

Lake Orion High School Science Curriculum Update

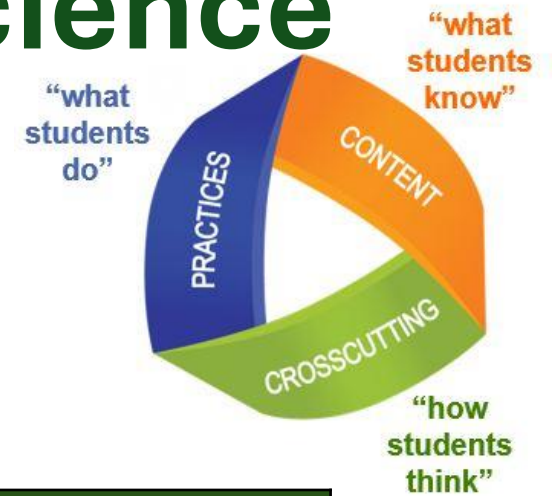
Why are we seeking change?

The last science curriculum adoption at LOHS was in 2006, using a textbook published in 2002.

- In 2015, Michigan adopted the Michigan Science Standards, aligned with the Next Generation Science Standards (NGSS).
- The NGSS are fundamentally different from previous standards and require a major shift in instruction and learning that textbooks cannot provide.
- Through the work of the STEM coaches and the Science Curriculum Specialists, the elementary and middle levels have adopted curricula that are aligned with the NGSS. We are seeking continuity of this work at the high school.

What are the Next Generation Science Standards (NGSS)?

- Standards are “three-dimensional” instead of exclusively content-based
- Three-dimensional learning requires a drastic shift in instructional practices:



Traditional Instruction	NGSS-Informed Instruction
<ul style="list-style-type: none">• Students obtain information from textbooks and lectures• Classwork involves drill and practice• Students assessed on ability to memorize facts• Application of content to the real world is limited• Critical thinking is an add-on• Disciplines are kept separate	<ul style="list-style-type: none">• Students generate questions based on observations of phenomena• Classwork involves data collection, analysis, discourse and generating original ideas• Students assessed on their ability to apply knowledge and practices to new scenarios• Critical thinking is a central focus• Interdisciplinary connections

What are the NGSS Dimensions?

Scientific & Engineering Practices

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Crosscutting Concepts

1. Patterns
2. Cause and effect: Mechanism and explanation
3. Scale, proportion, and quantity
4. Systems and system models
5. Energy and matter: Flows, cycles, and conservation
6. Structure and function
7. Stability and change

Disciplinary Core Ideas

Physical Sciences

PS1: Matter and its interactions

PS2: Motion and stability: Forces and interactions

PS3: Energy

PS4: Waves and their applications in technologies for information transfer

Life Sciences

LS1: From molecules to organisms: Structures and processes

LS2: Ecosystems: Interactions, energy, and dynamics

LS3: Heredity: Inheritance and variation of traits

LS4: Biological evolution: Unity and diversity

Earth and Space Sciences

ESS1: Earth's place in the universe

ESS2: Earth's systems

ESS3: Earth and human activity

Engineering, Technology, and Applications of Science

ETS1: Engineering design

ETS2: Links among engineering, technology, science, and society

Piloting & Adoption Timeline

Spring 2024

- “Future of Science” Committee is assembled. All members of department are invited to join.

Summer 2024

- The Teaching and Learning Department funded the purchase of equipment and materials for curriculum pilot.

Fall/Winter 2024

- Teachers begin attending “Level Up!” trainings at Oakland Schools
 - These trainings allowed teachers to experience the OpenSciEd (OSE) curriculum for biology, physics, and chemistry.
 - 8 teachers, plus Science Instructional Coaches, attend.

Spring 2025

- Semester-long pilot for OpenSciEd Biology
- Earth Science classes pilot New Visions, plus some OSE Physics and Chemistry
- Future of Science Committee maps out a plan for future course offerings. Plans are shared with the department.

Summer 2025

- Materials and equipment are ordered for OSE Physics and Chemistry pilots
 - Teachers utilize summer work hours to begin testing materials

Fall 2025

- All OpenSciEd Biology units are piloted by several science teachers.
- Semester-long pilot for OSE Physics and Chemistry (in Physical Science) - 2 units each
- Meetings with counseling and admin to discuss course offerings
- Course offerings approved by Curriculum Review committee

About the OpenSciEd (OSE) Curriculum

Research & Field Testing

Contributors	Field Testing & Pilots
Developed by a consortium of curriculum designers, learning scientists, and partner organizations (e.g., BSCS and university teams)	Field tests and pilots were done in collaboration with the participation of 10 state education agencies in real and diverse classrooms.
Unit Development	
<p>Each unit went through an ~18-month development cycle that includes drafting, external review, robust field testing, and iterative revision.</p> <p>Universal Design for Learning (UDL) was used to reduce barriers and create multiple paths for diverse learners, including those who are culturally and linguistically diverse, have a disability, are emerging multilingual learners (EMLs) and/or are considered gifted and talented.</p>	



