

Louisiana Guide to Piloting OpenSciEd Biology

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Purpose

To assist teachers with piloting the OpenSciEd biology curriculum, this document provides guidance on how OpenSciEd biology units correlate with the [Louisiana Student Standards for Science](#) (LSSS). The biology curriculum provides ample instructional guidance for teachers. This Louisiana Guide to Implementing Activate Learning OpenSciEd biology takes it a step further by highlighting areas where teachers may need to make strategic decisions that consider student needs.

While the OpenSciEd biology curriculum may include performance expectations featured in other courses, these units are intentionally designed to provide students with the opportunity to incrementally make sense of phenomena, building understanding and abilities over time through a coherent storyline. Modifications to the sequence or content of lessons within these units could undermine the design and should therefore be approached with caution and careful consideration.

This guidance document is considered a 'living' document, reflecting the expectation that teachers and other educators will continue to identify opportunities for improvement as it is applied in practice. Please send feedback to STEM@la.gov so that the Louisiana Department of Education (LDOE) may incorporate your suggestions when updating this guide.

Overview of OpenSciEd

OpenSciEd is an effort among science educators, curriculum developers, teachers, and philanthropic foundations to improve the supply of and demand for high-quality K-12 science instructional materials by producing open-source, freely available instructional materials designed for college- and career-ready science standards. OpenSciEd works with classroom educators, experienced science curriculum developers, individual school districts, education non-profits, and the science education community to create and pilot robust, research-based, open-source science instructional materials.

Field Testing and Release of Units

Ten partner states volunteered to join this effort, including California, Iowa, Louisiana, Massachusetts, Michigan, New Mexico, New Jersey, Oklahoma, Rhode Island, and Washington. After the initial development of the OpenSciEd units, the unit prototypes or field test units undergo rigorous external review and robust field testing in participating classrooms across partner states. The field test units are then revised based on the feedback and data collected and submitted to the NextGenScience Peer Review Panel before being made freely and openly available to the public upon earning a quality rating. The entire high school curriculum (16 units in total) is now available to download for free online.

Unit Design and Sample Scope and Sequence

The units in the OpenSciEd Sample Scope and Sequence include bundles of performance expectations that are built around an anchoring phenomenon. These units are intentionally designed to allow students to incrementally make sense of phenomena to build understanding and abilities over time through a coherent storyline. Modifying the sequence or content of lessons within these units could undermine the design and, therefore, is not recommended. It should be approached with caution and careful consideration.

Contact

Systems interested in piloting should reach out to STEM@la.gov for direct support. For questions or requests for additional information on the OpenSciEd initiative and/or materials, contact info@openscienced.org.

Sample Scope and Sequence

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Number of Lessons <i>(lessons vary in length from 1-5 class periods)</i>	11 lessons	12 lessons	12 lessons	11 lessons	9 lessons
Anchor Phenomenon Question	How do ecosystems work, and how can understanding them help us protect them?	What causes fires in ecosystems to burn, and how should we manage them?	Who gets cancer and why? What can we do about it?	How does urbanization affect non-human populations, and how can we minimize harmful effects?	What will happen to Arctic bear populations as their environment changes?
Louisiana Students Standards for Science¹	HS-LS2-1 HS-LS2-6* HS-LS2-7* HS-ESS3-3	HS-LS1-5 HS-LS1-6 [†] HS-LS1-7 [†] HS-LS2-4 HS-ESS2-6 [†]	HS-LS1-1 HS-LS1-2 HS-LS1-4 HS-LS3-1 [†] HS-LS3-2 HS-LS3-3	HS-LS4-2* HS-LS4-3 HS-LS4-4* HS-LS4-5*	HS-LS1-3 HS-LS2-6* HS-LS2-7* HS-LS4-1 HS-LS4-2* HS-LS4-4* HS-LS4-5* HS-ESS2-7 [†]
Unit Resources	Unit materials	Unit Materials	Unit Materials	Unit Materials	Unit Materials

*The performance expectation is addressed across multiple units.

