OpenSciEd Massachusetts Standards Guidance
8th Grade: Weather, Climate, & Water Cycling

This document is to provide guidance to Massachusetts 8th grade teachers who are implementing OpenSciEd. This guidance assumes the OpenSciEd curriculum is being implemented across grades 6-8, following the MA coherent sequence by grade level *(download)*. The following guidance identifies the MA standards addressed in the *Weather, Climate, & Water Cycling* unit, and the most effective use of the OpenSciEd materials for 8th grade teachers.

Scope and Sequence Recommendation

Implement the *Weather, Climate, & Water Cycling* unit in 8th grade as the last unit of the year, after the *Natural Selection & Ancestry* unit. *Weather, Climate, & Water Cycling* builds on the particulate model of matter established in the *Thermal Energy* unit in 7th grade; students need a foundational understanding of the particulate model of matter from the *Thermal* Energy unit in order to explain the movement of air masses in *Weather, Climate, & Water Cycling.* Refer to the MA coherent sequence by grade level *(download)* for the complete scope and sequence recommendation.

8th Grade Standards in *Weather, Climate, & Water Cycling*

Standards in unit	Lessons building towards standards
8.MS-ESS2-5. Interpret basic weather data to identify patterns in air mass interactions and the relationship of those patterns to local weather.	Lessons 1-22
8.MS-ESS2-6. Describe how interactions involving the ocean affect weather and climate on a regional scale, including the influence of the ocean temperature as mediated by energy input from the Sun and energy loss due to evaporation or redistribution via ocean currents.	Lessons 1-22
8.MS-PS1-4. **[Partial]** Develop a model that describes and predicts changes in particle motion, relative spatial arrangement, temperature, and state of a pure substance when thermal energy is added or removed. • **Why partial?** *Weather, Climate, & Water Cycling* applies an understanding of this standard to a new context (e.g., particle movement in air masses). • *Thermal Energy* (7th grade in MA) foundationally addresses this standard	Lessons 3-11, 13-14, and 17-18
8.MS-PS2-2. **[Partial]** Provide evidence that the change in an object's speed depends on the sum of the forces on the object (the net force) and the mass of the object. • **Why partial?** *Weather, Climate, & Water Cycling* applies an understanding of this standard to the movement of particles in a cloud. • Forces are foundationally addressed in *Contact Forces* (7th grade in MA).	Lessons 11-12

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Additional Standards in *Weather, Climate, & Water Cycling*

Standards in unit	Lessons building towards standards
6.MS-PS1-7(MA). Use a particulate model of matter to explain that density is the amount of matter (mass) in a given volume. Apply proportional reasoning to describe, calculate, and compare relative densities of different materials.	Lessons 5, 6, 7, 8, 16
6.MS-PS4-2. **[Partial]** Use diagrams and other models to show that both light rays and mechanical waves are reflected, absorbed, or transmitted through various materials. • **Why partial?** *Weather, Climate, & Water Cycling* addresses that light rays are reflected or absorbed by the ground; light rays that are absorbed are converted to thermal energy. • Light rays are foundationally addressed in *Light & Matter* (6th grade in MA) and further applied in *Thermal Energy* (7th grade in MA) and *Earth in Space* (6th grade in MA). Mechanical waves are addressed in *Sound Waves* (6th grade in MA).	Light rays: Lessons 3, 6-8, 10, 14, 17, 18, 20, 22; addressed foundationally in *Light & Matter* (6th grade in MA) Mechanical waves: Addressed in *Sound Waves* (6th grade in MA)
7.MS-PS3-4. **[Partial]** Develop a model that describes and predicts changes in particle motion, relative spatial arrangement, temperature, and state of a pure substance when thermal energy is added or removed. • **Why partial?** *Weather, Climate, & Water Cycling* applies an understanding of temperature and particle motion to weather phenomena. • This standard is foundationally addressed in *Thermal Energy* (7th grade in MA).	Lessons 5-8, 10, 12, 13, 14, 17, 18, 20, and 22
7.MS-PS3-6(MA). **[Partial]** Use a model to explain how thermal energy is transferred out of hotter regions or objects and into colder ones by convection, conduction, and radiation. • **Why partial?** Radiation and convection are emphasized throughout the sensemaking process. • *Thermal Energy* addresses conduction (7th grade in MA)	Convection: Lessons 12-13 Conduction: Addressed in *Thermal Energy* (7th grade in MA) Radiation: Lessons 1-7, 10
7.MS-ESS2-4. Develop a model to explain how the energy of the Sun and Earth's gravity drive the cycling of water, including changes of state, as it moves through multiple pathways in Earth's hydrosphere.	Lessons 1-22

See recommendations below for addressing these 6th and 7th grade standards.

Recommendations for Addressing Standards in *Weather, Climate, & Water Cycling*

Include, and teach the partial address of 6.MS-PS4-2 and 7.MS-PS3-4 with *Weather, Climate, & Water Cycling* as planned in the unit. The partial address of these standards builds coherence with earlier units in the OpenSciEd program by revisiting concepts applied to different phenomena. Although these standards are foundationally addressed in other units, **excluding these standards would decrease the depth of learning in the unit and the coherence of the curriculum, which is not recommended.**

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Include, and teach 6.MS-PS1-7(MA) and 7.MS-PS3-6(MA) with *Weather, Climate, & Water Cycling* as planned in the unit. The address of these standards is linked to explaining the hailstorm phenomena and will strengthen student explanations using the particulate model of matter. **The use of these standards in *Weather, Climate, & Water Cycling* in 8th grade should build on students' understanding of these standards from 6th and 7th grade.**

Include, and teach 7.MS-ESS2-4 with *Weather, Climate, & Water Cycling* as planned in the unit. This standard is bundled with the 8th grade Earth and Space Science standards and is necessary for explaining the phenomena in the unit. **Excluding this standard would require substantial redesign of the unit, which is not recommended.**

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