Ratings & Design Badges



OpenSciEd Biology

Gateway 1	OVERVIEW	Gateway 2	OVERVIEW	Gateway 3	OVERVIEW
Designed for NGSS	97%	Coherence and Scope	96%	Teacher & Student Supports	100%
MEETS EXPECTATIONS		MEETS EXPECTATIONS		MEETS EXPECTATIONS	

OpenSciEd Chemistry

Gateway 1	OVERVIEW	Gateway 2	OVERVIEW	Gateway 3	OVERVIEW
Designed for NGSS	94%	Coherence and Scope	96%	Teacher & Student Supports	100%
MEETS EXPECTATIONS		MEETS EXPECTATIONS		MEETS EXPECTATIONS	

OpenSciEd Physics

Gateway 1	OVERVIEW	Gateway 2	OVERVIEW	Gateway 3	OVERVIEW
Designed for NGSS	97%	Coherence and Scope	96%	Teacher & Student Supports	100%
MEETS EXPECTATIONS		MEETS EXPECTATIONS		MEETS EXPECTATIONS	

All high school units received the NGSS High Quality Design badge.



Three Core Courses

NGSS Standards are organized into three bundles:

- Life Science
- Physical Science
- Earth & Space Science



OpenSciEd rearranges the standards into three courses:

- Biology
- Chemistry
- Physics



Earth Science
integration

What are the benefits of integrating Earth Science?

- Curriculum is designed around real-world “anchoring phenomena” that are engaging and relevant.
- Because Earth-science phenomena are often open-ended and context-rich, studying them helps students develop critical thinking and inquiry skills.
- Earth science is inherently interdisciplinary — it draws on physics, chemistry, biology, mathematics, and more — which helps students see how different scientific disciplines interconnect.

Materials & PASCO Portal

The PASCO Portal is a teacher access point for up-to-date OpenSciEd resources and materials, providing:

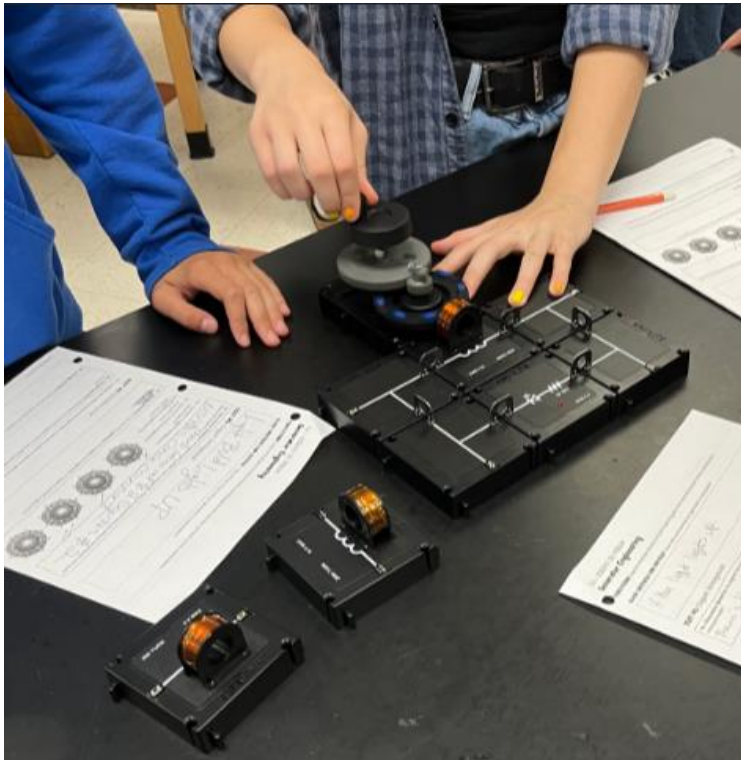


- **Curriculum Access:** Educators can efficiently access the full OpenSciEd curriculum, including lesson plans, slide decks, links, and videos.
- **Integration with Equipment:** The “PASCO version” curriculum is specifically tailored to utilize PASCO's award-winning lab equipment, such as wireless sensors, to facilitate hands-on investigations.
- **Resource Management:** Teacher and student files (including secure answer keys and sample data) are available for download in common formats, making them easy to distribute through an LMS.
- **Professional Development:** The portal offers on-demand professional development modules to help teachers effectively implement the OpenSciEd curriculum and use the associated PASCO technology.



Data-Driven Investigation with PASCO Technology

Student-Friendly Hands-On Investigation Materials



Lab-Grade Equipment & Remote Sensing



Software for Data Collection & Analysis



What Our Students Say...

"My teacher helps us learn by asking US questions. She makes sure we are understanding what we are doing but in a way that makes us think."

"I think the storyline gives us a real-life perspective of what we are learning. It feels as though we can see it in everyday life instead of feeling as though what we are learning is just another subject in a book or on paper. I can look around and put it to work in real-life scenarios."

"I personally enjoyed the cancer unit a lot, I think it was very interesting topic and important to learn about. Overall, I liked doing labs as well, they were fun and helped my understanding too."