[†]The performance expectation is addressed across the three-course sequence (Biology, Chemistry, Physics).

¹HS-LS1-6, HS-LS1-7, HS-LS3-1 are partially addressed; HS-LS1-8 is a Louisiana-specific standard and is not addressed.

This table does not include performance expectations unique to the Next Generation Science Standards for Life Science.

Pacing and Unit Order Guidance[†]

Approach modification of the lessons, even in the ways suggested here, with careful consideration. Give additional attention to navigation in lessons where adjustments are made to maintain coherence from the students' perspective.

Unit	Customization Guidance
Unit 1 B.1 Ecosystem Interactions & Dynamics	<i>If teaching out of sequence:</i> - This is the first unit in the OpenSciEd Scope and Sequence and is intended for use at the beginning of biology. If this unit is taught later in the year, the following modifications would need to be made. - Classroom community agreements need to be developed and supported. - Introduction to the routine and purpose of transfer tasks, including the rubric structure. - Scaffolded approach to developing individual and group models. <i>Condensing suggestions:</i> Lesson 2: Read the <i>History of Serengeti</i> aloud as a class instead of reading in small groups, and then discuss again as a class. Lesson 10: Instead of having each group present their conservation profiles and plans to the class, a gallery walk of the presentations may help to streamline this portion of the lesson.
Unit 2 B.2 Ecosystems: Matter & Energy	<i>If teaching out of sequence:</i> - If taught before <i>B.1</i>, supplemental teaching of the following would be required: - Teaching community agreements and setting up the Driving Question Board. These supports are built into the <i>B.1 Unit</i> and could be adapted accordingly for this unit if needed. - Teaching about the components, interactions, and mechanisms between organisms in ecosystems and how to represent them may be required. <i>Condensing suggestions:</i> Lesson 8: Have students begin discussing how they will represent their data when developing directional hypotheses, so that time is saved when representing data. Lesson 10: Assign the investigation of a community of choice as part of the home learning. Students can

Unit	Customization Guidance
Unit 2 <i>continued</i>	complete the investigation with community members and discuss their findings when they return. Lesson 12: Consider waiting to hand out <i>Nitrogen Pollution By State</i> until students reach that part of the assessment, or eliminate it entirely (and cross off or delete the text for question 12 that suggests using that reading).
Unit 3 B.3 Inheritance & Variation of Traits	<i>If teaching out of sequence:</i> - If taught before <i>B.1</i> and <i>B.2</i>, supplemental teaching of the following would be required: <i>B.3</i> is intended to be the third unit and supports student sensemaking in <i>B.4</i> and <i>B.5</i>, which follow directly. If students do not experience this unit in order, they will likely need additional support to review big ideas related to inheritance and variation of traits before engaging with evolution by natural selection and speciation. - Teaching community agreements and setting up the Driving Question Board. These supports are built into the <i>B.1 Unit</i>. <i>Louisiana-specific recommendations and condensing suggestions:</i> Lesson 2 LSSS Customization: In Lesson 2, students look at images of breast, lung, blood, and skin cells to figure out differences between cancer and non-cancer cells. The following recommendations support teachers in addressing specific language in the LSSS. - During Part 2, the “Initial Ideas Discussion”, - consider introducing the terms “differentiation” and “stem cells” and explain that while the organism begins as a single fertilized egg, the cells differentiate into these specialized types (HS-LS1-4); - elevate ideas about distinct cell types and their functions within systems of cells; and - consider extending the discussion to include what specific essential functions these systems of specialized cells perform. (HS-LS1-1, HS-LS1-2). - During Part 3, “Investigate Cells”, to further emphasize systems of specialized cells and their functions, consider having students compare healthy lung, skin, and breast tissue before investigating the

