Science Standards FAQ

With the adoption of the 2022 Oregon Science Standards, attention is now turning to implementation and alignment work needed to bring these standards to life for Oregon students. This Frequently Asked Question (FAQ) document provides answers that will support districts, schools, educators, and families embarking on this implementation. Please send additional questions to: jamie.rumage@ode.oregon.gov.

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A1: Are the science standards and instructional materials reviewed and revised every seven years?

Yes. Oregon statutes direct ODE to "regularly and periodically review and revise" the common curriculum goals and performance indicators, which include science (ORS 329.045). The Oregon State Board of Education has the authority to adopt statewide standards. State administrative rules direct ODE to review instructional materials on a seven-year cycle (OAR 581-011-0070), and this time cycle has typically guided standards revision prior to a materials review.

A2: Are the Oregon Science Standards the same as the Next Generation Science Standards?

Yes. While the specific language of the 2022 Oregon Science Standards remains essentially the same as the 2014 Oregon Science Standards (NGSS), there are three areas of updates to note:

1. All K-5 Science Standards have **clarification statements** and **assessment boundaries**. These supporting statements provide possible examples or additional information to the standard (performance expectation) and specify the limits to large-scale summative assessments.

2. The standards include elevated opportunities for **climate change education** across the K-12 standards. A caret, or up arrow (**^**), was added to those standards that have proximal connections to climate change and both disciplinary core ideas: Earth's Systems and Earth and Human Activity. These standards were identified by utilizing the research analysis conducted by MADE CLEAR through a National Science Foundation Grant that could further support climate change education.
3. The standards incorporate flexibility for districts to develop **middle school science standards sequences** based on localized needs. ODE strongly recommends districts develop a middle school course sequence allowing for coherence and the integration of the science standards to promote student ability to connect learning across science disciplines and practices.

A3: Is there a requirement to teach all the science standards in K-12?

Yes. In regards to the learning opportunities for all of the science standards from kindergarten through high school, here is the language in statute (ORS 329.045) and rule (OAR 581-022-2030) addressing district curriculum. This means there is a requirement to teach all of the standards, which by definition means science instruction must happen at every grade-level and that instruction should address all of the standards for that grade-level.

> Revision of Common Curriculum Goals**,** performance indicators, diploma requirements, Essential Learning Skills and **academic content standards; instruction in academic content areas**. (ORS 329.045)
>
> > *(3)(a) School districts and public charter schools must offer students instruction in mathematics, science, language arts, history, geography, economics, civics, physical education, health, the arts and world languages.*
> >
> > *(b) Instruction required under paragraph (a) of this subsection must:*
> >
> > *(A) Meet the academic content standards adopted by the State Board of Education; and*
> >
> > *(B) Meet the requirements adopted by the State Board of Education and the board of the school district or public charter school.*

A4: Is the topic of evolution a teaching requirement?

Yes. Per the requirements of OAR 581-022-2030 District Curriculum, which required by the state as part of the Division 22 Standards, along with the adoption of the 2022 Science Standards by the State Board of Education, evolution is one of the topics within the life science standards.

The following Oregon Science Standards within the life science disciplinary core ideas directly relate to evolution:

- Heredity: Inheritance and Variation of Traits
- Biological Evolution: Unity and Diversity

For additional resources to continue to explore teaching about evolution and the nature of science, please review the following list:

- Addressing controversial science topics in the K-12 classroom
- Helping Students Make Sense of the World-Toward More Equitable Learning in Science
- National Academy of Science - Evolution Resources
- Understanding the Scientific Enterprise: The Nature of Science
- Why students should investigate contemporary science topics?
- Why teach evolution?

A5: Are there specific instructional minutes for elementary science?

No. The Oregon Department of Education does not specify the number of minutes spent on science instruction in elementary classrooms. According to OAR 581-022-2320 Required Instructional Time, the minimum required instructional time in elementary school is 900 hours annually. However, all students, including elementary students, must have access to high-quality science instruction. Ensuring educators have time, resources, and support to engage all students in meaningful science experiences is critical for broadening participation in science and building a scientifically literate population.

> "Every child deserves to experience the wonder of science and the satisfaction of engineering. Children, even at very young ages, are deeply curious about the world around them and eager to investigate the many questions they have about their environment." NASEM, 2022. Science and Engineering in Preschool Through Elementary Grades: The Brilliance of Children and the Strengths of Educators.

