. Assessment items and tasks are structured on integration of the three-dimensions.

Activity 2 (expert response)

The materials teach the science and engineering practices, crosscutting concepts, and disciplinary core ideas separately when necessary but they are most often integrated together. For example, the questions on page 11 address the crosscutting concept, systems and system models, and disciplinary core ideas, ecological interactions. The questions on pages 12 and 13 also address the crosscutting concept, patterns, and the disciplinary core ideas. For example, the materials require students to develop a food web model to explain how organisms interact in an ecosystem.

Quality Science Curriculum: Alignment and Accuracy

CRITERIA	INDICATORS OF SUPERIOR QUALITY	MEETS METRICS (YES/NO)	JUSTIFICATION/COMMENTS WITH EXAMPLES
SECTION I: NON-NEGOTIABLE CRITERIA: Submissions must meet all of the non-negotiable criteria in order for the review to continue.			
Non-Negotiable **1. ALIGNMENT & ACCURACY:** Materials adequately address the Louisiana Student Standards for Science. Explaining phenomenon and designing solutions drive student learning. ☐ Yes ☐ No	**REQUIRED** **1a)** The majority of the Louisiana Student Standards for Science are incorporated, to the full **depth of the standards**.		
	REQUIRED **1b)** Observing and **explaining phenomenon** and **designing solutions** provide the purpose and opportunity for students to engage in learning.		
	REQUIRED **1c)** Science content is **accurate**, reflecting the most current and widely accepted explanations.		
	1d) In any grade or course, instructional materials spend minimal time on content outside of the course, grade, or grade-band.		



Discuss: What does this indicator mean?

Quality Science Curriculum: Alignment and Accuracy

1b) Observing and explaining phenomenon and designing solutions provide the purpose and opportunity for students to engage in learning.

Instructional materials that are aligned to phenomenon-based Instruction include:

1. Phenomena on the unit and lesson level
2. Phenomena that help students make sense of one or two parts of the anchor phenomenon
3. Phenomena that can only be understood or explained by students if they explore or investigate them using the science and engineering practices, crosscutting concepts and disciplinary core ideas
4. Phenomena that is complex and puzzling to students

Quality Science Curriculum: Alignment and Accuracy

1b) Observing and explaining phenomenon and designing solutions provide the purpose and opportunity for students to engage in learning.

Exercise:

- Review Activity 3 (Disruptions in Ecosystems - Activity 3.1-3.3 - pages 70-81)
- Review Activity 4 (Matter and Its Interactions)

Discuss:

Do the activities fulfill indicator 1b? Use evidence from the activities to support your response.

Quality Science Curriculum: Alignment and Accuracy

1b) Observing and explaining phenomenon and designing solutions provide the purpose and opportunity for students to engage in learning.

Activity 3 (expert response)

Phenomenon-based instruction is used on the unit and lesson level in the Disruptions in Ecosystems unit. The anchor phenomenon on the unit level is the removal of wolves from Yellowstone National Park. Additional phenomena are used in each chapter to help students understand how energy and matter flows within Yellowstone National Park including overfishing in Blue Bay, Gulf of Mexico dead zone and zebra mussels. These phenomena are used in each chapter to help students make sense of the anchor phenomenon.

Activity 4 (expert response)

Phenomenon-based instruction is not used at the unit or lesson level. On page 4 and 5, the materials provide students with a summary of matter at the beginning of the unit. The materials do not introduce a phenomenon for students to investigate throughout the unit and/or lesson level.

Quality Science Curriculum: Disciplinary Literacy

CRITERIA	INDICATORS OF SUPERIOR QUALITY	MEETS METRICS (YES/NO)	JUSTIFICATION/COMMENTS WITH EXAMPLES
SECTION I: NON-NEGOTIABLE CRITERIA: Submissions must meet all of the non-negotiable criteria in order for the review to continue.			
Non-Negotiable **3. DISCIPLINARY LITERACY:** Materials have students engage with authentic sources and incorporate speaking, reading, and writing to develop scientific literacy. ☐ Yes ☐ No	**REQUIRED *Indicator for grades 4-12 only** **3a)** Students have multiple opportunities to engage with **authentic sources** that represent the language and style that is used and produced by scientists. Examples could include journal excerpts, authentic data, photographs, sections of lab reports, and media releases of current research. Frequency of engagement with authentic sources should increase in higher grade levels courses.		
	REQUIRED **3b)** Students regularly engage in **speaking and writing** about scientific phenomena and engineering solutions.		
	3c) Materials provide a coherent sequence of authentic science sources that build scientific **vocabulary** and knowledge over the course of study. Vocabulary is addressed as needed in the materials but not taught in isolation of deeper scientific learning.		
	3d) Materials address the necessity of using **scientific evidence** to support scientific ideas.		