Unit	Customization Guidance
Unit 3 B.3 Inheritance & Variation of Traits <i>continued</i>	differences between healthy cells and cancer cells (HS-LS1-1, HS-LS1-2). - During Part 4, “Develop and Model to Explain How Cancer Causes Illness,” consider incorporating the optional extension on Page 5 of the Lesson 2 Teacher Guide to further develop science ideas about the functions of specialized cells and the related body systems (HS-LS1-2). ** Note that these recommendations could add as much as one extra class period to this lesson. To offset the additional time, implement the optional condensing suggestions for lesson 9 and lesson set 3 later in the unit. Lesson 8 LSSS Customization: OpenSciEd explicitly states, “The terms dominant and recessive are not introduced in this lesson. These terms oversimplify the relationship between gene and protein”. To meet LA HS-LS3-1, you must override this guidance. To further address Mendelian genetics and complex inheritance, - pause the lesson after Part 4, after discussing Lakita’s family pedigree. Remind students that there were previous questions about how we can find out the likelihood of someone inheriting a gene that increases their chances of getting cancer. Lesson 8a: Add a 2-day extension to introduce Punnett Squares as a mathematical model to predict the probability of traits being passed to the next generation by investigating what Lakita’s chances were of inheriting the gene that causes Li-Fraumeni. To introduce other inheritance patterns, contrast the inheritance of Li-Fraumeni syndrome with other traits (e.g., blood typing for codominance/multiple alleles, or skin pigmentation as a polygenic trait linked to the Lesson 9 melanin phenomenon). Add Punnett square, dominant, recessive, codominant, incomplete dominance, and sex-linked traits to the glossary. ** Note that these recommendations could add two additional class periods to this lesson. To offset the additional time, implement the optional condensing suggestions for lesson 9 and lesson set 3 later in the unit. Lesson 8 Continued: Return to lesson 8 with the suggested navigation: “Punnett squares are excellent tools for predicting the probability of a single trait like the p53 mutation. However, we’ll be investigating a new scenario which involves cancer risk when families pass down mutations in multiple genes at the same time.” Then, pick up at part 5 of the lesson where we introduce a new pedigree. Lesson 9: Reduce the time necessary for the investigation by providing students with sample data.

Unit	Customization Guidance
Unit 3 <i>continued</i>	• Lesson 10 LSSS Customization: Modify the Genetics Transfer Task to require students to use a Punnett square to calculate the statistical distribution of a trait in a population (covering HS-LS3-3). • Lesson Set 3: While critical to supporting students in making sense of cancer treatments and causes, Lesson Set 3 reinforces core ideas developed earlier in the unit related to cell division and can be condensed to recover time needed for the LSSS customizations.
Unit 4 B.4 Natural Selection & Evolution of Populations	<i>If teaching out of sequence:</i> • If taught before <i>B.1</i>, the following would be required: ◦ Supplemental teaching of biodiversity, resilience, group behavior, and carrying capacity will be required. ◦ Students will need additional scaffolding for transfer tasks, and the practices of asking questions and defining problems, developing and using models, and using mathematics and computational thinking. • If taught before <i>B.2</i>, the following would be required: ◦ Supplemental scaffolding of the Practice of constructing explanations and Crosscutting Concepts of cause and effect will be helpful. • If taught before <i>B.3</i>, the following would be required: ◦ Supplemental teaching of inheritance, variation, and mutation will be required. <i>Condensing suggestions:</i> • Lesson 1: Instead of taking students outside to look for examples of the effect of urbanization on non-human populations, have them take a virtual walk in another city. • Lesson 2: Model and collect all field/non-urban data together as a class, and then send students to complete the urban investigation in groups. • Lesson 4: Instead of having students visit both locations in pairs using Google Earth, have the teacher do it as a demonstration that students watch and record what they see. • Lesson 10: Remove the future transportation map from <i>Buckeye Development Designs</i> to reduce the amount of material for students to consider as they evaluate designs.