A recent Fordham Institute Report (2021) suggests elementary schools must protect instructional time for science education, specifically to address the unfinished learning due to the impacts of the global pandemic. The evidence indicates that schools should commit to forty-five minutes of daily science lessons, and connect literacy skills with science, social studies and other content areas to increase students' engagement and build important foundational scientific understanding.

Here are some additional resources to support K-5 science education:

- Why do we need to teach science in elementary school?
- How can arguing from evidence support sensemaking in elementary science?
- What does subject matter integration look like in elementary instruction?

A6: Is there research on successful high school course sequencing?

Yes, just not definitive research. However, there is research on the kinds of coursework that predicts later college success. There are many advocates for the physics first approach – and students are more likely to take physics in high school and have success if it is the first science course in a coherent high school course sequence.

For now, given the current research, the best practice for high school science course sequencing is to follow a sequence that is best supported by resources, instructional materials, and professional learning that are high quality and that elevate the instructional shifts called from in A K-12 Framework for Science Education.

Here are a few examples of possible high school science model course sequences:

- Model Course Mapping in Middle and High School for the Next Generation Science Standards
- OpenSciEd High School Course Sequence
- Patterns High School Science Sequence

A7: Are there specific high school graduation requirements for science education?

Yes. To earn an Oregon Diploma, three credits of high school science are required. These credits must include scientific inquiry and lab experiences. However, the Oregon Department of Education does not require a specific number of laboratory experiences for high school science courses. This determination would occur at the local level. High school science courses need to meet the Oregon State Board of Education adopted standards in order to count towards high school credit.

> ***What are "inquiry-based" courses?*** Science courses that are "inquiry-based" provide students the opportunity to apply scientific reasoning and critical thinking to support conclusions or explanations with evidence from their investigations.
>
> ***What is meant by "laboratory experiences"?*** Laboratory experiences provide opportunities for students to interact directly with the material world (or with data drawn from the material world), using the tools, data collection techniques, models, and theories of science. Laboratory experiences may be field-based experiences rather than traditional laboratory settings.

A8: Are there requirements for science local performance assessments?

Yes. In Oregon, the Local Performance Assessment Requirement (LPA) set out in OAR 581-022-2115(2) and Division 22 Standards states that school districts shall administer one or more performance assessments each year to all students in grades 3 through 8 and at least once in high school in: mathematics, scientific inquiry, speaking, and writing.

Local Performance Assessment development should emphasize building activities, exercises, or problems that get at higher depth of knowledge and cognitive complexity, as the tasks must evaluate the student's ability to apply their knowledge, rather than just recall or demonstrate.

Performance assessments must be a standardized measure (e.g. an activity, exercise, problem, or work sample scored by a common scoring instrument, such as the official state scoring guides or another scoring guide adopted by the district) that is embedded in the school curriculum and evaluates the application of students' knowledge and skills. Work Samples, scored using the official state scoring guide, are just one example of acceptable performance assessments. Districts have substantial flexibility when it comes to planning the performance assessments that will be used to fulfill this requirement.

It is allowable to utilize the science interim assessments to fulfill the local performance requirement. Please note that only the science interim assessment **cluster tasks** that align to the grade level content are allowable for the LPA requirement (refer to the Science Interim Assessment Overview document). Each Science Interim has a standardized scoring rubric specific to the task. Therefore, all students are being assessed to the same success criteria, and results are comparable across the classroom.

The science interim assessment should be selected so that it aligns to current instruction occurring in the classroom. It should not be a break in the instruction cycle and should be an embedded process of students applying their knowledge based on new or strengthened learning.

A9: Is the large-scale summative assessment required in science?

Yes. Large scale summative assessments are federally and state mandated in Science for grade 5, 8 and 11. Please refer to the Testing Administration Manual for more information.

A10: Can a student be excused from the science summative assessment?

Yes. Parents may request that their student be exempt from state testing based on either **disability** or **religion**. OAR 581-021-0009: Exemptions outline exemptions, allowing school districts to excuse students to accommodate student's disabilities or religious beliefs. To excuse a student from testing under this rule, the student's parent must submit a written request to the school district, listing the reasons for the request and proposing an alternative individualized learning activity for the student that meets the same goals as participation in state testing. Appropriate school personnel must evaluate and approve the parent's request. When reviewing a parent's request for exemption, school district personnel should first discuss the use of accommodations with the parent to determine whether the chosen accommodations during testing are most appropriate and might address the parent's concerns, allowing the student to participate in testing. Please refer to the Testing Administration Manual Section 5.3 for more information.

