Solving Dihybrid Punnett Squares with Coding

Grade 11 University Biology – Genetic Processes

Lesson Plan

Cross Curricular	Computational Thinking
Safety Notes	N/A

Big Ideas

- Investigate genetic processes and analyse data to solve basic genetic problems involving dihybrid crosses.

Learning Goals

- Students will learn appropriate terminology related to genetic processes, including allele, dominant, recessive, phenotype, genotype, heterozygous, homozygous, and zygote.
- Students will learn about Punnett Squares for dihybrid crosses.
- Students will complete Punnet Squares for dihybrid crosses
- Students will be able to predict phenotypic and genotypic ratios for dihybrid crosses based on the Punnett Square.

Specific Expectations

- Use appropriate terminology related to genetic processes, including but not limited to: haploid, diploid, spindle, synapsis, gamete, zygote, heterozygous, homozygous, allele, plasmid, trisomy, non-disjunction, and somatic cell.
- Use the Punnett square method to solve basic genetic problems involving dihybrid crosses, incomplete dominance, codominance, dihybrid crosses, and sex-linked genes
- Investigate, through laboratory inquiry or computer simulation, dihybrid crosses, and use the Punnett square method and probability rules to analyze the qualitative and quantitative data and determine parent genotype.

Description

Students will learn about Mendelian Genetics, more specifically probability and dihybrid crosses, by completing a partial code.

Background

Mendel's laws of inheritance should be discussed with students prior to this lesson. Students should understand appropriate terminology related to genetic processes, including allele, dominant, recessive, phenotype, genotype, heterozygous, homozygous, and zygote.

Accommodations/Modifications

Students have the opportunity to type, verbally record with speech-to-text software, and draw their answers.

Materials

- Computer
- Internet Access
- Projector
- 5 E Lesson on Solving Dihybrid Punnett Squares with Coding Handout
- Solving Dihybrid Punnett Squares with Coding Explain Handout Teacher Answer Key

Introduction

- This is a 5 E instructional model that include the following learning phases: Engage, Explore, Explain, Elaborate, and Evaluate.
- This lesson begins with the educator facilitating students in the **Engage Phase** of the 5 E's with the *5 E Lesson on Solving Dihybrid Punnett Squares with Coding* handout.
    - Educators will ask students to volunteer reading each paragraph in the Engage: Freckles Introduction section.
    - Students will work a partner that is predetermined by the educator. Students will appoint one person Partner A and the other person Partner B prior to completing Question 1-12.

Action

- Students will then complete the **Explore Phase** of the 5 E's with the *5 E Lesson on Solving Dihybrid Punnett Squares with Coding* handout.
    - Students will utilize the hands-on Scratch activity to explore the concept of genetic processes through dihybrid cross Punnett squares: https://scratch.mit.edu/projects/277242403/
    - Students will continue to explore the Dihybrid Cross Simulation, while attempting to make connections with the following words: Alleles, Dominant, Recessive, Heterozygous, Homozygous, Parent Genotype and Phenotype, Zygote, Offspring Genotype and Phenotype, Probability
- Teachers will facilitate the **Explain Phase** of the 5 E's with the *Solving Dihybrid Punnett Squares with Coding* handouts.
    - The educator will go over the *Solving Dihybrid Punnett Squares with Coding* Handouts Teacher Copy.
    - Students should follow along in the **Explain** section with the *5 E Lesson on Solving Dihybrid Punnett Squares with Coding* handout highlighting words they do not fully grasp/understand, so they can look up the definitions, examples, and/or videos on the concept.
    - Students will complete the Short Answer and Fill-In-The-Blank questions of the **Explain Phase** on the *5 E Lesson on Solving Dihybrid Punnett Squares with Coding* Handouts.

Consolidation/Extension

- In the **Elaborate Phase**, **s**tudents will be challenged to extend/remix the Dihybrid Scratch program, https://scratch.mit.edu/projects/277242403/ , by coding in various additional functions.
    - Students can view a list of additional coding functions in the **Elaborate: Dihybrid Scratch Extension** section of the *5 E Lesson on Solving Dihybrid Punnett Squares with Coding* handout.
- In the **Evaluate Phase**, students will assess their computational understanding and abilities and teachers evaluate students' understanding of key concepts and skill development with the Punnett Square Monohybrid Cross Elaboration Scratch program, https://scratch.mit.edu/projects/277530517/.
    - The Punnett Square Monohybrid Cross Elaboration Scratch program provides example code for including an introduction, changing the background, adding a sprite character, and adding a dihybrid cross question.