Unit	Customization Guidance
Unit 5 B.5 Common Ancestry & Speciation	<i>If teaching out of sequence:</i> • Due to its placement as the last unit in the course, several modifications are needed if taught earlier in the year. ◦ Students' understanding of ecosystems, inheritance, trait variation, natural selection, and population evolution would need additional support. <i>Condensing suggestions:</i> • Lesson 1: Consider replacing the fishbowl discussion with a more typical class discussion format. • Lesson 2: If students have demonstrated proficiency in DCI elements related to cellular respiration, consider modifying this portion of the lesson to condense it.

[†] Adapted from the OpenSciEd Teacher Background Knowledge for “How will I need to modify the unit if taught out of sequence?” and “How do I shorten or condense the unit if needed? How can I extend the unit if needed?” for each unit.

LDOE Formative Assessment Resources

LDOE formative assessment resources include a library of Louisiana educator-created discrete items and sets, LEAP Practice Test Items, and LEAP Assessment Guide Items correlated to the Louisiana Student Standards for Science. These resources can be used alongside guidance from a high-quality curriculum to provide opportunities for students to showcase their learning.

Unit	Discrete Items	Sets
B.1 Ecosystem Interactions & Dynamics	<u>LDOE Formative Assessment Items</u> (Password: Educate2020) - Mary's Goldfish, Nutria (HS-LS2-1) - Seawater Acidity (HS-LS2-6) - Salvinia (HS-LS2-7) <u>Biology LEAP Practice Test Standalone Items:</u> 40 (HS-LS2-6) <u>LEAP Assessment Guide Items:</u> - N/A <u>LEAP Science Released Items:</u> - N/A	<u>LDOE Formative Assessment Sets</u> (Password: Educate2020) - Item Set: Wolves (HS-LS2-1 and HS-LS2-6) <u>Biology LEAP Practice Test Sets:</u> - Item Set: Kit Fox Ecology (HS-LS2-1 and HS-LS2-7) <u>LEAP Assessment Guide Sets:</u> - Item Set: Biodiversity in Longleaf Pine Ecosystems (HS-LS2-1 and HS-LS2-7) <u>LEAP Science Released Items:</u> - Item Set: Ebola Virus (HS-LS2-1)
B.2 Ecosystems: Matter & Energy	<u>LDOE Formative Assessment Items</u> (Password: Educate2020) - Elodea Lab (HS-LS1-5) - Carb Loading (HS-LS1-7) - Bald Eagle (HS-LS2-4) <u>Biology LEAP Practice Test Standalone Items:</u> 14 (HS-LS1-5) 21 (HS-LS1-7) 23 (HS-LS1-5) <u>LEAP Assessment Guide Items:</u> - Cellular Respiration (HS-LS1-1) <u>LEAP Science Released Items:</u> - N/A	<u>LDOE Formative Assessment Sets</u> (Password: Educate2020) - N/A <u>Biology LEAP Practice Test Sets:</u> - Item Set: Alaskan Salmon (HS-LS1-6 and HS-LS1-4) - Item Set: TonewoodTrees (HS-LS1-5 and HS-LS2-4) <u>LEAP Assessment Guide Sets:</u> - N/A <u>LEAP Science Released Items:</u> - N/A

