**Unit Plan : Genetics**

**A template based on Understanding by Design**

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| **Title of Unit** | Genetics | **Grade Level** | Grade 10 |
| **Subject** | Science | **Time Frame** | 15+ lessons (2.5 weeks) |
| **Developed By** | Marne B |

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| **Stage 1 – Desired Results** |
| **Communication** Students will develop their ability to articulate their ideas in scientific language and express their view on ethical topics. | **Thinking**Students will learn apply prior knowledge to new genetics situations throughout the unit. Student will be able to connect each of the genetics concepts to the resulting diversity in living things. Students will be asked to connect their opinions on ethical issues to scientific facts and reason out these view. | **Personal and Social**Students will consider their own traits and connect them to genetics concepts. Students will connect positively to the genetic diversity in their own families and communities. |
| **Big Idea:** *Genes are the foundation for the diversity of living things.* **Essential Question:** What questions might spark student interest / engagement in the topic? What provocative questions will foster inquiry into the content?(Think open-ended questions that stimulate thought and inquiry linked to the content of the enduring understanding). What provocative questions will promote understanding and transfer of learning?What is DNA? How is the structure related to Function?How does DNA result in Biodiversity?What are Genes? What are the basic of Mendelian Theory? Why was Mendel’s discovery important?What is Heredity? How are traits determined by genes?How would you apply laws of genetics to offspring? How do you feel about Genetic Modification of foods?How does a genetic mutation happen? What is natural selection?How does natural and artificial selection effect agriculture? |
| **What students will be able to DO****Curricular competency learning standards:****Questioning and predicting** • Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal interest **Processing and analyzing data and information** • Experience and interpret the local environment • Analyze cause-and-effect relationships**Evaluating** • Consider the changes in knowledge over time as tools and technologies have developed • Connect scientific explorations to careers in science **Applying and innovating** • Consider the role of scientists in innovation **Communicating** • Formulate physical or mental theoretical models to describe a phenomenon • Communicate scientific ideas, claims, information, and perhaps a suggested course of action, for a specific purpose and audience, constructing evidence-based arguments and using appropriate scientific language, conventions, and representations | **What students will KNOW**Content learning standards:Students are expected to know the following: * Mendelian genetics, Punnett squares, complete dominance, co-dominance, incomplete dominance, sex-linked inheritance
* mutation: (mechanisms for the diversity of life)positive, negative, and neutral impacts
	+ mutagens and carcinogens
* natural selection:
	+ adaptive radiation
	+ selection pressure (e.g., adaptation and extinction, invasive species)
	+ adaptations
	+ extinctions
* artificial selection:
	+ agricultural examples (e.g., monoculture, polyculture, food sustainability)
	+ breeding (plant and animal)
* applications of genetics: genomics, GMOs, gene therapy, cloning, stem cells, reproductive technology, species, population and ecosystems, forensics, genetic engineering
* ethical considerations: the health, environmental, social, and political implications of modern genetics
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| **Stage 2 – Assessment Evidence** |
| **Formative Assessments**Observation of skillsDNA group explanationEntrance/exit slipINB completion | **Summative Assessments**QuizzesSummative testInquiry project (Applications of genetics) | **Self-Assessment / Peer Assessment**DNA explanation (groups share and learn from each other)Peer evaluation of Genetics inquiry project (evaluation presentation and communication) |
| **Stage 3 – Learning Plan** ***Should be Differentiated*** |
| **Potential Barriers to Success / Areas to Differentiate:**Might include: engagement, motivation, organization, language ability, exceptionalities, reading level, etc.Difficulty of topics for some studentsAbility to connect to big ideaELL Absences (how to keep up the INB |
| **Giving students voice and choice:** how you will adjust for differentiation needsOffer choice of presentation of learningPeer learning and helpingInteractive Notebook: Allows me to give scaffolded notes as well as completed notes for students who need them. INB is also always on the desk so I know if students are keeping up.Offer different explanation using videos postedFocus on skills (ability to connect ideas rather than repeat information by rote. |
| **Integrating Aboriginal worldviews and perspectives:**Blood brothersInvestigation of existence of how long indigenous people were here before colonization (DNA evidence?)Blood quantum – how do we test to prove heritage? |
| **Sequence of Lessons:** The basics of what you plan to do in each lesson of the unit. The first one will be how will you engage students at the beginning of the unit? (motivational set – your ‘hook’ – it could be accessing their background knowledge in some way)**\*\*\* INB: Interactive Notebooks:** These are notebooks created using a spiral notebook. The students either take notes or glue-in notes and then create (either on their own or using the cut-out given) an interactive “output” page. The idea is to produce a reference book that will help them recall and connect concepts throughout the unit. Since Textbooks may not be available for a class, the INB provide a consistent and standardized format that help the teacher ensure that all students are able to refer to the same information. INBs also help visual and kinesthetic learners to engage in the material. **(samples are offered at the end of the unit .)****\*\*\* Learning intentions are listed on the board each day as well as on a Teaching BLOG site. Lesson activities and resources are all posted on blog as well.****HIGHLIGHTed lessons have detailed lesson plans** |

