OpenSciEd Massachusetts Standards Guidance
8th Grade: Genetics

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 *Genetics* unit, and the most effective use of the OpenSciEd materials for 8th grade teachers.

Scope and Sequence Recommendation

Implement the *Genetics* unit in 8th grade after the *Metabolic Reactions*, and before the *Natural Selection & Ancestry* unit. *Genetics* has significant coherence when building on ideas about how the body uses food molecules from the *Metabolic Reactions* unit and leading into learning about traits inherited over long periods of time in the *Natural Selection & Ancestry unit*. *Genetics* addresses four 8th grade life and physical science standards, and one 6th grade life science standard. Refer to the MA coherent sequence by grade level *(download)* for the complete scope and sequence recommendation.

8th Grade Standards in *Genetics*

Standards in unit	Lessons building towards standards
8.MS-LS1-5. Construct an argument based on evidence for how environmental and genetic factors influence the growth of organisms.	Genetic: Lessons 4-8, 16 Environmental: Lesson 3, 4 16 Both: Lesson 17 assessment
8.MS-LS3-1. Develop and use a model to describe that structural changes to genes (mutations) may or may not result in changes to proteins, and if there are changes to proteins there may be harmful, beneficial, or neutral changes to traits.	Lessons 8-10
8.MS-LS3-2. Construct an argument based on evidence for how asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. Compare and contrast advantages and disadvantages of asexual and sexual reproduction.	Lesson 7-10, 13-17
8.MS-LS3-3 (MA). Communicate through writing and in diagrams that chromosomes contain many distinct genes and that each gene holds the instructions for the production of specific proteins, which in turn affects the traits of an individual.	Lessons 5-8
8.MS-LS3-4 (MA). Develop and use a model to show that sexually reproducing organisms have two of each chromosome in their cell nuclei, and hence two variants (alleles) of each gene that can be the same or different from each other, with one random assortment of each chromosome passed down to offspring from both parents.	Lessons 5-10
8.MS-LS4-5. Synthesize and communicate information about artificial selection, or the ways in which humans have changed the inheritance of desired traits in organisms.	Lesson 9

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Additional Standards in *Genetics*

Standards in unit	Lessons building towards standards
6.MS-LS1-2. **[Partial]** Develop and use a model to describe how parts of cells contribute to the cellular functions of obtaining food, water, and other nutrients from its environment, disposing of wastes, and providing energy for cellular processes. • **Why partial?** This unit primarily focuses on the proteins that make up the cell and the nucleus which contains genetic information, and does not thoroughly address other parts of the cell. Students do not develop a comprehensive model detailing multiple structures, functions, or interactions between cell parts. • 6.MS-LS1-2 is fully addressed in the *Cells and Systems* unit (Grade 6 in Massachusetts). Ideas are reinforced in this unit. No changes or extensions are recommended for this unit to address this standard.	Lessons 2, 5-7, 12
7.MS-LS1-4. **[Partial]** Construct an explanation based on evidence for how characteristic animal behaviors and specialized plant structures increase the probability of successful reproduction of animals and plants. • **Why partial?** This unit only addresses plant structures in detail. • 7.MS-LS1-4 is fully addressed in the *Natural Selection & Ancestry* unit (Grade 8 in Massachusetts). Ideas are introduced in this unit. No changes or extensions are recommended for this unit to address this standard.	Lessons 13, 17

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

Recommendations for Addressing Standards in *Genetics*

Include, and teach 6.MS-LS1-2 and 7.MS-LS1-4 with *Genetics* as planned in the unit. These standards are integral to the understanding of other standards in the unit and is used as an opportunity for application in most lessons. Depending on your students' prior knowledge of this standard, support for students should be adjusted to increase the rigor of explanations or modeling. **Excluding these standards would require substantial redesign of the unit, which is not recommended.**