Discuss: What does this indicator mean?

Quality Science Curriculum: Disciplinary Literacy

3a) Students have multiple opportunities to engage with authentic sources that represent the language and style that is used and produced by scientists,. Examples could include journal excerpts, authentic data, photographs, sections of lab reports, and media releases of current science research. Frequency of engagement with authentic sources should increase in higher grade levels and courses.

Exercise:

- Review Activity 5 (Matter and Its Interactions pages 144-145)
- Review Activity 6 (Zebra Mussels Invade - pages 109-123 in the Disruptions in Ecosystems Unit)

Discuss:

Are these strong or weak examples of indicator 3a? Use evidence from the activities to support your response.

Quality Science Curriculum: Disciplinary Literacy

3a) Students have multiple opportunities to engage with authentic sources that represent the language and style that is used and produced by scientists,. Examples could include journal excerpts, authentic data, photographs, sections of lab reports, and media releases of current science research. Frequency of engagement with authentic sources should increase in higher grade levels and courses.

Activity 5 (expert response)

Students do not have multiple opportunities to engage with authentic sources. For example, the materials do not present journal excerpts, authentic data or lab report sections etc. and the materials are not connected to real-world phenomena. Instead, the information is presented as a historical textbook where students are required to read about a topic and answer questions about the topic (examples can be found on page 5, 145 and 21).

Quality Science Curriculum: Disciplinary Literacy

3a) Students have multiple opportunities to engage with authentic sources that represent the language and style that is used and produced by scientists,. Examples could include journal excerpts, authentic data, photographs, sections of lab reports, and media releases of current science research. Frequency of engagement with authentic sources should increase in higher grade levels and courses.

Activity 6 (expert response)

Instructional materials incorporate authentic reading sources that are centered around real-world phenomena. For example, on pages 77-81 students review authentic data from three real-world fisheries. On pages 109-112, students read a nonfiction text that incorporates a map of Lake Michigan zebra mussel density and a graph of the Hudson River chlorophyll levels over time. Students use the data from the graph, map, and reading article to answer questions, construct explanations, design solutions and engage in argument from evidence.

Quality Science Curriculum: Additional Indicators of Quality

While the previous 3 indicators are the most critical when analyzing science instructional materials for LSSS alignment, the rubric used by The Department to analyze instructional materials also has other indicators which are evaluated.

Criteria	Description
Scaffolding and Support	Materials provide teachers with guidance to build their own knowledge to give all students extensive opportunities and support to explore key concepts using multiple, varied experiences to build scientific thinking.
Usability	Materials are easily accessible, promote safety in the science classroom, and are viable for implementation given the length of a school year.
Assessment	Materials offer assessment opportunities that genuinely measure progress and elicit direct observable evidence of the degree to which students can independently demonstrate the assessed standards.

Schedule

Instructional Materials Review

Quality Science Curriculum

Connecting to the Instructional Shifts

Connecting to the Assessment

LDOE Implementation Plan and Support

Next Steps

Instructional Shifts

The Louisiana Student Standards for Science call for students to:

- Apply Content Knowledge
- Investigate, Evaluate, and Reason Scientifically
- Connect Ideas Across Disciplines

As a group,

- Analyze the "shifts" page.
- How do the three most critical indicators of the instructional materials rubric *(Three-Dimensional Learning, Alignment and Accuracy, Disciplinary Literacy)* support the instructional shifts?

Instructional Shifts

Key shifts called for by the Louisiana Student Standards for Science:

Apply content knowledge	Content knowledge is critical and evident in the standards in the Disciplinary Core Ideas, the key ideas in science that have broad importance within or across multiple science or engineering disciplines. However, simply having content knowledge is not enough. Students must investigate and apply content knowledge to scientific phenomenon.
Investigate, evaluate, and reason scientifically	Scientists do more than learn about science; they "do" science. Science instruction must integrate the practices, or behaviors, of scientists and engineers as they investigate real-world phenomenon and design solutions to problems.
Connect ideas across disciplines	For students to develop a coherent and scientifically-based view of the world, they must make connections across the domains of science (life science, physical science, earth and space science, environmental science, and engineering, technology, and applications of science). The crosscutting concepts have applications across all domains.

