Unit 2: Inheritance and Variation of Traits

Content Area: **Science**
Course(s): **Biology/Lab Honors**
Time Period: **2nd Marking Period**
Length: **10 Weeks**
Status: **Published**

Unit Overview

DNA, in the form of chromosomes, passes genetic information from one generation to the next. Environmental and genetic causes of mutation result in variation within a population.

Transfer

Students will be able to independently use their learning to...

-Identify types of mutations.

-Predict the effect of a mutation on an organism.

-Predict the genotypic and phenotypic ratios of offspring given the parent genotypes.

For more information, read the following article by Grant Wiggins.

http://www.authenticeducation.org/ae_bigideas/article.lasso?artid=60

Meaning

Understandings

Students will understand that...

-Genetic information is passed on to new cells during cell division.

-Cell division is essential to the development, growth and maintenance of an organism.

-Mutations may cause variation within a population.

-Traits are inherited from one generation to the next.

Essential Questions

Students will keep considering...

-How do cells know what to do?

-Are you a mutant? How do you know?

Application of Knowledge and Skill

Students will know...

Students will know...

-Genetic information is passed on to new cells during cell division.

-Cell division is essential to the development, growth and maintenance of an organism.

-Mutations may cause variation within a population.

-Traits are inherited from one generation to the next.

Students will be skilled at...

Students will be skilled at...

-Identifying the phases of cell division.

-Recognizing types of mutations.

-Predicting the genotypes and phenotypes of offspring.

Academic Vocabulary

Chromosome
Chromatid
Centromere
Histone
Homologous pair
Sex chromosome
Autosome
Haploid
Diploid
Karyotype
Cell cycle
Binary fission
Mitosis
Meiosis
Interphase
Cleavage furrow
Cell plate
Cytokinesis

Heredity
Genetics
Dominant factor
Recessive factor
Gene Allele
Genotype
Phenotype
Homozygous
Heterozygous
Probability
Monohybrid cross
Dihybrid cross
Punnett square
Complete dominance
Incomplete dominance
Codominance
Sex linkage

Linkage groups
Crossing over
Germ cell mutations
Somatic cell mutations
Lethal mutations
Chromosome mutations
Deletion
Inversion
Translocation
Nondisjunction
Gene mutation
Point mutations
Frame shift mutations
Patterns of inheritance
Carrier
Single-allele traits
Multiple-allele traits
Polygenic traits
Sex-influenced traits

Learning Goal 1

Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

Proficiency Scale

Target 1

SWBAT:

-Identify steps of mitosis.

-Model the activities at each step in mitosis.

-Describe how genes control mitosis.

-Explain the phenoma of cancer in terms of mitotic division.

-Relate the importance of mitosis to the growth and development of an organism.

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- -Explain the phenoma of cancer in terms of mitotic division.
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- -Model the activities at each step in mitosis.
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SCI.HS-LS1-4	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

Further Inquiry

Explain why cancer patients often lose hair when undergoing chemotherapy treatment.

Learning Goal 2

Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

Proficiency Scale

Target 1

SWBAT:

-Identify steps of meiosis.

-Differentiate between haploid and diploid cells and their roles in multicellular organisms.

-Describe how meiosis results in genetic variability.

-Apply how fertilization restores the diploid number and how meiosis maintains the diploid number across generations.

-Compare the steps of meiosis in males versus females.

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- -Compare the steps of meiosis in males versus females.
- -Describe how meiosis results in genetic variability.
- -Differentiate between haploid and diploid cells and their roles in multicellular organisms.

- -Identify steps of meiosis.

SCI.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.

Further Inquiry

Why is meiosis essential to sexual reproduction and the inheritance of equal genes from two parents?

Learning Goal 3

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.

Proficiency Scale

Target 1

SWBAT:

-Define genotypes and phenotypes and provide examples.

-Predict the genotypes and phenotypes of offspring.

-Identify types of dominance and the effects on phenotypes.

-Evaluate possible genotypes for given phenotypes in humans.

-Relate the importance of genotypes and phenotypes to an organism's advantage in the environment.

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- -Evaluate possible genotypes for given phenotypes in humans.
- -Identify types of dominance and the effects on phenotypes.
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SCI.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.

Target 2

SWBAT:

-Differentiate between gene and chromosome mutations.

-Explain sex-determination and sex-linkage.

-Identify different types of inheritance patterns.

-Connect the consequences of inbreeding to the inheritance of genetic disease.

-Identify the specific genetic cause, symptoms, and treatment of a genetic disease.

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SCI.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.

Further Inquiry

Some inherited genetic disease of humans appear in children of parents who do not have the disease. Explain this.

Learning Goal 4

Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

Proficiency Scale

Target 1

SWBAT:

-Identify the genotypic and phenotypic frequencies within a gene pool.

-Describe factors that can affect gene pools.

-Construct a graph for a population based on phenotypic data.

-Relate factors that affect gene pools to the genotypic and phenotypic frequencies.

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- -Describe factors that can affect gene pools.
- -Identify the genotypic and phenotypic frequencies within a gene pool.
- -Relate factors that affect gene pools to the genotypic and phenotypic frequencies.

SCI.HS-LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

Further Inquiry

Why is a small population at risk for detrimental mutations?

Formative Assessment and Performance Opportunities

-Science notebook/textbook/-Supplemental textbook materials

-Homework/Classwork assignments

-Lab activities/explorations

-Quizzes, Tests, Projects

-Unit Test Open-ended Response

-Online resources

-Laptops

-Student Response Systems

Summative Assessment

Common unit assessment aligned to the NJSLS and differentiated for varied learners.

Common Assessment is administered on LinkIt

Accommodations/Modifications

-504 accommodations

-IEP modifications

-Science notebook entries

-Videos, models, posters

Ex:

- model the effects of mutation; from start to finish
- students are supplied with amino acid chart

Unit Resources

-Holt Modern Biology 2009

-Supplemental textbook materials

-Online resources

-Laptops

-Student Response Systems

-Lab materials

-POGIL: Activities for HS Biology

21st Century Life and Careers

CRP.K-12.CRP1.1	Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going

	beyond the minimum expectation and in participating in activities that serve the greater good.
CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP5.1	Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.
CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.
CRP.K-12.CRP7.1	Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
CRP.K-12.CRP9.1	Career-ready individuals consistently act in ways that align personal and community-held ideals and principles while employing strategies to positively influence others in the workplace. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the directions and actions of a team or organization, and they apply insights into human behavior to change others' action, attitudes and/or beliefs. They recognize the near-term and long-term effects that management's actions and attitudes can have on productivity, morals and organizational culture.
CRP.K-12.CRP12.1	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.