**LESSON PLAN**

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Subject: Biology

Grade/Class: Grade 11/SBI3U

Duration: 75 minutes (with optional additional 75 minute activity included)

Lesson Topic: Genetics

**INTRODUCTION:**

This lesson is an overview of the grade 11 Genetics unit, in its entirety. Students will be encouraged to recall previous topics learned in class and apply them; It will serve as a “review” for their upcoming test. Playing a game such as Jeopardy will allow students to practice the skills learned during class. The questions range from defining a simple word to application questions. By the end of this lesson, students should have a better understanding of what type of questions are to be asked on the test.

**CURRICULUM EXPECTATIONS:**

This is a review of the SBI3U Genetics Unit, it will cover  all of D1, D2, and D3 in the Ontario Curriculum Documents.

Overall Expectations:  By the end of this course, students will:

* D1. Evaluate the importance of some recent contributions to our knowledge of genetic processes, and analyse social and ethical implications of genetic and genomic research;
* D2. Investigate genetic processes, including those that occur during meiosis, and analyze data to solve basic genetics problems involving monohybrid and dihybrid crosses;
* D3. Demonstrate an understanding of concepts, processes, and technologies related to the transmission of hereditary characteristics.

**SPECIFIC EXPECTATIONS:**

* Specific Expectations:  By the end of this course, students will:
	+ D1. Relating Science to Technology, Society, and the Environment
	+ D1.1 Analyse, on the basis of research, some of the social and ethical implications of research in genetics and genomics (e.g., genetic screening, gene therapy, in vitro fertilization) [IP, PR, AI, C]
	+ D1.2 Evaluate, on the basis of research, the importance of some recent contributions to knowledge, techniques, and technologies related to genetic processes (e.g., research into the cystic fibrosis gene; the use of safflowers to produce insulin for human use) [IP, PR, AI, C]
* D2. Developing Skills of Investigation and Communication
	+ D2.1 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* [C]
	+ D2.3 Use the Punnett square method to solve basic genetics problems involving monohybrid crosses, incomplete dominance, codominance, dihybrid crosses, and sex-linked genes [PR, AI, C]
* D3. Understanding Basic Concepts
	+ D3.1 Explain the phases in the process of meiosis in terms of cell division, the movement of chromosomes, and crossing over of genetic material
	+ D3.2 Explain the concepts of DNA, genes, chromosomes, alleles, mitosis, and meiosis, and how they account for the transmission of hereditary characteristics according to Mendelian laws of inheritance
	+ D3.3 Explain the concepts of genotype, phenotype, dominance, incomplete dominance, codominance, recessiveness, and sex linkage according to Mendelian laws of inheritance
	+ D3.4 Describe some genetic disorders caused by chromosomal abnormalities (e.g., non-disjunction of chromosomes during meiosis) or other genetic mutations in terms of chromosomes affected, physical effects, and treatments
	+ D3.5 Describe some reproductive technologies (e.g., cloning, artificial insemination, in vitro fertilization, recombinant DNA), and explain how their use can increase the genetic diversity of a species (e.g., farm animals, crops)

**LEARNING GOALS:**

By the end of this lesson plan students should be able to:

* Define the terms (not limited to):
	+ DNA, dominant, recessive, phenotype, incomplete dominance, codominance, sex-linkage, alleles, genes, mitosis, meiosis, dihybrid cross, punnett square, homozygous, heterozygous, etc.
* Analyze basic research that may pose an ethical or social issue (in vitro fertilization)
* Use Mendelian laws of inheritance to explain concepts such as (not limited to):
	+ Codominance, recessiveness, incomplete dominance, sex linked genes
* Solve various types of genetic problems using punnett squares
* Use genetic disorders such as non-disjunction to explain chromosomal abnormalities
* Explain how cloning and in vitro fertilization can be used to increase the genetic diversity

**LEARNING/TEACHING RESOURCES:**

* Powerpoint Jeopardy Game
* Computer
* SmartBoard or Projector
* Blackboard/Chalk or Paper/Pen (to keep scores)
* Prizes, small for individual answers, large for group who wins (optional)
* Three white boards and markers (one per team). (optional)
* Three buzzers (one per team); could use ‘Easy’ buttons from Staples or bells (optional)

**LESSON SEQUENCE:**

Day 1 (75 mins): (optional, proceed to Day 2 if not interested)

Introductory Activity:

* Divide the class into three groups by giving students a number from 1-3

Developmental Strategies:

* Demonstrate to students how a cheat sheet can be used to help them play the game
* Instruct students to form a "cheat sheet" in groups; a cheat sheet is a one page document with details about definitions and concepts which students can refer to during assessments.
* Purpose: to prepare students for their up-coming test. Developing a cheat sheet gives students the opportunity to review all the material for the unit while deciphering which information is important enough to make note of on their cheat sheet.  This is a great way to unconsciously prepare students to study for the test.

Day 2 (75 mins):

* Instruct students to get into their assigned teams (3 teams)
* For maximum participation all teams can be given white boards to write answers on, students will flip cards over so that teacher can see everyone’s answer after answer is given in game.
* Each team is given a bell.
* Students will play jeopardy, by choosing category and price/amount. Teacher will read question and whichever team buzzes in first gets to answer. If answer is incorrect other teams has a chance to steal. The team that answers correctly gets the point value for that question. This is when students would show teacher answers from white boards.
* Teacher must keep score either on the blackboard or on paper.  It is suggested that teacher keeps track of individual student scores as well.
* Play until all questions have been answered.
* Team with the highest total points wins (optional: receives a grand prize)
* Purpose:To facilitate students in understanding key concepts and terms

**DIFFERENTIATED INSTRUCTIONAL STRATEGIES:**

Teachers can variate as they like, whether they want to ask students to all answer each question on paper or white board and still give points to the first team to ring in with right answer. This will allow the teacher to see how many students got the right answer and how many are still struggling with the concept. Teachers can also ask questions between the jeopardy questions either relating to answers or similar questions to those in the jeopardy game.

The use of diagrams and pictures in the Jeopardy game for the visual learners and those with reading/comprehension difficulties (ELL, student with learning disabilities, etc.)

Use discussions and ask questions regarding the understanding of the material. To ensure all students participate in this, randomly choosing students to answer the questions/discussions.

**CULMINATING ACTIVITY:**

Teachers can use extra time to go over any questions or concepts students had difficulty with. This could be questions they noticed were difficult during the game or those that students ask about afterwards.

Exit card

* Instruct students to hand in one question used in the game they felt they can answer with confidence

**ON-GOING ASSESSMENT/EVALUATION:**

* Students will be assessed informally
* Determining students'  level of understanding through discussion are ongoing throughout the entire lesson

**FOLLOW-UP ACTIVITIES/IDEAS OR NEXT STEPS:**

* The next lesson will be a test wrapping up the genetics unit.