Unit 2- Heredity: Inheritance & Variation of Traits (Life Science)

Content Area: **Science**
Course(s): **Science 8 Honors**
Time Period:
Length: **45 Days & Grade 8**
Status: **Published**

Unit 2

Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

Science Honors, Grade 8

Unit 2- Heredity: Inheritance & Variation of Traits

Belleville Board of Education

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Belleville, NJ 07109

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Unit Overview

Heredity: Inheritance & Variation of Traits

- Growth and development of organisms
- Inheritance of Traits
- Variation of Traits

Reproduction, Heredity, and Growth Module B Lesson 3

- Inheritance
- Asexual and sexual reproduction
- Plant reproduction and growth
- Animal reproduction and growth

Genetic Change and Traits (D)

- DNA
- Gene codes/sequences
- Causes of genetic change
- Mutations

Human Influence on Inheritance (D)

- Artificial Selection
- Biotechnology and Inheritance

Students should expect to learn:

- Compare and contrast sexual and asexual reproduction
- Define heredity and explore role of genes and chromosomes
- Mitosis and Meiosis
- Genotypes and phenotypes
- Predicting inheritance and probability in reproduction. How to use a Punnett Squares
- Difference between genetic disorders
- Importance of mutation
- DNA
- Artificial selection and selective breeding
- How humans influence inheritance

Enduring Understanding

- We are unique individuals as a direct result of DNA from prior generations.
- Organisms reproduce, develop, have predictable life cycles, and pass on some traits to their offspring.
- Sometimes differences between organisms of the same kind give advantages in surviving and reproducing in different environments.
- Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring.

Essential Questions

- How do living organisms pass traits from one generation to the next?
- How do organisms change as they go through their life cycles?
- In what ways are organisms of the same kind different from each other?
- How do differences aid in survival?
- How are traits and organisms passed from one generation to another?

Exit Skills

By the end of Grade 8, Science Unit 2, the student should be able to:

- Define genetic terms

- Use models to describe ways gene mutations and sexual reproduction contribute to genetic variation
- Compare and contrast sexual and asexual reproduction
- Define heredity and explain the role of genes and chromosomes in the process of inheriting a specific trait.
- Describe how cells divide to increase their numbers through the process of mitosis, and sequence the steps of mitosis
- Contrast the processes of mitosis and meiosis in relation to growth, repair, reproduction, and heredity.
- Identify the phenotype of an organism based on its genotype
- Use Punnett square to predict the probability of traits passed from parents to offspring
- Use a Punnett Square and apply
- Use ideas of genetic variation in a population to make sense of organisms surviving and reproducing, hence passing on the traits of the species.
- Describe Gregor Mendel's experiments
- Distinguish dominant and recessive traits/alleles/ and phenotypes/genotypes
- Communicate a deeper understanding of how gene structure determines differences in the functioning of organisms.
- Explain heredity and connection to allele frequency
- Interpret heredity based on Sex linked traits
- Debate the value of Genetic engineering
- Use ideas of genetic variation in a population to make sense of organisms surviving and reproducing, hence passing on the traits of the species.

New Jersey Student Learning Standards (NJSLS-S)

NextGen Science Standards

SCI.6-8.MS-LS3	Heredity: Inheritance and Variation of Traits
SCI.6-8.MS-LS3-2	Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
SCI.6-8.MS-LS3-1	Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.

