Marietta City Schools

District Unit Planner

Everything on the unit planner must be included on the unit curriculum approval statement.

Science Grade 7 Advanced Studies

Unit title	*Genetics*	**MYP year**	*2*	**Unit duration (hrs)**	*35 Hours*

Mastering Content and Skills through INQUIRY (Establishing the purpose of the Unit): ***What will students learn?***

GSE Standards

Standards

S7L3. Obtain, evaluate, and communicate information to explain how organisms reproduce either sexually or asexually and transfer genetic information to determine the traits of their offspring.

a. Construct an explanation supported with scientific evidence of the role of genes and chromosomes in the process of inheriting a specific trait.

b. Develop and use a model to describe how asexual reproduction can result in offspring with identical genetic information while sexual reproduction results in genetic variation. (Clarification statement: Models could include, but are not limited to, the use of monohybrid Punnett squares to demonstrate the heritability of genes and the resulting genetic variation, identification of heterozygous and homozygous, and comparison of genotype and phenotype.)

c. Ask questions to gather and synthesize information about the ways humans influence the inheritance of desired traits in organisms through selective breeding. (Clarification statement: The element specifically addresses artificial selection and the ways in which it is fundamentally different from natural selection.

Gifted Standards

S2B. Develop and apply the cognitive components of creative thinking: *risk-taking, curiosity, complexity, and imagination.*

S3B. Develop critical thinking, inductive and deductive reasoning to analyze and evaluate logical reasoning within a variety of problems and dilemmas.

S4D. Respectfully collaborate and effectively communicate exchanges of constructive/critical feedback.

S5A. Explore personal beliefs, feelings, and understanding of self, regarding one's own unique giftedness.

Prior Student Knowledge: (REFLECTION – PRIOR TO TEACHING THE UNIT)

In 5th grade, students are expected to:

S5L2. Obtain, evaluate, and communicate information showing that some characteristics of organisms are inherited and other characteristics are acquired.

a. Ask questions to compare and contrast instincts and learned behaviors.
b. Ask questions to compare and contrast inherited and acquired physical traits (*Classification statement:* Punnett Squares and genetics are taught in future grades.

Concepts/Skills to be Mastered by Students

- Genes and Chromosomes
- Sexual and Asexual Reproduction
- Inheritance of Traits & Variation of Traits
- Selective breeding (artificial selection)

Key Vocabulary: (KNOWLEDGE & SKILLS)
Heredity, DNA, chromosomes, genes, alleles, traits, genotype, phenotype, dominant, recessive, homozygous dominant, heterozygous, homozygous recessive, sexual reproduction, meiosis, asexual reproduction, binary fission, budding, clone, offspring, artificial selection, selective breeding, reproduce, reproduction, transfer, genetics, genetic information, genetic variation, Punnett square, heritability, inheritance

Year-Long Anchoring Phenomena: (LEARNING PROCESS)
Humans have the ability to positively and/or negatively impact biological and ecological systems.

Unit Phenomena (LEARNING PROCESS)
How is my phenotype influenced by my parents' genotypes?

Possible Preconceptions/Misconceptions: (REFLECTION – PRIOR TO TEACHING THE UNIT)
- Students often confuse the relationship between DNA, chromosomes, genes, and alleles.
- Students often confuse genotype with phenotype.
- Students may have a misconception that a dominant trait equates to being more common in the population.
- Students may interpret a heterozygous genotype as having characteristics of both alleles (incomplete dominance). This is not discussed until high school biology.
- Students may need additional support in terms of calculating ratios and percentages in Punnett Square analysis.

Key concept	Related concept(s)	Global context
Relationships Relationships are the connections and associations between properties, objects, people and ideas— including the human community's connections with the world in which we live. Any change in relationship brings consequences—some of which may occur on a small scale, while others may be far-reaching, affecting large networks and systems such as human societies and the planetary ecosystem.	Patterns (MYP/CCC) Transformation (MYP)	**Identities and relationships** Who we are: an inquiry into the nature of the self; beliefs and values; personal, physical, mental, social and spiritual health; human relationships including families, friends, communities and cultures; rights and responsibilities; what it means to be human.

Statement of inquiry
The relationship between chromosomes, genes, alleles, and traits can be understood by examining patterns of inheritance.

Inquiry questions
Factual What are chromosomes, genes, alleles, and traits? How are dominant and recessive alleles different? What is a Punnett Square? What are the different possibilities of genotypes? What is selective breeding/artificial selection? What is the difference between sexual and asexual reproduction? **Conceptual** What is the relationship between DNA, chromosomes, genes, alleles, and traits? What role do chromosomes, genes, and alleles play in heredity? How are our traits determined? How does genotype relate to phenotype? Why do some offspring look more like their parents than others? What determines whether offspring will or will not have genetic variation? How can I use a Punnett Square to determine the likelihood of offspring inheriting a certain genotype and displaying a certain phenotype? **Debatable** Where do we draw the line with artificial selection/selective breeding? Should we genetically modify organisms for various purposes? Should parents be able to use what we know about heredity and genetics to pre-select traits for their offspring?

