

## Unit 5: Genetics

### Biology

11 Class Meetings

Rev. June 2019

#### Essential Questions

- How is genetic information carried from one organism to its offspring?

#### Enduring Understandings with Unit Goals

**EU 1:** The formation of gametes during meiosis allows for sexual reproduction.

- Compare and contrast a cell before, during, and after meiosis.
- Explore how alleles are inherited from parent cells.

**EU 2:** Genetics is the study of variation among offspring as a result of sexual reproduction. Changes in normal inheritance can result in genetic disorders.

- Complete and analyze a variety of Punnett Squares which look at the statistics of inheritable traits.
- Evaluate inheritance patterns for dominance, blending inheritance, codominance and other forms of inheritance.

#### Standards

##### Next Generation Science Standards:

- **HS-LS3-1.** Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
- **HS-LS3-2.** Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
- **HS-LS3-3.** Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

##### Common Core State Standards:

- **CCSS.ELA-Literacy.RST.9-10.1** Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- **CCSS.ELA-Literacy.RST.9-10.4** 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 9-10 texts and topics*.

## Unit 5: Genetics

### Biology

11 Class Meetings

- **CCSS.ELA-Literacy.RST.9-10.7** Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- **CCSS.ELA-Literacy.RST.9-10.9** Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
- **CCSS.Math.Content.HSN.Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- **CCSS.Math.Content.HSN.Q.A.2** Define appropriate quantities for the purpose of descriptive modeling.
- **CCSS.Math.Content.HSN.Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- **CCSS.Math.Content.HSS.IC.B.6** Evaluate reports based on data.

### MSMHS Academic, Civic and Social Competencies

**Competency 1.** Read and write effectively for a variety of purposes

**Competency 2.** Speak effectively with a variety of audiences in an accountable manner

**Competency 3.** Make decisions and solve problems independently and collaboratively

**Competency 4.** Apply scientific knowledge and concepts to a variety of investigative tasks

**Competency 5.** Contribute to a positive learning environment with respect and responsibility

### Unit Content Overview

- Sexual vs. Asexual Reproduction
- Fertilization
- Meiosis – gametes, non-disjunction, haploid, diploid
- Chromosomal Mutations- Duplication, Substitution, Inversion
- Alleles and genes: homozygous, heterozygous: dominant and recessive
- Mendelian genetics
- Inheritance types: simple, incomplete dominance, codominance, sex linked
- Blood Typing
- Probability in offspring using Punnett squares demonstrating types of inheritance
- Karyotype
- Pedigree
- Genetic disorders

**Unit 5: Genetics**  
**Biology**  
11 Class Meetings

**Interdisciplinary Connections**

- Algebra I- Probability

**Daily Learning Objectives with TWPS Activities**

**The student will be able to...**

- Compare and contrast asexual and sexual reproduction.
  - *A small piece of a cactus breaks off the plant, falls to the ground, and begins to grow. Explain and describe whether the cactus undergoes asexual or sexual reproduction.*
- Identify and describe the phases of meiosis.
  - *If a cell started with 24 chromosomes at the beginning of meiosis. Explain how the amount of chromosomes changes throughout the process of meiosis.*
- Explain the major processes that occur in meiosis to increase variation: crossing over, independent assortment, mutations & random fertilization.
  - *Explain how crossing over will increase genetic variability.*
  - *When there is an issue with a chromosome during meiosis, how can this impact the individual?*
- Characterize the effects of errors in DNA replication.
  - *If there was an error DNA replication, explain how this will impact the gametes.*
- Distinguish between genotypes and phenotypes.
  - *If purple flowers are dominant over white flowers. Explain what the different phenotypes would be for those genotypes.*
- Explain dominance in relation to genotype and phenotype expression.
  - *A TT (tall) plant is crossed with a tt (short plant). Explain why all the offspring will only be tall and not short.*
- Predict the probability of offspring with particular traits using various types of Punnett Squares.
  - *Everyone in Squidward's family has light blue skin, which is the dominant trait for body color in his hometown of Squid Valley. His family brags that they are a "purebred" line. He recently married a nice girl who has light green skin, which is a recessive trait. What are the probabilities their offspring will have the different genotypes and phenotypes?*
- Research and investigate the causes, symptoms, and probability of inheritance for various genetic disorders.
  - *Analyze the family's pedigree. If you were a geneticist what would you tell the family?*
- Create a pedigree to show how a specific trait is passed through generations of a family.
  - *Create a pedigree using the provided information. Provide an explanation about which people are impacted.*

## Unit 5: Genetics

### Biology

11 Class Meetings

#### Instructional Strategies/Differentiated Instruction

- **HLP:** Academically Productive Talk
- **HLP:** Writing to Learn (TWPS)
- **HLP:** Effective Feedback
- Lecture with notes
- Close reading with annotations
- Graphic organizers
- Self-assessments
- Student reflection
- Whiteboards
- Exit slips
- Laboratory exercises using microscopes
- Guided notes
- Providing students with completed notes and outlines
- Rephrasing information for students
- Card Sorts
- Student choice
- Strategic grouping
- Flash cards for vocabulary
- Shortened/modified reading assignments

#### Assessments

##### **FORMATIVE ASSESSMENTS:**

- Thacker Family Pedigree
  - MSMHS Rubric 3: Problem Solving
- Written Homework assignments
- Entrance and exit slips
- Oral Questioning
- Accountable Talk Discussions
- Daily Think-Write-Pair-Share (TWPS)
- Warm Up Activities

##### **SUMMATIVE ASSESSMENTS:**

- Quiz on EU 1
- Thacker Family Pedigree
- Unit Test

## Unit 5: Genetics

### Biology

11 Class Meetings

#### Unit Task

**Unit Task Name:** Thacker Family Pedigree

**Description:** Students will create a pedigree for a family that has the polydactyl trait. They will use information learned about the chances of mutation (EU 1) and probability of inheritance of various genotypes (EU 2) to synthesize information. Students have to differentiate if the disorder is genetically inherited (i.e. dominant, recessive and/or sex-linked).

**Evaluation:** MSMHS Rubric 3: Problem Solving

#### Unit Resources

- Clownfish in Aquaculture lab
- Microscopes
- Amoeba Sisters/Crash Course videos on YouTube
- POGIL: Meiosis
- MSMHS School Wide Rubrics
- Internet databases
- Laptops