A11: Are there climate change standards?

Yes. The Oregon Science Standards specifically introduces global climate change and human impact on earth's system as a core idea in middle school and high school to learn of the factors that have caused the rise in global temperatures over the past century, and current relationships among Earth systems and the effects of human activity on the climate. In K-5, the focus is on the fundamental understanding of weather, climate, and human impacts on natural resources. In addition, the state board of education adopted 2022 K-12 Oregon Science Education Standards include elevated opportunities for **climate change education** across the K-12 standards. A caret, or up arrow (**^**), was added to those standards that have proximal connections to climate change and the both disciplinary core ideas: Earth's Systems and Earth and Human Activity. These proximal standards were identified by utilizing the research analysis conducted by MADE CLEAR through a National Science Foundation Grant that could further support climate change education.

For additional resources to continue to explore teaching about climate change and climate justice, please review the following list:

- Talk Climate provides educators support for having productive and empowering conversations about climate change in the PK-12 education system.
- The Hechinger Report explores climate change and approaches to engage young learners

without sparking fear.

- PK-12 lessons and units shared from the Washington State science and climate science learning effort that has produced OER resources and portraits of project work.
- ClimateGeneration has communication toolkits that can help organize and engage community events.
- STEM Teaching Tools has a curated collection of resources relating to the teaching of climate change in school and community settings.

A12: Do the Tribal History-Shared History science lessons support the science standards?

Yes. The purpose of Tribal History, Shared History is to elevate tribal nations' histories and contemporary knowledge and perspectives throughout K-12 academic content areas. These histories and perspectives have not always been honored or respected within our current educational system. The Essential Understandings of Native Americans in Oregon (EUs) document provides grounding information to elevate the culture and contributions of Native people and ways of being that may not be the lived experience for some educators. The specific lessons, currently in 4, 5, 8, and 10th grades, center the EUs and are designed to leverage the strengths, assets, culture, and perspectives of our Native students and their communities.

Here are some additional resources to continue to explore multiple ways of knowing:

- Critical Orientations: Indigenous Studies and Outdoor Education
- Implementing Meaningful STEM Education with Indigenous Students and Families
- Knowing Home: Braiding Indigenous Science with Western Science (Book 1)
- Knowing Home: Braiding Indigenous Science with Western Science (Book 2)
- Teaching STEM In Ways that Respect and Build Upon Indigenous Peoples' Rights
- Weaving Indigenous science, protocols and sustainability science

A13: Are there resources on how to elevate equity and social justice within science education?

Yes. STEM Teaching Tools is one site with resources dedicated to elevate equity and social justice within K-12 science education. These co-designed resources are focused on supporting the teaching of the Next Generation Science Standards (NGSS). Each tool is focused on a specific issue and leverages the best knowledge from research and practice.

Here are some additional resources to address equity and social justice:

- Building an Anti-racist Science Classroom
- Designing for Social Justice in Science Teaching and Learning: Working Toward Rightful Presence
- Gender Inclusive Biology
- Helping Students Make Sense of the World -Toward More Equitable Learning in Science
- Learning in Places: Power and Historicity Framework
- NSTA: Social Justice – Centered Science Teaching and Learning
- Why it is crucial to make cultural diversity visible in STEM education

A14: Are there STEM content standards?

No. While the State Board of Education has adopted academic content standards for science with

embedded engineering design processes and mathematics education, there are no specific STEM academic standards. Science, Technology, Engineering, and Mathematics (STEM) are represented by separate content areas that make up the acronym but encompass a greater emphasis focused on the pedagogical approach to STEM teaching and learning.

A15: Are there STEM instructional practices?

Yes. When best instructional practices are used, STEM education focuses on applied learning, interdisciplinary instruction, and skills like critical thinking and complex problem solving. Additional learning opportunities include creativity, artistic expression, collaboration, communication, and computational and design thinking. These are the skills useful in future careers and applicable to learning within any content area.

“We live in a time of exponential change – where we are flooded by information, where new technologies alter nearly every facet of our lives, and where the pace of global developments have an increasing impact on our communities and our planet. In this shifting context Oregon must prepare its learners for a future that we can’t even imagine today, to solve problems that we are header, 2021) The Oregon STEM Education Plan provides the goals and aspirations of STEM Education in Oregon. For additional information, please visit the ODE STEM Education website.

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