7th Grade Unit 3 - Reproduction of Organisms

Content Area: **Science**
Course(s): **Science Grade 7**
Time Period: **MP3**
Length: **45 days**
Status: **Published**

NJSLS - Science

MS-LS1-4	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-LS1-5	Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
MS-LS1-8	Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
MS-LS3-2	Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-4	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Science and Engineering Practices

Constructing Explanations and Designing Solutions

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)

Engaging in Argument from Evidence

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)

Obtaining, Evaluating, and Communicating Information

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-LS1-8)

Developing and Using Models

Develop and use a model to describe phenomena. (MS-LS3-2)

Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs. (MS-ETS1-4)

Asking Questions and Defining Problems

Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. (MS-ETS1-1)

Disciplinary Core Ideas

LS1.B: Growth and Development of Organisms

Animals engage in characteristic behaviors that increase the odds of reproduction. (MS-LS1-4)

Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. (MS-LS1-4)

Genetic factors as well as local conditions affect the growth of the adult plant. (MS-LS1-5)

LS1.D: Information Processing

Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories. (MS-LS1-8)

LS3.A: Inheritance of Traits

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)

LS3.B: Variation of Traits

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)

ETS1.A: Defining and Delimiting Engineering Problems

The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1)

ETS1.B: Developing Possible Solutions

A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4)

Models of all kinds are important for testing solutions. (MS-ETS1-4)

ETS1.C: Optimizing the Design Solution

The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MS-ETS1-4)

Crosscutting Concepts

Cause and Effect

Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS1-8, MS-LS3-2)

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)

Structure and Function

Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS3-1)

Influence of Science, Engineering, and Technology on Society and the Natural World

All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ETS1-1)

The uses of technologies and limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-ETS1-1)

Rationale and Transfer Goals

Students use data and conceptual models to understand how the environment and genetic factors determine the growth of an individual organism. They connect this idea to the role of animal behaviors in animal reproduction and to the dependence of some plants on animal behaviors for their reproduction. Students provide evidence to support their understanding of the structures and behaviors that increase the likelihood of successful reproduction by organisms. They also demonstrate understanding of the genetic implications of sexual and asexual reproduction. The crosscutting concepts of cause and effect and structure and function provide a framework for understanding the disciplinary core ideas. Students demonstrate grade-appropriate proficiency in analyzing and interpreting data, using models, conducting investigations, and communicating information. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Enduring Understandings

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 affect the traits of the individual.

In addition to variations that arise from sexual reproduction, genetic information can be altered due to mutations.

Organisms reproduce either sexually or asexually and transfer their genetic information to their offspring.

Essential Questions

How do characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively?

How do environmental and genetic factors influence the growth of organisms?

How do organisms receive and respond to information from their environment?

How do asexual reproduction and sexual reproduction affect the genetic variation of offspring?

Content - What will students know?

- Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. There are a variety of ways that plants reproduce.
- Specialized structures for plants affect their probability of successful reproduction.
- Some characteristic animal behaviors affect the probability of successful reproduction in plants.
- Animals engage in characteristic behaviors that affect the probability of successful reproduction.
- There are a variety of characteristic animal behaviors that affect their probability of successful reproduction.
- There are a variety of animal behaviors that attract a mate.
- Successful reproduction of animals and plants may have more than one cause, and some cause-and-effect relationships in systems can only be described using probability.
- Genetic factors as well as local conditions affect the growth of organisms. A variety of local environmental conditions affect the growth of organisms.
- Genetic factors affect the growth of organisms (plant and animal).
- The factors that influence the growth of organisms may have more than one cause.

- Some cause-and-effect relationships in plant and animal systems can only be described using probability.
- Sense receptors respond to different inputs (electromagnetic, mechanical, chemical).
- Sense receptors transmit responses as signals that travel along nerve cells to the brain.
- Signals are then processed in the brain.
- Brain processing results in immediate behaviors or memories.
- Cause-and-effect relationships may be used to predict response to stimuli in natural systems.
- Organisms reproduce either sexually or asexually and transfer their genetic information to their offspring.
- Asexual reproduction results in offspring with identical genetic information.
- Sexual reproduction results in offspring with genetic variation.
- Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited.
- 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.
- Punnett squares, diagrams, and simulations can be used to describe the cause-and-effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.

Skills - What will students be able to do?

- Collect empirical evidence about animal behaviors that affect the animals' probability of successful reproduction and also affect the probability of plant reproduction.
- Collect empirical evidence about plant structures that are specialized for reproductive success.
- Use empirical evidence from experiments and other scientific reasoning to support oral and written arguments that explain the relationship among plant structure, animal behavior, and the reproductive success of plants.
- Identify and describe possible cause-and effect relationships affecting the reproductive success of plants and animals using probability.
- Support or refute an explanation of how characteristic animal behaviors and specialized plant structures affect the probability of successful plant reproduction using oral and written arguments.