Unit	Discrete Items	Sets
B.3 Inheritance & Variation of Traits	<u>LDOE Formative Assessment Items</u> (Password: Educate2020) - Sickle Cell Trait, Zygote (HS-LS1-1) - Runners (HS-LS1-2) - Dolly (HS-LS1-4) - Tay-Sachs Disease (HS-LS3-1) - Sandra Laing (HS-LS3-2) - Cystic Fibrosis (HS-LS3-3) <u>Biology LEAP Practice Test Standalone Items:</u> 13 (HS-LS-3-1) 22 (HS-LS3-1) 34 (HS-LS-1-2) 39 (HS-LS1-2) <u>LEAP Assessment Guide Items:</u> - Rabbit Muscle (LS-HS1-2) - Chickens (LS-HS3-3) <u>LEAP Science Released Items:</u> - Genetic Testing (HS-LS3-3) - Heritable Diseases (HS-LS3-3)	<u>LDOE Formative Assessment Sets</u> (Password: Educate2020) - Item Set: Stem and IPS Cells (HS-LS1-1, HS-LS-1-4 and HS-LS3-1) <u>Biology LEAP Practice Test Sets:</u> - Item Set: Primate Traits (HS-LS3-1, HS-LS3-2) <u>LEAP Assessment Guide Sets:</u> - Task Set: Bee Communication (HS-LS1-1 and HS-LS1-2) <u>LEAP Science Released Items:</u> - Task Set: Migration of Pink Salmon (HS-LS3-1, HS-LS3-2)
B.4 Natural Selection & Evolution of Populations	<u>LDOE Formative Assessment Items</u> (Password: Educate2020) - Irish Lumper, Daphne Major Finches (HS-LS4-2) - Blue Gramma, Super Weeds, Elephants (HS-LS4-3) - Oil Spill (HS-LS4-4) <u>Biology LEAP Practice Test Standalone Items:</u> 33 (HS-LS4-2) 35 (HS-LS4-2) 37 (HS-LS4-3) 41 (HS-LS4-3)	<u>LDOE Formative Assessment Sets</u> (Password: Educate2020) - Item Set: Adaptations I (HS-LS4-4, HS-LS4-5) - Item Set: Adaptations II (HS-LS4-4, HS-LS4-5) <u>Biology LEAP Practice Test Sets:</u> - N/A <u>LEAP Assessment Guide Sets:</u> - N/A

Unit	Discrete Items	Sets
B.4 <i>continued</i>	<u>LEAP Assessment Guide Items:</u> - Reed Grasses (HS-LS4-4) <u>LEAP Science Released Items:</u> - Rainy Season (HS-LS4-4)	<u>LEAP Science Released Items:</u> N/A
B.5 Common Ancestry & Speciation	<u>LDOE Formative Assessment Items (Password: Educate2020)</u> - Goldfish, Blood Sugar (HS-LS1-3) - Seawater Acidity (HS-LS2-6) - Salvinia (HS-LS2-7) - Arkansas Whale, Cytochrome C (HS-LS4-1) - Irish Lumper, Daphne Major Finches (HS-LS4-2) - Oil Spill (HS-LS4-4) <u>Biology LEAP Practice Test Standalone Items:</u> 32 (HS-LS1-3) 33 (HS-LS4-2) 35 (HS-LS4-2) 38 (HS-LS1-3) <u>LEAP Assessment Guide Items:</u> - Reed Grasses (HS-LS4-4) <u>LEAP Science Released Items:</u> - Costa Rica (HS-LS2-7)	<u>LDOE Formative Assessment Sets (Password: Educate2020)</u> - Item Set: Adaptations I (HS-LS4-4, HS-LS4-5) - Item Set: Adaptations II (HS-LS4-4, HS-LS4-5) <u>Biology LEAP Practice Test Sets:</u> - Task Set: Banded Snails (HS-4-5, HS-LS4-4) - Item Set: Scales and Feathers (HS-LS4-1, HS-LS1-1) <u>LEAP Assessment Guide Sets:</u> - N/A <u>LEAP Science Released Items:</u> - The Galapagos Islands (HS-LS4-5, HS-LS4-3)
Additional Standards	<u>LDOE Formative Assessment Items (Password: Educate2020)</u> - Bacteria & Penicillin (HS-LS1-8) <u>Biology LEAP Practice Test Standalone Items:</u> 15 (HS-LS1-8) 36 (HS-LS1-8) <u>LEAP Assessment Guide Items:</u> - N/A	<u>LDOE Formative Assessment Sets (Password: Educate2020)</u> - N/A <u>Biology LEAP Practice Test Sets:</u> - N/A <u>LEAP Assessment Guide Sets:</u> - N/A

Unit	Discrete Items	Sets
Additional Standards <i>continued</i>	<u>LEAP Science Released Items:</u> • N/A	<u>LEAP Science Released Items:</u> • Task Set: Viruses Attack (HS-LS1-8, HS-LS1-4)*