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| **#** | **Lesson Title** | **Lesson Activities (Learning Experiences)** | **Assessment and Core competency** | **Resources** |
| **1 lesson** | **Intro** | ***Genes are the basis for the diversity of living things*****Activity:** Walk into forest “how many different types of trees do you count here.”KWL chartCrash Course**Closure** – Connect genes to diversity (in all living things) | **Assessment:** for learningKWL chartDiscussionExit slip | **KWL** |
| **Core:** Thinking – Connecting # of living thigs to genes |
| **1 lesson** | **History****&****Review** | **The study of genetics is a science that has a long history and continues to advance**What do you know about cells? How does this knowledge connect to heredity?Meiosis and MitosisIF DONE - DNA – intro (video) | **Assessment:** Exit slip – How does meiosis relate to genetic diversity? |  |
| **Core:** Thinking – recall understandings from grade 9 and  |
| **2 classes** | **DNA****Review****and DNA to protein** | **DNA is the blue print for life (2 -3 lessons to complete)***Students will review their understanding of DNA through a jigsaw share (videos, readings) and connect this knowledge to diversity.**Students will generally connect DNA structure to protein synthesis and understand the basic Idea of it (that DNA is copied and RNA leaves the Nucleus to act as a code for building specific proteins.**Students will know some of the basic functions of proteins.***Activity 1:** Resource Jigsaw – creation of a visual to explain DNA*Show different examples of how to put a concept together on 1 page (mind map, visual, labeling, flow chart)***Activity 2:** Share posters and ask peers for copies if students would like several different visuals in their INB**Activity 3**: DNA to protein (video and visuals on board) Glue in given for INB**Closure** – how does the structure effect the function of DNA.What is the role of DNA in genetic Diversity?  | **Assessment:**DNA visual postersEntrance slip on Meiosis  |  |
| **Core:** communicatingVisual images |
| **2+ lessons** | **Genes****& Chromosomes****Lesson plan only for 1 lesson and not complete?** | **Chromosomes & Genes - are they what make you YOU?*** What is a Gene?Where is a Gene?
* What is an allele? Alleles are the various specific forms of a gene.
* How are new alleles formed?
* Chromosomes – Homologous, number of
* Karyogram
* Genomes

 **Activities:*** STUFF OF LIFE graphic novel interpretation
* Human genome – connect this to scientists sharing information
* Karyotyping : Video: <https://www.youtube.com/watch?v=yoxMGHNj3ZU>
* Genetic disorder detection: <http://learn.genetics.utah.edu/content/basics/diagnose/>
* Karyotype activity: <http://learn.genetics.utah.edu/content/basics/diagnose/>