Interdisciplinary Connections

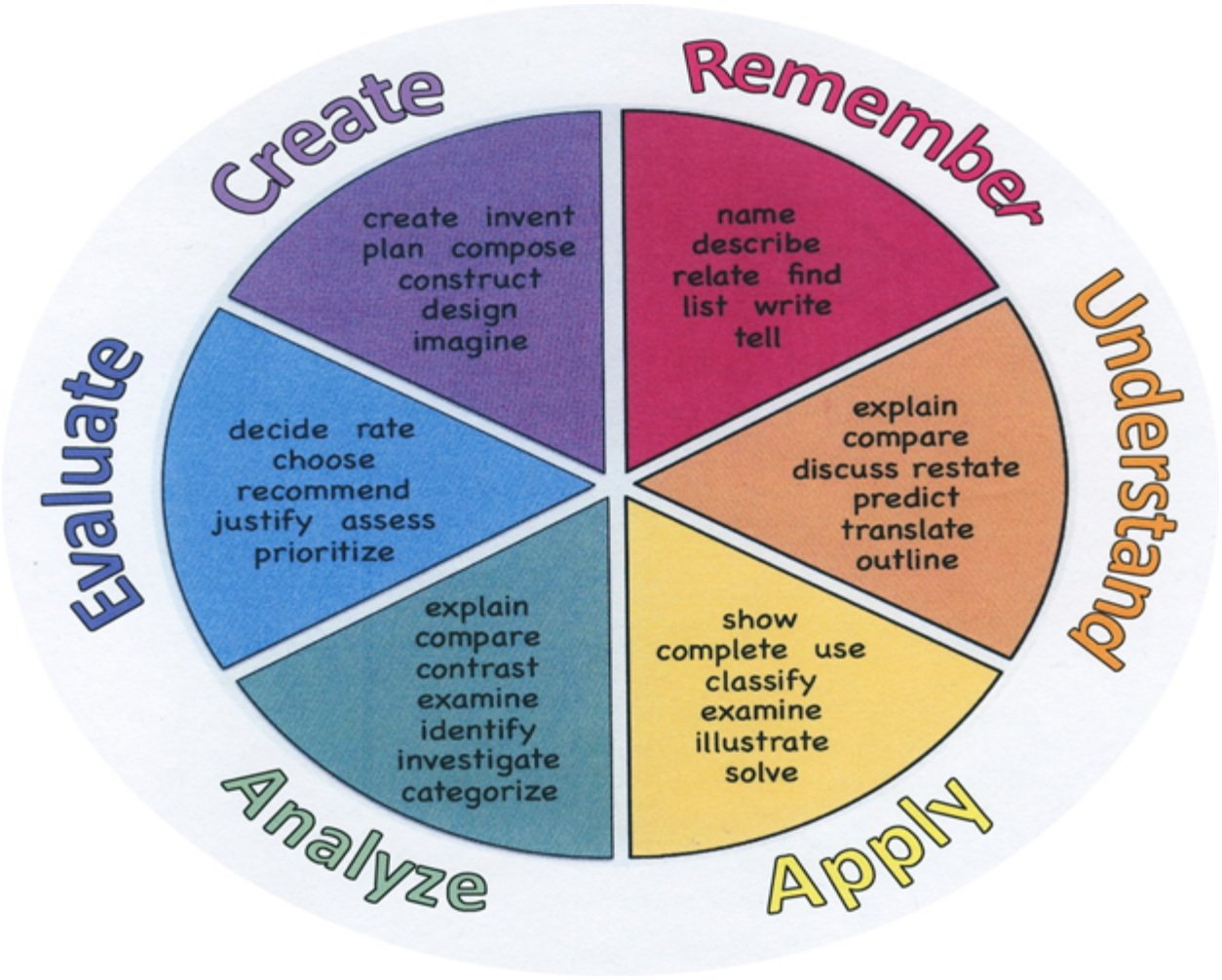
LA.RH.6-8.1	Cite specific textual evidence to support analysis of primary and secondary sources.
LA.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
LA.RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
LA.RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

Learning Objectives

Students will demonstrate the ability to:

- investigate how genetic factors influence organisms traits
- describe how asexual reproduction results in offspring with identical genetic information and how sexual reproduction results in offspring with genetic variation
- explain how genetic environmental factors affect the growth and reproduction of plants
- gather evidence and explain how an animal's behavior influences is reproductive success and survival
- use models to understand how the information in genes is used to code for specific proteins that determine traits
- investigate mutations in DNA can leave to changes in the structure of function of proteins
- independently use their learning of genetics and heredity to better evaluate how parents' genotype will be reflected in their offspring's genotype and phenotype.
- incorporate their learning of the complex nature of living organisms in order to predict if and how an organism will sustain in given situations

