Survival of the Fittest: Understanding Sexual and Asexual Reproduction in Planarians

Lesson Plan Information Sheet

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Introduction/Abstract to Lesson Plan (max. 100 Words) Include aspects of the lesson that are unique and innovative.	**keywords: reproduction, genotype, phenotype, traits, genetic variation** **This lesson plan uses planarians to introduce students to different types of reproduction and Punnett squares for genetic variation. The case study allows students to model offspring genotype and phenotype, comparing and contrasting sexual and asexual reproduction.**
List of Standards Addressed (This should be list of all full standards addressed by the lesson.)	**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.**
Learning Objectives using Measurable Verbs (what students will be able to do)	**Contrast asexual and sexual reproduction with respect to genetic variance. Analyze genetic information using a Punnett square. Assess the effectiveness of reproductive strategies in a given environment.**
Appropriate Grade Levels	**7th grade**
Group Size/# of students	**20-30 students working individually or in pairs**
Setting	**indoor classroom**
Approximate Time of Lesson	**20-30 minutes**
Resources Needed for Students	**Pencils; markers, colored pencils, or crayons**
Resources Needed for Educators	**PowerPoint presentation, printer (preferably with colored ink)**
Apps/Websites Needed	**None**
Lesson Activity (step by step description of activity)	Introduction and Background **Using the PowerPoint provided, the teacher will go through what planarians are and the different types of reproduction. A video of asexual reproduction is provided! Genetic variation and Punnett squares are covered in the slide show.**

	Engage: planarian pictures and video **Explore: case study worksheet** **Explain: students will explain their answers to the class** **Elaborate: applied question on the case study** **Evaluate: case study serves as an evaluation**
	Step by Step Activity ● **Students will be given two planarians with specific phenotypes (Blue dots [dominant - denoted by D] vs no dots [recessive - denoted by d] and yellow stripes [dominant - denoted by S] vs no stripes [recessive - denoted by s]). Both "parents" will be heterozygous for the dominant trait they show and homozygous for the recessive trait, so that the "children" have variation (genotypes = Ddss and ddSs).** ● **Students in pairs (or individually) will draw out the Punnett square and draw the potential phenotypes for all the children including the likely proportions (4 with dots and stripes: 4 with dots only: 4 with stripes only: 4 with neither). We used this paradigm so that the "parents" look different, but we also included a version of the worksheet that utilizes the classic dihybrid cross (final proportions would be 9:3:3:1) if that is preferred. Both paradigms can be used for extra practice.**
	Reflection/Assessment ● **Students will be presented with a hypothetical habitat. They will then decide 1) which phenotype would be best suited for this habitat (which worms would camouflage best) then 2) which form of reproduction would be most beneficial. The first habitat could look like one of the dominant traits, wherein asexual reproduction would be favorable.** ● **A hypothetical event would be presented that changes the habitat situation. For example, 1) the introduction of a new "plant species" that is blue or yellow or 2) the introduction of a new predator that can only see dots or stripes. The students would then say which phenotype/mode of reproduction would be better suited.** ***This reflection would show the costs/benefits of the different modes of reproduction. While sexual reproduction requires more energetic investment, the population is more poised to survive new situations.**

Researcher Bio Questionnaire

Name: Kendall Clay

Professional Title: Graduate Student

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Brief Description of Research Interests: My research focuses on the genetic basis of neuron regeneration in planarians. I am interested in how genetic pathways control neuron formation after injury. Other interests include science communication, illustration, and data visualization!

Name: Taylor Medlock-Lanier

Professional Title: Graduate Student

Contact Information (Email, Twitter, Personal Website, etc.): email: temedlock@uga.edu Twitter: @taylormlanier

Brief Description of Research Interests: My research focuses on how neurons regenerate in planarians! In general I am interested in neural regeneration and degeneration. I love learning how the brain works, and what happens when things go wrong!

Name: Jennifer Jenkins

Professional Title: Graduate Student

Contact Information (Email, Twitter, Personal Website, etc.): email: jennifer.jenkins@uga.edu

Brief Description of Research Interests: I am interested in how cells communicate/coordinate during tissue regeneration. How does the remaining tissue know what to produce? How do the cells work together to achieve this goal? I also find it important to research the most effective teaching/learning strategies!