Three Dimensional Learning: the integration of the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts in science instruction

Contact LouisianaStandards@la.gov with questions.

Instructional Shifts

How do the three most critical indicators of the instructional materials rubric *(Three-Dimensional Learning, Alignment and Accuracy, Disciplinary Literacy)* support the instructional shifts? (expert response)

Instructional Shifts	Non-negotiable criteria of the rubric that support the instructional shifts
Apply Content Knowledge	Alignment and accuracy: Explaining phenomena and designing solutions drive student learning Disciplinary literacy: Speaking and writing about scientific phenomenon and engineering solutions
Investigate, Evaluate, and Reason Scientifically	Alignment and accuracy: Full depth of the standards Three dimensional learning: Application of three dimensions (practices) Disciplinary literacy: Engaging in argument and communicate scientifically using authentic sources
Connect Ideas Across Disciplines	Alignment and accuracy: Full depth of the standards Three dimensional learning: Application of three dimensions (crosscutting concepts)

Schedule

Instructional Materials Review

Quality Science Curriculum

Connecting to the Instructional Shifts

Connecting to the Assessment

LDOE Implementation Plan and Support

Next Steps

Connecting to the Assessment

Instructional Shifts
Apply Content Knowledge
Investigate, Evaluate, and Reason Scientifically
Connect Ideas Across Disciplines

IMR Critical Indicators
Three Dimensional Learning
Alignment and Accuracy (Phenomenon)
Disciplinary Literacy

Analyze the sample item set.

- Identify 2 ways in which the item set connects to the instructional shifts.
- Identify how the item set supports the indicators of a quality science curriuclum.

Connecting to the Assessment

- Set-Based Design
- a scientific phenomenon provides the focus for the sets
- a stimulus or stimuli material describe the scientific phenomenon
- comprised of four to five questions
- students use stimuli and course knowledge to answer the questions

- Item Sets
- selected-response (multiple-choice and/or multiple-select), technology-enhanced, and two-part questions
- some sets culminate with a 2-point constructed-response item

- Task Set
- selected-response questions
- culminates with a 6- or 9- point extended-response item, for grades 3-4 and 5-8, respectively

- Discrete Items
- selected-response, technology-enhanced, and two-part questions

Connecting to the Assessment

- **No operational science test for grades 3-8, students take the science field test in Spring 2018.**

- Features of the Science Field Tests

- two Sessions
- timed
- in the same test window as LEAP 2025 grades 3-8 tests
- administered online for all grades, districts have the option for paper-based tests at grades 3 and 4
- all items reviewed by educator committees for multi-dimensional alignment and appropriateness for grade level and Louisiana students

- Resources

- Science Field Test Overview
- Science Field Test Guides

Connecting to the Assessment

- **Biology remains as four-level EOC test assessing the old GLEs**
- Field Test items aligned to the new Louisiana Student Standards for Science will be embedded within each test session in the Spring 2018 administration only

- All embedded field test items will be reviewed and approved by educator committees for multi-dimensional alignment and appropriateness for course and Louisiana students
- Test remains untimed for 2017-2018

- Resources
- Science Field Test Overview
- Biology Assessment Guide
- Biology Field Test Guide
- Online Tools Training – available Winter 2017-2018

Schedule

Instructional Materials Review

Quality Science Curriculum

Connecting to the Instructional Shifts

Connecting to the Assessment

LDOE Implementation Plan and Support

Next Steps

Standards Implementation Support

Tools: A number of documents have been released regarding the Louisiana Student Standards for Science.

- Shifts in Science
- Appendix A: Progressions of Learning
- Appendix B: Connections to ELA and Math Standards
- Middle School Sample Transition Plan
- Sample Scope and Sequence Documents *(updated)*

Schedule

Instructional Materials Review

Quality Science Curriculum

Connecting to the Instructional Shifts

Connecting to the Assessment

LDOE Implementation Plan and Support

Next Steps

Next Steps

Reflect: Given your knowledge of high quality science instructional materials and The Department's current plan, what are your next steps regarding science curriculum?

For science assessment information, attend the science assessment session at these collaborations.

Contact: lydia.hill@la.gov with questions regarding instructional support.