Remember	Understand	Apply	Analyze	Evaluate	Create
Choose	Classify	Choose	Categorize	Appraise	Combine
Describe	Defend	Dramatize	Classify	Judge	Compose
Define	Demonstrate	Explain	Compare	Criticize	Construct
Label	Distinguish	Generalize	Differentiate	Defend	Design
List	Explain	Judge	Distinguish	Compare	Develop
Locate	Express	Organize	Identify	Assess	Formulate
Match	Extend	Paint	Infer	Conclude	Hypothesize
Memorize	Give Examples	Prepare	Point out	Contrast	Invent
Name	Illustrate	Produce	Select	Critique	Make
Omit	Indicate	Select	Subdivide	Determine	Originate
Recite	Interrelate	Show	Survey	Grade	Organize
Select	Interpret	Sketch	Arrange	Justify	Plan
State	Infer	Solve	Breakdown	Measure	Produce
Count	Match	Use	Combine	Rank	Role Play
Draw	Paraphrase	Add	Detect	Rate	Drive
Outline	Represent	Calculate	Diagram	Support	Devise
Point	Restate	Change	Discriminate	Test	Generate
Quote	Rewrite	Classify	Illustrate		Integrate
Recall	Select	Complete	Outline		Prescribe
Recognize	Show	Compute	Point out		Propose
Repeat	Summarize	Discover	Separate		Reconstruct
Reproduce	Tell	Divide			Revise
	Translate	Examine			Rewrite
	Associate	Graph			Transform
	Compute	Interpolate			
	Convert	Manipulate			
	Discuss	Modify			
	Estimate	Operate			
	Extrapolate	Subtract			
	Generalize				
	Predict				



Suggested Activities & Best Practices

Family Gene Project

- Students will create their own Punnet Squares and pedigrees based on their family members. (Can be presented in the following formats: brochure, power-point, poster, video, etc.)

Research a Genetic Disorder, i.e PKU, Downs Syndrome, Cystic Fibrosis, Sickle Cell, etc

- Students will create an informational representation (Can be presented in the following formats: brochure, power-point, poster, video, etc.)

Assessment Evidence - Checking for Understanding (CFU)

Exit Ticket: Solve the Punnet sqaure for both parents being heterzygous for the Brown eyed trait (Br) (Formative)

Google Classroom Module B lesson 3&4 assessment (Summative)

• Admit Tickets (Formative)

• Compare & Contrast.(Formative)

• Create a Multimedia Poster.(Alternate)

• Define.(Formative)

• Describe.(Formative)

• Evaluate.(Formative)

• Evaluation rubrics.(Alternate)

• Exit Tickets. (Formative)

• Explaining. (Formative)

• Fist- to-Five or Thumb-Ometer. (Formative)

• Illustration. (Formative)

• Kahoot. (Formative)

• KWL Chart. (Formative)

• Question Stems. (Formative)

• Quickwrite.(Formative)

• Quizzes.(Summative)

• Self- assessments. (Alternate)

• Study Guide. (Formative)

• Teacher Observation Checklist. (Alternate

• Think, Pair, Share. (Formative)

• Unit test. (Summative)

- Admit Tickets

- Anticipation Guide
- Common Benchmarks
- Compare & Contrast
- Create a Multimedia Poster
- DBQ's
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Fist- to-Five or Thumb-Ometer
- Illustration
- Journals
- KWL Chart
- Learning Center Activities
- Multimedia Reports
- Newspaper Headline
- Outline
- Question Stems
- Quickwrite
- Quizzes
- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide
- Surveys
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Top 10 List
- Unit review/Test prep
- Unit tests
- Web-Based Assessments
- Written Reports

