Louisiana Guide to Piloting OpenSciEd: Physics

This document provides guidance regarding how OpenSciEd units correlate with the Louisiana Student Standards for Science (LSSS) to assist teachers with piloting the OpenSciEd physics curriculum. The OpenSciEd physics pilot provides ample instructional guidance for teachers. This Louisiana Guide for piloting OpenSciEd physics further points out where teachers may need to make strategic decisions considering student needs.

While the OpenSciEd Physics pilot 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 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, so it should be approached with caution and careful consideration.

This guidance document is considered a "living" document because we believe that teachers and other educators will find ways to improve it as they use it. Please send feedback to STEM@la.gov so we can use your input when updating this guide.

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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-sourced, 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 and 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@openscied.org.

2024-2025 Sample Scope and Sequence

	Unit 1 Energy Flow from Earth's Systems	Unit 2 Energy, Forces, and Earth's Crust	Unit 3 Collisions & Momentum	Unit 4 Meteors, Orbits, & Gravity	Unit 5 Electromagnetic Radiation	Unit 6 Stars & the Big Bang
Number of Lessons **lessons vary in length from 1-5 class periods*	11 lessons	13 lessons	15 lessons	15 lessons	13 lessons	7 lessons
Anchor Phenomenon Question	How can we design more reliable systems to meet our communities' energy needs?	How do forces in Earth's interior determine what will happen to the surface we see?	What can we do to make driving safer for everyone?	How have collisions with objects from space changed Earth in the past, and how could they affect our future?	How do we use radiation in our lives, and is it safe for humans?	Why do stars shine, and will they shine forever?
Louisiana Students Standards for Science[1]	**HS-PS2-5*** **HS-PS3-1*†** **HS-PS3-2*†** **HS-PS3-3** **HS-PS3-5†** HS-ESS3-2†	**HS-PS2-1*** *HS-PS1-8*†* HS-ESS1-5 HS-ESS2-1† HS-ESS2-3	**HS-PS2-1*** **HS-PS2-2** **HS-PS2-3**	**HS-PS2-4** **HS-PS3-1*†** **HS-PS3-2*†** HS-ESS1-4 HS-ESS1-6	**HS-PS2-5*** **HS-PS4-1** **HS-PS4-3**	*HS-PS1-8*†* HS-ESS1-1 HS-ESS1-2† HS-ESS1-3
Unit Resources	Unit Materials	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). *Italicized performance expectations are found in the Physical Science Louisiana Student Standards for Science.*
[1] HS-PS3-4 is addressed in the Chemistry course.
This table does not include performance expectations unique to the Next Generation Science Standards for Life Science.

Pacing and Unit Order Guidance

Modification of the lessons, even in the ways suggested here, should be approached with careful consideration. Additional attention should be given to navigation in lessons where adjustments are made in order to maintain coherence from the student's perspective.

Unit	Relevant OpenSciEd Guidance for Teaching Units in a Different Sequence †	Relevant OpenSciEd Guidance for Condensing † (*Includes guidance directly from OpenSciEd)*

Unit 1
 	
P.1 Energy Flow from Earth's Systems
	• This is the first unit in the OpenSciEd Scope and Sequence, intended for use at the beginning of physics. If teaching this unit later in the year, the following modifications would need to be made.
	  ○ If this unit is taught before the *chemistry curriculum*, supplemental teaching of the particle model of matter, including a conceptual understanding of the nature of electrons, nuclei, and atoms, will be required.
	  ○ If taught later in the school year, additional supplementary materials related to forces should be incorporated into class discussions to help students integrate a "forces and energy" perspective.
		• **Lessons 2, 5, 6, and 7:** Demonstrations may be utilized in some of the lessons listed; however, students need to have opportunities to carry out investigations for at least two of the lessons listed.

Unit 2 **P.2 Energy, Forces, and Earth's Crust**	• If taught before the *chemistry curriculum,* supplemental teaching of the particle model of matter will be required. This will include a conceptual understanding of the nature of electrons, nuclei, and atoms. A review of the nature of thermal energy and thermal energy transfer would also be needed. • Supplementary teaching on the nature of energy transfer through systems and how to represent it may be required if taught earlier in the school year.	• **Lesson 8:** Decrease the investigation time within the lesson. • **Lessons 9, 11, and 12:** Reduce the time necessary for the investigations by providing students with sample data. Students who have experienced the *chemistry curriculum* will have had practice with this performance expectation.

Unit	Relevant OpenSciEd Guidance for Teaching Units in a Different Sequence†	Relevant OpenSciEd Guidance for Condensing† (*Includes guidance directly from OpenSciEd)*

Unit 3
 	
P.3 Collisions & Momentum
	• If taught earlier in the school year, supplemental teaching of the following may be required:
	  ○ Support around the nature of energy transfer through systems and how to represent it.
	  ○ Support around the basics of forces.
		• **Lesson 4:** Reduce the time for the investigation by conducting a demonstration and providing students with sample data to do the analysis.
		• **Lesson 11:** The Scientists Circle about M-E-F perspectives wraps up the crumple zone discussion but could be integrated into the Lesson 12 Gotta-Have-It Checklist discussion.

Unit 4
 	
P.4 Meteors, Orbits, & Gravity
	• If taught earlier in the school year, supplemental teaching of the following may be required:
	  ○ Support around the nature of energy transfer through systems and how to represent it.
	  ○ Support around the nature of forces, how to represent them, and Newton's second and third laws.
		• **Lesson 3:** Use the Circular Motion Investigation to collect qualitative data instead of taking actual measurements of the period of revolution using the physical model.
		• **Lessons 8 and 9:** Condense these lessons into a single lesson and use it as a re-anchor to motivate the lessons in the second lesson set.

Unit 5
 	
P.5 Electromagnetic Radiation
	• If taught before the *chemistry curriculum*, supplemental teaching of the following will be required:
	  ○ Review the particle model of matter, including a conceptual understanding of the nature of electrons, nuclei, atoms, molecules, and polarity.
	  ○ Review the nature of thermal energy and thermal energy transfer.
		• **Lesson 5:** Develop an investigation plan together as a class.

Unit 5 ***continued***	• If taught earlier in the school year, supplemental teaching of the relationship between energy and forces, the nature of forces at a distance, the basic properties of mechanical waves, and the fundamentals of electricity will be required.	

Unit 6
 	
P.6 Stars & the Big Bang
	• Due to its placement as the last unit in the course, several modifications would need to be made if taught earlier in the year.
	  ○ Additional materials related to energy, forces, and matter, including developing the M-E-F triangle conceptual framework, should be incorporated into class discussions to help students integrate forces and energy perspectives. Lesson 1 includes a visual of this conceptual framework. Lesson 3 of P.2 includes instructions for co-developing the M-E-F triangle as a conceptual tool.
	  ○ Additional supplementary teaching about the nature of electromagnetic radiation may also be required.
	• If taught before P.2, additional supplementary materials related to scale, stability, and change will be required. This unit uses the Scale Chart conceptual tool developed in P.2 to help students think about the significance of scale and how systems can seem stable at one scale but not at another.
	• If taught before *chemistry*, supplementary teaching of the particle model of matter will be required, including a conceptual understanding of spectral analysis and the nature of electrons, nuclei, and atoms.
		• There are no recommended opportunities for condensing P.6.