Genomes of different animalsPost: INB of connection of genes – chromosomes – DNA (notes and visual)  | **Assessment:**Entrance Slip – DNAAbility to connect DNA to Genes/Genomes (Pairs production on walls?) |  |
| **Core:** Thinking and P/SInquiry-type questionsIntegrating new knowledge in existing understandings |
| **4 lessons** | **Inheritance - Mendel** | **History and discovery of patterns of inheritance****INTRO:** Story of farming or connect to offspringVideo:Mendel <https://www.youtube.com/watch?v=CBezq1fFUEA>**Activity** – put together a visual story – jigsaw the explanation(make trailer or movie poster or comic strip about Mendel?)**Post**: INB – glue-in notes Output – draw a picture of how Mendel discovered inheritance. | **Assessment:**Trailer produced – or movie poster? | **Cue Video****INB glue-in** |
| **Core:** communicating |
|  | **Where are the traits? Vocabulary day and making monsters.****Mendelian Genetics problems and Punnett squares.****Complete dominance**Vocab: <https://www.brightstorm.com/science/biology/mendelian-genetics/alleles/>**Activity: Making Monsters Part 1(no Punnett squares needed – only dominance and allele understanding.** | **Assessment:**Mendelian Word Cloud or poll at start of class  | **INB GLUE IN** |
| **Core:** P/S thinking about society and self  |
|  | **Punnett Squares are an easy way to determine possible traits in offspring**<https://www.youtube.com/watch?v=CBezq1fFUEA>**Activity:** Mating Monsters: Part 2 of Making monsters (use Punnett squares to determine possible offspring traits. | **Complete and Hand in Making monsters** |  |
|  | **Incomplete dominance and Co Dominance**Blood typing (co)Snap Dragon Colour (incomplete) | **Assessment:**Entrance slipCompletion of trait analysis |  |
| **Core:** Thinking |
|  | **Sex-inked dominance**Baby Blunder activity – draw a portrait of your babyFace swap on Snap chat | **Assessment:**Formative: Baby activity Punnett square |  |
| **Core:** Personal/Social – working together in activity |
|  | **Where to add in… ??? Blood Quantum** |  |  |
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| **1 lesson** |  | **How does genetics contribute to diversity?**Mutations and Evolution* Positive and Negative and neutral impacts (xmen vs disorder)
* Mutations and carcinogens

Hook – Show 3 video clips of real/fantasy mutations*Notes*- How do mutations happen? Basic understandingINB – Mutations notes – output – cause-effect**Activity –** Mutation – pairs get a gene mutation and they predict what the effect/outcome would be**Post**  - update INB |  |  |
| **Core:** Thinking |
| **2classes** |  | **Natural vs artificial selection****Application – agriculture****Hook –** Crash Course – Natural Selection**Activity: Follow the wheat changes** | **Assessment:** |  |
| **Core:** Personal SocialHow do my actions impact others? |
| **4classes****2 for prep****2 for present** | **Application** | **Applications of genetics – what is possible?****Inquiry project**Give hand-out.**Presentation of projects – gallery format (1/2 class each day)***\*\*maybe have ethics discussion between class time and presentation days to give more time for prep)* | **Assessment:** Inquiry project |  |
| **Core:** Thinking and communicating (using scientific language) |
| **13** | **Ethics** | **Discussions – prep and fishbowl. –** virtual discussion thread?Presenter? | **Assessment:**Student self-assessment as to Participation and ability to connect ideas**.** |  |
| **Core:** Thinking |
| **Review(1 class)****Test: One class** |  | **Review will include problems from the class****Summative test: Written test that will use information and topics discussed.** The images will be ones that they have copies of in their INB and students will be asked to explain the connections between the different concepts learned. Students will have to be able to explain how each concept we learned connects to diversity (EG – how crossover contributes to genetic diversity)Student will have to complete Punnett squares and show their ability to identify genotype, phenotype, allele and other vocab in word problems.Students will be asked to apply their understanding of Genetics to a kind o dominance that we have not discussed I class. If they are able to recognize the visual symbols we have used before and understand the vocab, they will able to complete the puzzle. |  |  |