Primary Resources & Materials

Textbook and Dimensions supplementary materials

- HMHco workbook and Website

- Brainpop
- Laboratory materials
- NewsELA

Ancillary Resources

- Outdoor area of school
- Computer carts for research when available

Technology Infusion

https://www.brainpop.com/health/geneticsgrowthanddevelopment/heredity/

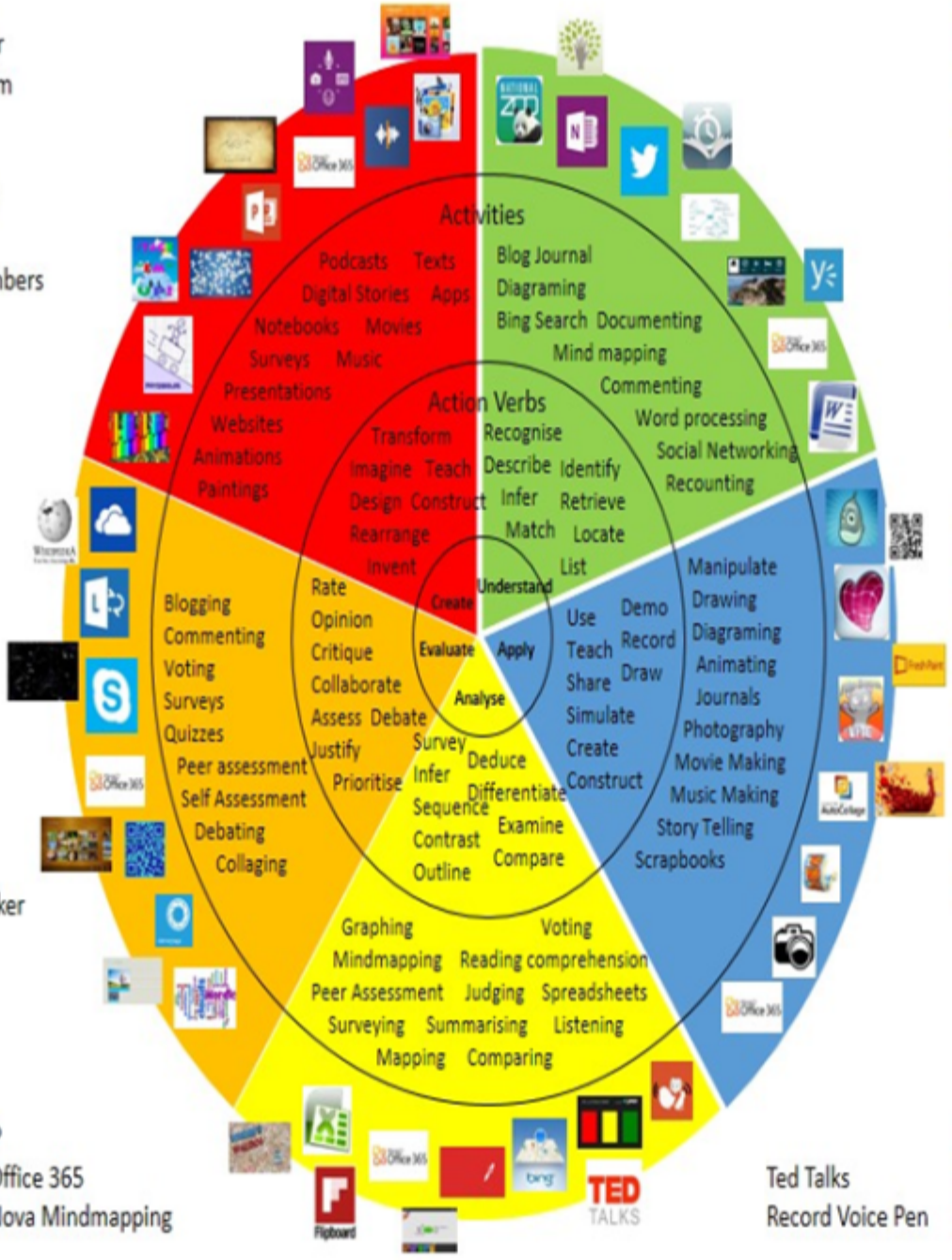
https://create.kahoot.it/details/punnett-squares/d5aef828-58e7-47b0-90ca-383924d219a0

- Smart board
- Document Camera
- Pod-casts video streams
- Discovery Education video streams
- You Tube video streams
- Brain-pop video streams
- Laptops
- Power Point presentation
- MS Word

Win 8.1 Apps/Tools Pedagogy Wheel

Podcasts
Photostory 3
Kid Story Builder
Music Maker Jam
Paint A Story
Office 365
MS PowerPoint
Stack 'Em Up
NqSquared Numbers
Physamajig
Xylophone 8

Wikipedia
Skydrive
Lync
SkyMap
Skype
Office 365
Puzzle Touch
Easy QR
Memorylage
Life Moments
Word Cloud Maker



Where's Waldo?
MS Excel
Flipboard
Office 365
Nova Mindmapping

Ted Talks
Record Voice Pen

Originally taken from http://www.coetail.com/vzimmer/files/2013/02/iPadagogy-Wheel.001.jpg
And adapted for Windows 8.1 devices by Charlotte Beckhurst @CharBeckhurst