MYP Objectives	Assessment Tasks	
*What specific MYP **objectives** will be addressed during this unit?*	***Relationship** between summative assessment task(s) and statement of inquiry:*	*List of common formative and summative assessments.*

Science: Criterion A: Knowing and Understanding i. describe scientific knowledge ii. apply scientific knowledge to solve problems set in familiar and unfamiliar situations Criterion C: Processing and Evaluating i. present collected and transformed data ii. interpret data and describe results using scientific reasoning Criterion D: Reflecting on the Impacts of Science i. describe the ways in which science is applied and used to address a specific problem or issue ii. discuss and analyze the various implications of using science and its application in solving a specific problem or issue iii. apply scientific language effectively Design A: Inquiring & Analyzing i. explain and justify the need for a solution to a problem ii. construct a research plan, which states and prioritizes the primary and secondary	SOI: The relationship between chromosomes, genes, alleles, and traits can be understood by examining patterns of inheritance. In the summative assessment, students are tasked with using various models to examine, predict, and determine patterns of inheritance. Students use Punnett Squares to determine possible allele combinations of offspring when provided with the genotypes and/or phenotypes of the parents. They may also determine parent genotypes based on offspring genotypes. Students interpret models of binary fission and meiosis to identify similarities and differences between inheritance in asexual and sexual reproduction. Students also investigate scenarios to determine how selective breeding uses patterns of inheritance to produce offspring with desired traits.	**Formative Assessment(s):** Genetic Terminology CFA Punnett Square CFA **Summative Assessment(s):** Genetics Unit Assessment Paper I and Paper II (Science A, D)

research needed to develop a solution to the problem iv. develop a design brief, which presents the analysis of relevant research. Design B. Developing Ideas i. develop a design specification which outlines the success criteria for the design of a solution based on the data collected Design C: Creating the Solution i. construct a logical plan, which outlines the efficient use of time and resources, sufficient for peers to be able to follow to create the solution		

Approaches to learning (ATL)
Category: Thinking **Cluster:** Critical-Thinking **Skill Indicator:** Use models and simulations to explore complex systems and issues. Gather and organize relevant information to formulate an argument.

Learning Experiences Add additional rows below as needed.		
Objective or Content	**Learning Experiences**	**Personalized Learning and Differentiation**

S7L3. Obtain, evaluate, and communicate information to explain how organisms reproduce either sexually or asexually and transfer genetic information to determine the traits of their offspring. a. Construct an explanation supported with scientific evidence of the role of genes and chromosomes in the process of inheriting a specific trait.	NSTA: Using Pop Culture to Teach Genetics Punnett Squares: Genetic Disorders Extracting DNA from a Strawberry Lab	• Capstone Connections • Discovery Education High School Biology Science Techbook • NGSS Case Study 7: Gifted and Talented Students • Next Generation Science Standards: "All Standards, All Students • Extensions – Enrichment Tasks/Projects Task-Specific Differentiation • Use of Mosa Mack Phenomenon for Increased Level of Rigor • Genetics vs. Environment Debate/Argumentation Session • Use of Mosa Mack Engineering Design Challenge • Open-Ended Lab Report Sections
S7L3. Obtain, evaluate, and communicate information to explain how organisms reproduce either sexually or asexually and transfer genetic information to determine the traits of their offspring. b. Develop and use a model to describe how asexual reproduction can result in offspring with identical genetic information while sexual reproduction results in genetic variation. (Clarification statement: Models could include, but are not limited to, the use of monohybrid Punnett squares to demonstrate the heritability of genes and the resulting genetic variation, identification of heterozygous and homozygous, and comparison of genotype and phenotype.)	NSTA: Using Pop Culture to Teach Genetics Modeling Asexual Reproduction & Discussion Punnett Squares: Genetic Disorders	
S7L3. Obtain, evaluate, and communicate information to explain how organisms reproduce either sexually or asexually and transfer genetic information to determine the traits of their offspring. c. Ask questions to gather and synthesize information about the ways humans influence the inheritance of desired traits in organisms through selective breeding. (Clarification statement: The element specifically addresses artificial selection and	Selective Breeding Real-World Scenarios Selective Breeding & Hybrid Project Campaign	

the ways in which it is fundamentally different from natural selection.		

Content Resources

NSTA: Using Pop Culture to Teach Genetics

Capstone Connections

Mosa Mack Genetics vs. Environment
Lesson 3: Engineer
Engineer a Solution to an Environmental Issue that Impacts Genetics
-Research Environmental Factors that Influence Growth
-Design a Solution to Fix Global Nutrition Deficits

Capstone Action Proposal
MYP Design A.i., ii., iv.
MYP Design B.i., iv.
MYP Design C.i.