"I found the biology curriculum very intriguing. It helped me be effective in my learning as it used specific situations/stories which clearly represented the topic being taught throughout the unit. It kept me engaged and focused, and overall I found it as a very effective way of teaching."

What Our Educators Say...

“I appreciate the use of videos, graphs, and pictures because they provide multiple entry points into complex science concepts, reducing reliance on text-heavy instruction. Additionally, online simulations allow students to experiment and see cause-and-effect relationships without needing advanced language skills. Furthermore, card games and dice games encourage collaboration with English speaking peers and reinforce concepts and processes in a low-stakes, fun environment. EL learners also benefit from activities like building models with candy make abstract concepts tangible, supporting comprehension through physical representation. Students can show their learning throughout the lessons using white boarding, which give EL learners a chance to express their knowledge even if they are in the beginning stages of writing in English. Overall, by combining visuals, kinesthetic activities, interactive tools, and opportunities to express learning through model representation, the curriculum aligns with sheltered instruction strategies that benefit ELs.”

- Tiffany Smrtnik, ELL Teacher

“I personally like having a set storyline that the kids are able to build off of. The progress tracker also helps them have a place to organize the information they are learning and input the context in which we learned it as a reference cue. I think it is easy to accommodate most assignments to fit the class as a whole, meeting the needs of each student learning. This curriculum is also good at holding the kids accountable for their own learning and encouraging good attendance.”

- Meaghan Everitt, OSE Biology Pilot Teacher

Implementation at LOHS

OpenSciEd Budget

Implementation: Materials to supply teachers and stock 2 labs.

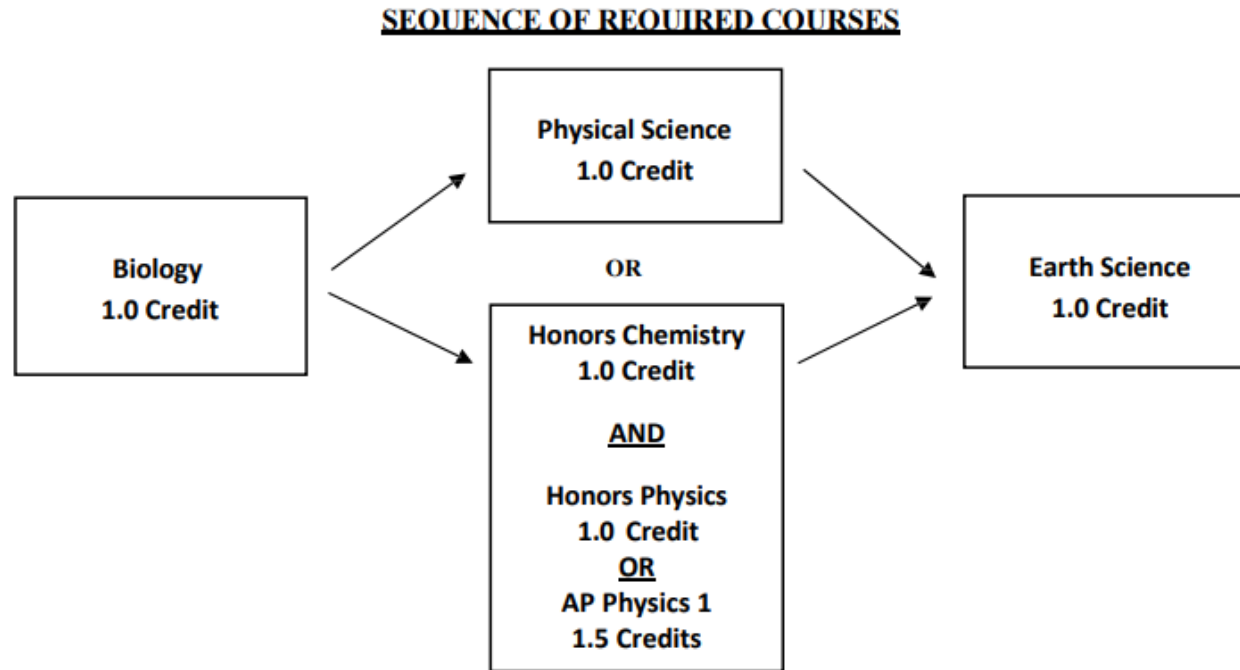
- 2025-2026 = \$20,000
- 2026-2027 = \$35,000

Future costs: Replenish/replace materials for Biology, Chemistry, and Physics.

- \$30,000 per year (estimation).

To keep costs down, the Science Specialist and High School Instructional Coach have been working on sourcing the materials needed, rather than buying all the kits from Pasco. This results in an initial cost savings of \$120,000.

Current Required Classes



Adopting OpenSciEd curriculum will allow this sequence to be streamlined to Biology – Chemistry – Physics.

Please note that these are sample pathways. There are many different paths students can take towards their career goals. Talk to a counselor or science teacher for more guidance.

Pathways in Science

Students wishing to take more science coursework are encouraged to enroll in **Suggested Electives**. A list of suggested electives has been created for each pathway to complement the main courses of study.