- Conduct experiments, collect evidence, and analyze empirical data.
- Use evidence from experiments and other scientific reasoning to support oral and written explanations of how environmental and genetic factors influence the growth of organisms.
- Identify and describe possible causes and effects of local environmental conditions on the growth of organisms.
- Identify and describe possible causes and effects of genetic conditions on the growth of organisms.
- Gather, read, and synthesize information from multiple appropriate sources about sensory receptors' response to stimuli.
- Assess the credibility, accuracy, and possible bias of each publication and methods used.
- Describe how publications and methods used are supported or not supported by evidence.
- Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information.
- Develop and use a model to describe why sexual reproduction results in offspring with genetic variation.
- Use models such as Punnett squares, diagrams, and simulations to describe the cause-and effect-relationship of gene transmission from parent(s) to offspring and resulting genetic variation.

Activities - How will we teach the content and skills?

- Inspire Science Life Science Unit 3 Module 1: Lesson 1 Inheritance
- Inspire Science Life Science Unit 3 Module 1: Lesson 2 Types of Reproduction
- Inspire Science Life Science Unit 3 Module 1: Reproduction and Growth of Animals
- Inspire Science Life Science Unit 3 Module 1: Lesson 4 Reproduction and Growth of Plants
- MS-LS1-4 Lesson Examples
- MS-LS1-5 Lesson Examples
- MS-LS1-8 Lesson Examples
- MS-LS3-2 Lesson Examples

Evidence/Assessments - How will we know what students have learned?

- Inspire Science Labs
- Inspire Science STEM Module Projects
- Inspire Science Life Science Unit 3 Module 1 Assessment
- Inspire Science Life Science Unit 3 Module 2 Assessment
- Daily Warm Ups
- Daily Exit Tickets
- Grade 7 Unit 3 Benchmark Assessment

Spiraling for Mastery

Content or Skill for this Unit	Spiral Focus from Previous Unit	Instructional Activity
• Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. There are a variety of ways that plants reproduce. • Animals engage in characteristic behaviors that affect the probability of successful reproduction. • There are a variety of characteristic animal behaviors that affect their probability of successful reproduction.	By the end of Grade 5, students understand that: Reproduction is essential to every kind of organism. Organisms have unique and diverse life cycles. Organisms have both internal and macroscopic structures that allow for growth, survival, behavior, and reproduction. Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.	4-LS1-1 Activities

Key Resources

Inspire Science

Phet: Interactive Simulations https://phet.colorado.edu/

National Science Teachers Association: http://ngss.nsta.org/Classroom-Resources.aspx

21st Century Life and Careers

9.2.8.CAP.8	Compare education and training requirements, income potential, and primary duties of at least two jobs of interest.

Career Readiness, Life Literacies, & Key Skills

9.4.8.CI.1	Assess data gathered on varying perspectives on causes of climate change (e.g., cross-cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).
9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
9.4.8.CT.2	Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1).
9.4.8.CT.3	Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.
9.4.8.IML.3	Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping (e.g., 6.SP.B.4, 7.SP.B.8b).
9.4.8.IML.4	Ask insightful questions to organize different types of data and create meaningful visualizations.
9.4.8.IML.5	Analyze and interpret local or public data sets to summarize and effectively communicate the data.
9.4.8.TL.1	Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making.
9.4.8.TL.2	Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).

Interdisciplinary Connections/Companion Standards

NJSLS ELA

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS1-4, MS-LS1-5, MS-ETS1-1)

RST.6-8.2 Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. (MS-LS1-5)

RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics. (MS-LS3-2)

RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS3-2)

RI.6.8 Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. (MS-LS1-4)

WHST.6-8.1 Write arguments focused on discipline content. (MS-LS1-4)

WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS1-5)

WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-LS1-8, MS-ETS1-1)

WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS1-5)

SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS3-2, MS-ETS1-4)

NJSLS Mathematics

MP.2 Reason abstractly and quantitatively. (MS-ETS1-1, MS-ETS1-4)

MP.4 Model with mathematics. (MS-LS3-2)

6.SP.A.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. (MS-LS1-4, MS-LS1-5)

6.SP.B.4 Summarize numerical data sets in relation to their context. (MS-LS1-4, MS-LS1-5)

6.SP.B.5 Summarize numerical data sets in relation to their context. (MS-LS3-2)

7.EE.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. (MS-ETS1-1, MS-ETS1-3)

7.SP Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. (MS-ETS1-4)