Alignment to 21st Century Skills & Technology

- English, reading or language arts
- World languages
- Arts
- Mathematics
- Economics
- Science
- Geography
- History
- Government and Civics

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP11	Use technology to enhance productivity.
CAEP.9.2.8.B.2	Develop a Personalized Student Learning Plan with the assistance of an adult mentor that includes information about career areas of interest, goals and an educational plan.
CAEP.9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.
TECH.8.1.8	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.8.C.CS2	Communicate information and ideas to multiple audiences using a variety of media and formats.
TECH.8.1.8.F.CS3	Collect and analyze data to identify solutions and/or make informed decisions.

21st Century Skills/Interdisciplinary Themes

- Environmental Literacy.
- Financial, Economic, Business and Entrepreneurial Literacy.
- Global Awareness.
- Health Literacy
- Civic Literacy

- Communication and Collaboration
- Creativity and Innovation
- Critical thinking and Problem Solving

- ICT (Information, Communications and Technology) Literacy
- Information Literacy
- Life and Career Skills
- Media Literacy

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- Communication and Collaboration
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- Civic Literacy
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- Financial, Economic, Business and Entrepreneurial Literacy
- Global Awareness
- Health Literacy

Differentiation

- Students will create their own evidence notebook by providing enough evidence to support
- Select 3 different traits and create a punnett square with the possible phenotype outcomes.

Differentiations:

- Small group instruction
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions
- Use manipulatives
- Center-based instruction
- Study guides
- Teacher reads assessments allowed
- Rephrase written directions
- Multisensory approaches
- Additional time
- Highlight text

Lo-Prep Differentiations

- Exploration by interest
- Flexible grouping
- Goal setting with students
- Jigsaw

- Mini workshops to re-teach or extend skills
- Open-ended activities
- Think-Pair-Share

Hi-Prep Differentiations:

- Alternative formative and summative assessments
- Games and tournaments
- Group investigations
- Guided Reading
- Independent research and projects
- Interest groups
- Multiple texts
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products

Special Education Learning (IEP's & 504's)

Use of probability models to evaluate the chances of certain phenotypes

Use of Brainpop to reinforce genetics. https://www.brainpop.com/health/geneticsgrowthanddevelopment/heredity/

• printed copy of board work/notes provided

• additional time for skill mastery.

• assistive technology

• behavior management plan.

• Center-Based Instruction

• check work frequently for understanding

• computer or electronic device utilizes

• extended time on tests/ quizzes

• have student repeat directions to check for understanding

• highlighted text visual presentation

• modified assignment format

• modified test content

• modified test format

• modified test length.

• multiple test sessions.

• multi-sensory presentation

• preferential seating

• preview of content, concepts, and vocabulary.

• reduced/shortened reading assignments

• Reduced/shortened written assignments.

• secure attention before giving instruction/directions

• shortened assignments

• student working with an assigned partner.

• teacher initiated weekly assignment sheet.

• Use open book, study guides, test prototype

- printed copy of board work/notes provided
- additional time for skill mastery
- assistive technology
- behavior management plan
- Center-Based Instruction
- check work frequently for understanding
- computer or electronic device utilizes
- extended time on tests/ quizzes
- have student repeat directions to check for understanding
- highlighted text visual presentation
- modified assignment format
- modified test content
- modified test format
- modified test length
- multiple test sessions
- multi-sensory presentation
- preferential seating

- preview of content, concepts, and vocabulary
- Provide modifications as dictated in the student's IEP/504 plan
- reduced/shortened reading assignments
- Reduced/shortened written assignments
- secure attention before giving instruction/directions
- shortened assignments
- student working with an assigned partner
- teacher initiated weekly assignment sheet
- Use open book, study guides, test prototypes

English Language Learning (ELL)

Use of probability models to evaluate the chances of certain phenotypes

Use of Brainpop to reinforce
genetics. https://www.brainpop.com/health/geneticsgrowthanddevelopment/heredity/

• reducing the number of answer choices on a multiple choice test

• tutoring by peers

• using computer word processing spell check and grammar check features

• using true/false, matching, or fill in the blank tests in lieu of essay teaching key aspects of a topic. Eliminate nonessential information.

• using videos, illustrations, pictures, and drawings to explain or clarify.

• allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning

• allowing students to correct errors (looking for understanding)

• allowing the use of note cards or open-book during testing

• decreasing the amount of work presented or required

• modifying tests to reflect selected objectives

• providing study guides

• reducing or omitting lengthy outside reading assignments

- teaching key aspects of a topic. Eliminate nonessential information
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- allowing the use of note cards or open-book during testing
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using computer word processing spell check and grammar check features
- using true/false, matching, or fill in the blank tests in lieu of essay tests

At Risk

Use of probability models to evaluate the chances of certain phenotypes

Use of Brainpop to reinforce genetics. https://www.brainpop.com/health/geneticsgrowthanddevelopment/heredity/

- Allowing students to correct errors (looking for understanding).
- teaching key aspects of a topic. Eliminate nonessential information.
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards
- charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
- allowing students to select from given choices
- allowing the use of note cards or open-book during testing.
- collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to
- reflect objectives for the student, eliminate sections of the test, and determine how the grade will be
- determined prior to giving the test.
- decreasing the amount of work presented or required
- having peers take notes or providing a copy of the teacher's notes
- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments.
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using authentic assessments with real-life problem-solving
- using true/false, matching, or fill in the blank tests in lieu of essay tests
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Talented and Gifted Learning (T&G)

Project: Family Gene

- Students will create their own Punnet Squares and pedigrees based on their family members. (Can be presented in the following formats: brochure, power-point, poster, video, etc.)

Presentation: Research a Genetic Disorder, i.e PKU, Downs Syndrome, Cystic Fibrosis, Sickle Cell, etc

- Students will create an informational representation (Can be presented in the following formats: brochure, power-point, poster, video, etc.

- Allowing students to chose their own method of representation, i.e. brochure, poster, powerpoint, youtube video, etc.
- Teaching explorations sections of workbook
- Allowing students to apply concepts to real-life scenarios and how they would be affected
- Higher order, critical & creative thinking skills, and discovery
- Flexible skill grouping within a class or across grade level for rigor
- Cluster grouping
- Project-based learning for greater depth of knowledge
- Utilize exploratory connections
- Teacher-selected instructional strategies that are focused to provide challenge, engagement, and growth opportunities
- Allow students to work at a faster pace
- Multi-disciplinary unit and/or project

- Above grade level placement option for qualified students

- Advanced problem-solving
- Allow students to work at a faster pace
- Cluster grouping
- Complete activities aligned with above grade level text using Benchmark results
- Create a blog or social media page about their unit
- Create a plan to solve an issue presented in the class or in a text
- Debate issues with research to support arguments
- Flexible skill grouping within a class or across grade level for rigor
- Higher order, critical & creative thinking skills, and discovery
- Multi-disciplinary unit and/or project
- Teacher-selected instructional strategies that are focused to provide challenge, engagement, and growth opportunities
- Utilize exploratory connections to higher-grade concepts
- Utilize project-based learning for greater depth of knowledge

Sample Lesson

Unit Name: Heredity: Inheritance & Variation

NJSLS: See Link

Statement of Objective: SWDAT create a unique 'Face' by flipping a coin to determine the genotypes of their facial features and then determing the correct phenotype to draw.

Anticipatory Set/Do Now: If the sequence of bases is ATCGGA what it the complimentary Sequence? ANS: TAGCCT

Learning Activity: 1) Review do now

2) Students will work on Punnet Square Practice Sheet (circulate to check for understanding)

3) Begin 'Genetics with a Smile' worksheet

4)) Exit ticket: Create a punnet square with Parental Genotypes and possible offspring genotypes of your choosing. Make sure I can tell what the dominant and recesssive genotypes would present. i.e Freckles, blonde hair, hitchhikers thumb, etc.

Student Assessment/CFU's: Think- pair- share,

Materials: Coins, Notebooks, workbook, laptop, google classroom

Differentiation: Heterogeneous groups, visual mediums to be used for students

Integration of Technology: Laptops for google classroom for exit ticket, do now via ppt

6-8.MS-LS3-2.LS3.A.1	Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited.
6-8.MS-LS3-1.LS3.A.1	Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits.
6-8.MS-LS3-2.LS3.B.1	In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other.
6-8.MS-LS3-1.LS3.B.1	In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism.