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| **Teacher:** Lily Trinh  **Subject Area:** ELL Science (level 2)  **Grade Level:** ELL 2 (grades 8-11)  **Unit Title:** Genetics  **Duration:** 11 classes (each class: 80 minutes) | **Unit Objectives (Knowledge, Skills, Processes)**   * Students will understand and differentiate between chromosome, DNA, and genes * Students will explore and understand basic concepts of genetics that will help them explore and understand heredity, gene expression, and genetic diseases   **Language objectives**   * Students will learn and practice reading and creating imperative sentences as used in science labs and directions |
| **Big Ideas (Major Concepts or understandings)**  This class will be separated into 3 mini sections:   1. Students will learn the function and structure of DNA  * Topic is presented with class activities to generate interest into the topic and its use in real life settings  1. Students will learn about Punnet squares and predicting heredity using simple laws of probability  * Personal traits and genetic diseases are gathered and discussed  1. Students will learn about dominant and recessive genes  * Students explain gene expression and predict future gene expressions * Lab: DNA extraction | |
| **Rationale:**   * Students will study and explore Scientific writing, reading, listening, and speaking styles * Students will have a chance to utilize scientific equipment in a lab setting   *There will be a greater focus on the English Language Arts objectives than on science or biology objectives. Although genetics is not a mandatory topic in any Science or Biology PLOs in British Columbia high schools, successful students who enter into mainstream science classes will be able to relate genetics with Biology 11’s topic of evolution in respects to the “basic structure of DNA” and “role of DNA in evolution”. (Education, 2006)* | |

**Detailed Unit Plan Overview**

**Sequenced Learning Activities/ Instruction:**

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| **Topic** | **Lesson No.** | **PLO**  **Objective** | **Methods (Activities, Strategies, Etc.)** | **Materials/ Resources** | **Assessment & Evaluation** |
| **Pre-assessment, Unit introduction** | **1** | Language Arts objectives:   * Understand and be able to explain the difference between recessive and dominant traits. * Interact and collaborate with classmates and teacher in agreement of class rules and expectations * Be able to use visual cues to gather meaning   Genetics class objectives:   * Dominant and recessive traits and its relation to genetics and heredity * Heredity is passage of instruction from parents (one generation down to the next)   Key Vocabulary:  -inherit  -dominant  -recessive  -traits  -express / expression  -hereditary | Mini introduction:   * Tell the class the topic/will be teaching for 11 classes * Show rough timeline/weekly schedule * Go over class rules and expectations (no phones!)   Hook:   1. Have 1 student (the best artist) to go to the board. Ask the other students to describe Mr. Bylsma in terms of his facial and body characteristics and the artist to draw everything on the board. Encourage students to describe Mr. B’s features in detail (ears, eye shape and colour, hair type and length), height, body hair, fingers or toe length… etc) 2. Discussion: Are any of Mr. B’s characteristics very different from theirs? Where did Mr. B get his features from? (heredity🡪instructions from DNA from parents)   Lesson:   * give worksheet that students need to fill out during class time for key vocabulary and concepts * Show worksheet on the PPT and discuss meaning of key vocabulary words * Explain the meaning and significance of “Dominant” and “Recessive” traits * Worksheet: Dominant and recessive trait worksheet🡪have students complete the worksheet individually * Discuss worksheet: Gather some information from students and which they think is more popular/were they surprised at the class results or their initial thoughts * Ask the class which traits they think are D or R * Show answers🡪 Discussion: Why are some traits were not popular in the class but still are Dominant traits (expressed)? * Watch video that summarizes the vocabulary words and tells which traits in their survey are Dominant/Recessive (stop and illicit survey answers or predictions)🡪students circle in different colours to represent D or R trait * Brainstorm other traits they inherit from their parents/any distinguishing features   Homework:   1. Think of 5 other traits that are passed down/inherited from their parents 2. why is studying genetics is important | * Daily key vocabulary and key concepts worksheet * PPT * Worksheets of traits * Video: <https://www.youtube.com/watch?v=mnSkz8s-b44> | * Group participation in hook activity * Individual or pair work to fill out daily vocabulary/concept worksheet * Individual work circling D or R traits on characteristics survey * Discussion of class rules and expectations |
| **Cell structures and function** | **2** | Language Arts objectives   * Be able to express thoughts and opinions using visuals and collaboration with peers * Understand and fill in labelling worksheets   Genetics class objectives:   * Understand and differentiate between the roles of DNA, chromosomes, genes * List the steps involved of making particular genes   Key vocabulary:  -cell  -nucleus  -ribosome  -expression | Hook:   * Game (show of hands or kahoot): Show a picture of various embryos in different stages and have the students guess which one is human (human, fish, salamander, turtle, and chicken) * Explain humans share many of the same DNA as other species * What IS DNA? Where is it located? How is it made? Can it be changed?   Lesson:   * Homework check: Have students answer the 5 other traits that are passed down from their parents and why studying genetics is important 🡪 relate that each trait is expressed by genes * Where do genes and DNA come from? * Go over parts of a cell * Show structure and function of parts of the cell * Scaffold and provide an overview of the process of how DNA is made * Label parts of the cell in groups and go over the worksheet together as a class * Second worksheet of the structures and main functions of the cell * Provide supplemental video   Exit quiz:   * Quiz on labelling parts of a cell * Think about what kind of things are genetically modified | * Daily key vocabulary and key concepts worksheet * PPT * Pictures of embryos in different states of development * Cell labelling worksheet * Cell structures and function worksheet * Video: <https://www.youtube.com/watch?v=zwibgNGe4aY> | * Check homework * Class involvement in discussion embryos * Involvement in labelling cell structures * Group project involvement * Completion of exit quiz |
| **Base pairs, chromosomes, DNA, genes** | **3** | Language Arts objectives:   * Explain how the production of proteins and genes affect gene expression   Genetics class objectives   * Understand the structure of DNA and its matching base pairs * G and C / T and A bases * Provide video supplemental   Key vocabulary:  -ribosomes  -RNA  -proteins  -Base pairs  -Chromosomes  -DNA  -Genes | Hook:   * Game: Labelling game of structure and function of a cell * Game: Kahoot! game of functions of cells   Lesson:   * Scaffold previous knowledge on structure and function of gene and explain the production of DNA and RNA * Differentiate the production of proteins and genes 🡪gene expression * G with C / T with A * Genes expression results in different species * Make a flow chart from inside the cell to DNA creation   Classwork and Homework:   * Check homework: What things are genetically modified? * Group project of DNA structure🡪get into groups and brain storm ideas | * Daily key vocabulary and key concepts worksheet * PPT * Video: DNA: <https://www.youtube.com/watch?v=zwibgNGe4aY> * Video: Gene: <https://www.youtube.com/watch?v=5MQdXjRPHmQ> | * Engagement in group games and individual games * Scores on individual games |
| **Punnett Squares and Predicting Heredity (1)** | **4** | Language Arts Objectives:   * Prediction words: passive voice with correct modal verbs (could/would) * Present tense wordings🡪be able to link results with findings * Describe ways to remember phenotype means the way something looks (ph🡪 phonotype and photograph)   Genetics class objectives:   * Introduce Gregor Johann Mendel and his findings * Recreate Mendel’s findings with green versus yellow peas🡪 change the concept of smooth versus wrinkly surface * Identify and explain the difference between genotype and phenotype   Key vocabulary:  -Punnett square  -Mendelian genetics  -inheritance  -express  -dominant  -recessive  -gene  -probability  -genotype  -phenotype  -homozygote  -heterozygote  -allele | Hook:   * Question: How can we predict what traits we will pass on to our children? Have students list traits that they have that are similar to and traits that different from their parents (think/pair/share) * Further discussion: Show students a photograph of my parents and me together and discuss which characteristics I inherited from my parents * Introduce role of chance and its function in process of inheritance   Lesson   * Check homework/process of DNA structure * Relate chance to gene expression and inheritance🡪 each cell contains those information🡪passed on to next generation/next generation inherits half of the genes   Story telling:   * Provide PPT of Mendel’s past and findings (smooth versus bumpy covering) * Provide diagrams of parent generation * Then of the F1 generation * What does it mean…? 🡪 show diagrams of what Mendel did (isolated pea plants…)   🡪Question: How does it relate to our first class of dominant and recessive genes? 🡪which trait is dominant and which are recessive?   * Illicit responses of students’ predictions🡪which traits are R and which are D? * Utilize key vocabulary words in explanation * As a class, recreate Mendel’s findings with green versus yellow peas 🡪 use Punnett square to help explain * Provide video supplemental * 🡪go onto colour of plants if time permits * Allow time for completion of DNA structure 🡪hand in | * Daily key vocabulary and key concepts worksheet * PPT * Video: <https://youtu.be/Mehz7tCxjSE> * Punnett squares | * Check homework / progress of DNA structure * Discussion and involvement of inheritance and personal traits versus parents’ traits * Engagement in Mendel’s history and findings * Participation in group DNA structure project |
| **Punnett Squares and Predicting Heredity (2)** | **5** | Language Arts objectives:   * Present tense wordings🡪be able to link results with findings   Genetics class objectives:   * Identify and explain the difference between genotype and phenotype * Advance to combining the 4 traits into a larger Punnett square | Key vocabulary:  -homozygote  -heterozygote  -homozygous  -heterozygous  -parent generation  -F1 generation  -allele  Hook/quiz:   * Entrance quiz based on previous’ lesson on Mendel’s smooth versus bumpy covering & green versus yellow peas (think/pair/share)   Lesson   * Review previous class’s lesson of Mendel’s findings of green versus yellow peas🡪describe using genotype and phenotype * Have students practice again with smooth versus wrinkle peas * Explain the difference between parent generation and F1 generation🡪 enforce concept by making Punnett squares of various combinations of F1 generations and describing their genotype and phenotype * Working in pairs or in groups, have students advance to completing a larger Punnett square of 4 traits * In pairs, students have to write down the descriptions of certain offspring using key vocabulary words, drawing, and colouring show more detail   Exit quiz:   * “what is the chance that two parents with homozygous recessive traits will pass on a dominant trait to their offspring?” 🡪0% * Students vote on the best DNA structure | * Daily key vocabulary and key concepts worksheet * PPT * Entrance quiz * Exit quiz * Punnett squares (2x2 and 4x4) | * Check entrance quiz answers * Involvement in group work * Critical thinking when working in the expanded 4x4 Punnett squares * Completion of exit quiz |
| **Family tree of Monsters (1)** | **6** | Language Arts objectives   * Students need to explain the genotype and phenotype of each family linage * Use previous key vocabulary in explaining recessive and dominant traits   Genetics class objectives:   * Work in a group to decide on the genotype of the parent generation * Create and how Punnett squares as evidence of family linage and phenotype * Draw and illustrate the phenotype of monsters | Key Vocabulary:  -quick review of all vocabulary words and their meaning  Hook:  Group game: show that there is a 50% of being born a male or female by Punettt square  Lesson:   * Explain the group activity * Provide examples for students to review and access throughout the lesson for reference * Set expectations and rubric * Explain students need to use vocabulary words to explain the genotype and phenotype of the family lineages of 3 additional generations * Give students enough time to complete the group project * Give worksheet to help students write their report | * PPT * Poster paper * Coloring pencils and markers * Completed project pictures * Writing prompt worksheets | * Engagement in group review game * Involvement in group project |
| **DNA extraction lab (1)** | **7** | Language Arts objectives:   * Introduction of Procedure genre * Recognize and understand Procedure genre’s writing traits * Uses of Procedural writing * understand the steps of the lab and place the main steps in sequential order * Summarize the main steps (in turn practicing procedural writing)   Genetics class objectives:   * Learn about safe lab practices * Use of test tubes and graduated cylinders | Key vocabulary:  -Procedures  -sequence  Science lab  -test tube  -graduated cylinders  -alcohol  -detergent  Hook: Quiz:  -Kahoot! review game for past concepts and for students vote on the size on a strand of DNA  Discussion: does DNA have colour? How can we isolate it? Do bananas and strawberries have the same DNA? Do they have the same genes? How will they look like? (think/pair/share)  Lesson   * Encourage students to share their ideas of the banana and strawberry having the same DNA or genes. * We will find out the next class with the DNA extraction lab * Introduce the lab, have random students read each step * Explain the lab equipment and safety precautions * In pairs, students place the pictures of the main steps in sequential order * In pairs, students place the instructions of the lab in sequential order * Check answers together and summarize each step into fewer words * Watch video of strawberry DNA extraction   Exit slip:   * Will the DNA strands of the banana and strawberry look different? | * Daily key vocabulary and key concepts worksheet * PPT * Pictures for worksheet * Lab instructions for worksheet * Lab worksheet for students to summarize the instructions * Lab equipment handout * Video: <https://youtu.be/67KXatgoNKs> | * Involvement in discussions * Engagement in group activity for lab preparation * Completion of exit question |
| **DNA extraction lab (2)** | **8** | Language Arts objectives:   * Verbally review the steps in the lab * Remind students to speak English during the lab   Genetics class objectives:   * Review lab equipment * Be mindful of safe lab practices * Remind them to clean up after they are finished | Key vocabulary:  -brief review of the key vocabulary words from last class  Hook:   * Quiz: Kahoot game with steps of the lab or equipment * Tell students they can keep the DNA afterwards   Lesson   * Hand out lab activity worksheet * Do the lab and have students fill out the questions as they are completing the steps * Remind students to clean after the lab * After everyone is finished and cleaned up, bring students together and ask discussion questions of the purpose of certain lab supplies (salt and dish detergent) * Discussion: (relating to previous class’ exit slip): did the DNA strands of the banana and strawberry look different? Why didn’t we use our own cells? | * Lab activity worksheets * Bring all equipment and materials | * Students following the lab procedures and safety rules * Students are cleaning up after the lab * Critical thinking and engagement of class discussions |
