MS. Growth, Development, and Reproduction of Organisms

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A Performance Expectations MS.LS1.GDR

1. Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively. MS-LS1-4
2. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. MS-LS1-5
3. Develop and use a model to explain why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. MS-LS3-1
4. Develop and use a model to describe how asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. MS-LS3-2
5. Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. MS-LS3-5

B Science and Engineering Practices MS.GDR.SEP

1. Developing and Using Models MS.GDR.SEP.1
   a. Develop and use a model to describe phenomena. (MS- LS3-1),(MS-LS3-2) MS.GDR.SEP.1A
2. Constructing Explanations and Designing Solutions MS.GDR.SEP.2
   a. Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MS-LS1-5 MS.GDR.SEP.2A
3. Engaging in Argument from Evidence MS.GDR.SEP.3
   a. Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-LS1- 4) MS.GDR.SEP.3A

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4 Obtaining, Evaluating, and Communicating Information MS.GDR.SEP.4

a Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-LS4-5) MS.GDR.SEP.4A

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C Disciplinary Core Ideas MS.GDR.DCI

1. LS1.B: Growth and Development of Organisms MS.GDR.DCI.LS1.B
   a. Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary to MS-LS3-2) MS.GDR.DCI.LS1.B.1
   b. Animals engage in characteristic behaviors that increase the odds of reproduction. (MS-LS1-4) MS.GDR.DCI.LS1.B.2
   c. Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. (MS-LS1-4) MS.GDR.DCI.LS1.B.3
   d. Genetic factors as well as local conditions affect the growth of the adult plant. (MS-LS1-5) MS.GDR.DCI.LS1.B.4
2. LS3.A: Inheritance of Traits MS.GDR.DCI.LS3.A
   a. Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. (MS-LS3-1) MS.GDR.DCI.LS3.A.1
   b. Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS3-2) MS.GDR.DCI.LS3.A.2
3. LS3.B: Variation of Traits MS.GDR.DCI.LS3.B
   a. In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. (MS-LS3-2) MS.GDR.DCI.LS3.B.1
   b. In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Some changes are beneficial, others harmful, and some neutral to the organism. (MS-LS3-1) MS.GDR.DCI.LS3.B.2
   c. (NYSED) Mutations may result in changes to the structure and function of proteins. (MS-LS3-1) MS.GDR.DCI.LS3.B.3
4. LS4.B: Natural Selection MS.GDR.DCI.LS4.B
   a. In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. (MS-LS4-5) MS.GDR.DCI.LS4.B.1

D Crosscutting Concepts MS.GDR.CC

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1 Cause and Effect MS.GDR.CC.1

a Cause and effect relationships may be used t predict phenomena in natural systems. (MSLS3-2) MS.GDR.CC.1A

b Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS1-4), (MS-LS1-5),(MS-LS4- - 5) MS.GDR.CC.1B

2 Structure and Function MS.GDR.CC.2

a Complex and microscopic structures and systems can be visualized, modeled, and use to describe how their function depends on th shapes, composition, and relationships amon its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS3-1) MS.GDR.CC.2A

3 Interdependence of Science, Engineering, and Technology MS.GDR.CC.3

a Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-LS4-5) MS.GDR.CC.3A

4 Science Addresses Questions About the Natural and Material World MS.GDR.CC.4

a Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-LS4-5) MS.GDR.CC.4A