| **Genetic diseases** | **9** | Language Arts objectives:   * Use prediction language with correct passive voice and modal verbs * Use past tense language to explain the hereditary traits and linage of Queen Victoria’s descendants   Genetics class objectives:   * Be able to use proper vocabulary words to explain dominant and recessive genes and its expressions and consequence | Key vocabulary:  -sex linked traits  -hemophilia  -male pattern baldness  Hook:  Group game: Relating to Punnett squares, receive and dominant traits, what does it mean when male pattern baldness affects more men than woman?  Lesson   * Go over the hook question and discussions from the class. * Draw Punnett squares to illustrate the answer of sex linked traits of male patterned baldness in males * Show video on male pattern video, stop the video before they explain how females could get bald🡪present question to class🡪group activity with Punnett square as proof * Class discussion and have someone from the group draw their Punnett square * Introduce hemophilia and its history in Queen Victoria’s descendants. 🡪effects of this disease * Relate this disease to male pattern baldness and draw references to Queen Victoria’s linage * Show supplement video   Exit slip:   * Explain how a girl can get bald. (if she receives both receive “X” chromosomes containing the baldness gene) | * Daily key vocabulary and key concepts worksheet * Male pattern baldness video: <https://youtu.be/N5plbx-i2Kw> * Worksheet for students to read on hemophilia in Queen Victoria’s descendants * Hemophilia video: <https://www.youtube.com/watch?v=bY_Nlihiz8Q> | * Involvement in group game * Engagement in class discussion questions * Completion of exit slip |
| **Test** | **10** | Unit objective:   * Test students’ knowledge on genetics unit | * Go over exit slip from last class. Elicit responses from students. * Quick Kahoot! game to review * Have students sit in another seat and not next to their friends * Hand out test and supervise * Tell students they will receive the test next class and there will be games | * Tests * Kahoot! | * Hand out tests |
| **Go over test**  **Unit end party** | **11** | Unit objective:   * Give back test * Go over answers and answer questions * Give me any projects or assignments | * Go over answers and concerns with the class * Allow time for students to ask questions * Encourage students to come see me after class if they want to go over any answers * Group review games on PPT | * PPT * Snacks | * Return test * Return any entrance or exit slips or worksheets |

**Simple Unit Plan Overview**

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| **Class** | **Date** | **Topic** | **Format** |
| **1** | Tuesday, March 8 | * Introduction (timeline, rules & expectations) * Start unit * Dominant/recessive traits, inherited traits from parents, why study genetics * Homework assigned | * Lesson |
| **2** | Thursday, March 10 | * Check homework * Cells and structures inside the cell (where can DNA be found) * Exit quiz | * Lesson |
|  |  | *-No school: Easter Monday: March 28-* |  |
| **3** | Tuesday, March 29 | * Kahoot! game to review/label structures and functions of the cell organelles * DNA breakdown: DNA, RNA, G-C & T-A * Group project assigned * Homework assigned | * Lesson * Group project |
| **4** | Thursday, March 31 | * Relate back to the first class with traits * Use storytelling to introduce Mendel and his pea plans * Relate which traits are dominant and which are recessive * Allow time for group project | * Group project |
| **5** | Monday, April 4 | * Entrance quiz on Mendel’s findings * Scaffold knowledge using genotype and phenotype * Parent generation and F1 generation * Allow time for group project * Exit quiz | * Lesson * Group project |
| **6** | Wednesday, April 6 | * Group project due: presentations * Go over exit quiz * 1 day group project: Family tree of monsters * Allow time for group project | * Presentations * Group work |
| **7** | Friday,  April 8 | * DNA lab extraction: instruction and lesson * Read instructions and write summaries * Enforce safety rules * Watch video on the lab * Exit slip | * Lesson |
| **8** | Tuesday, April 12 | * Go over exit slip * Kahoot! game to enforce rules and instructions * Perform DNA extraction lab * Worksheet to complete * Discussion | * Lab |
| **9** | Thursday, April 14 | * Sex linked traits, hemophilia, male pattern baldness * Show video to cement concept * Exit slip | * Lesson |
|  |  | *-No school: Pro-D day: April 18-* |  |
| **10** | Wednesday, April 20 | * Go over exit slip * Quick Kahoot! game to review * Genetics Unit test | * Unit test |
| **11** | Friday, April 22 | * Go over test answers (if students have taken it) * Genetics quizzes and games * Class party | * Unit end quizzes/games * Party |