

GRADE 8 UNIT 1 REPRODUCTION-HEREDITY-EVOLUTION

UNIT 1 – REPRODUCTION, HEREDITY & EVOLUTION (SEPUP *Our Genes, Our Selves and Evolution* Modules)

Time needed: 9 weeks

ESSENTIAL QUESTION: How does life on earth continue and adapt to environmental change?

Key Idea 1: Living things are both similar to and different from each other and from nonliving things.

Major Understandings:

- 1.2h The nervous and endocrine systems interact to control and coordinate the body’s responses to changes in the environment, and to regulate growth, development, and reproduction. Hormones are chemicals produced by the endocrine system; hormones regulate many body functions.
- 1.2i The male and female reproductive systems are responsible for producing sex cells necessary for the production of offspring.
- 1.2j Disease breaks down the structures or functions of an organism. Some diseases are the result of failures of the system. Other diseases are the result of damage by infection from other organisms (germ theory). Specialized cells protect the body from infectious disease. The chemicals they produce identify and destroy microbes that enter the body.

Key Idea 2: Organisms inherit genetic information in a variety of ways that result in continuity of structure and function between parents and offspring.

Major Understandings:

- 2.1a Hereditary information is contained in genes. Genes are composed of DNA that makes up the chromosomes of cells.
- 2.1b Each gene carries a single unit of information. A single inherited trait of an individual can be determined by one pair or by many pairs of genes. A human cell contains thousands of different genes.
- 2.1c Each human cell contains a copy of all the genes needed to produce a human being.
- 2.1d In asexual reproduction, all the genes come from a single parent. Asexually produced offspring are genetically identical to the parent.
- 2.1e In sexual reproduction typically half of the genes come from each parent. Sexually produced offspring are not identical to either parent.
- 2.2a In all organisms, genetic traits are passed on from generation to generation.
- 2.2b Some genes are dominant and some are recessive. Some traits are inherited by mechanisms other than dominance and recessiveness.
- 2.2c The probability of traits being expressed can be determined using models of genetic inheritance. Some models of prediction are pedigree charts and Punnett squares.

Key Idea 3: Individual organisms and species change over time.

Major Understandings:

- 3.1a The processes of sexual reproduction and mutation have given rise to a variety of traits within a species.

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- 3.1b Changes in environmental conditions can affect the survival of individual organisms with a particular trait. Small differences between parents and offspring can accumulate in successive generations so that descendants are very different from their ancestors. Individual organisms with certain traits are more likely to survive and have offspring than individuals without those traits.
- 3.1c Human activities such as selective breeding and advances in genetic engineering may affect the variations of species. Describe factors responsible for competition within species and the significance of that competition.
- 3.2a In all environments, organisms with similar needs may compete with one another for resources.
- 3.2b Extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient to permit its survival. Extinction of species is common. Fossils are evidence that a great variety of species existed in the past.
- 3.2c Many thousands of layers of sedimentary rock provide evidence for the long history of Earth and for the long history of changing lifeforms whose remains are found in the rocks. Recently deposited rock layers are more likely to contain fossils resembling existing species.
- 3.2d Although the time needed for change in a species is usually great, some species of insects and bacteria have undergone significant change in just a few years.

Key Idea 4: The continuity of life is sustained through reproduction and heredity.

Major Understandings:

- 4.1a Some organisms reproduce asexually. Other organisms reproduce sexually. Some organisms can reproduce both sexually and asexually.
- 4.1b There are many methods of asexual reproduction, including division of a cell into two cells, or separation of part of an animal or plant from the parent, resulting in the growth of another individual.
- 4.1c Methods of sexual reproduction depend upon the species. All methods involve the merging of sex cells to begin the development of a new individual. In many species, including plants and humans, eggs and sperm are produced.
- 4.1d Fertilization and/or development in organisms may be internal or external.
- 4.2a The male sex cell is the sperm. The female sex cell is the egg. The fertilization of an egg by a sperm results in a fertilized egg.
- 4.2b In sexual reproduction, sperm and egg each carry one-half of the genetic information for the new individual. Therefore, the fertilized egg contains genetic information from each parent.
- 4.3a Multicellular organisms exhibit complex changes in development, which begin after fertilization. The fertilized egg undergoes numerous cellular divisions that will result in a multicellular organism, with each cell having identical genetic information.
- 4.3b In humans, the fertilized egg grows into tissue which develops into organs and organ systems before birth.
- 4.3c Various body structures and functions change as an organism goes through its life cycle.
- 4.3d Patterns of development vary among animals. In some species the young resemble the adult, while in others they do not. Some insects and amphibians undergo metamorphosis as they mature.
- 4.3e Patterns of development vary among plants. In seed-bearing plants, seeds contain stored food for early development. Their later development into adulthood is characterized by varying patterns of growth from species to species.
- 4.3f As an individual organism ages, various body structures and functions change.
- 4.4a In multicellular organisms, cell division is responsible for growth, maintenance, and repair. In some one-celled organisms, cell division is a method of

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asexual reproduction.

4.4b In one type of cell division, chromosomes are duplicated and then separated into two identical and complete sets to be passed to each of the two resulting cells. In this type of cell division, the hereditary information is identical in all the cells that result.

4.4c Another type of cell division accounts for the production of egg and sperm cells in sexually reproducing organisms. The eggs and sperm resulting from this type of cell division contain one-half of the hereditary information.

4.4d Cancers are a result of abnormal cell division.

Key Idea 7: Human decisions and activities have had a profound impact on the physical and living environment.

Major Understandings:

7.2d Since the Industrial Revolution, human activities have resulted in major pollution of air, water, and soil. Pollution has cumulative ecological effects such as acid rain, global warming, or ozone depletion. The survival of living things on our planet depends on the conservation of Earth's resources.

General Skills (from NYS Core Curriculum)

GS 1. follow safety procedures in the classroom and laboratory

GS 2. safely and accurately use the following measurement tools: metric ruler, balance, graduated cylinder, thermometers, spring scale, voltmeter

GS 3. use appropriate units for measured or calculated values

GS 4. recognize and analyze patterns and trends

GS 5. classify objects according to an established scheme and a student-generated scheme

GS 6. develop and use a dichotomous key

GS 7. sequence events

GS 8. identify cause-and-effect relationships

GS 9. use indicators and interpret results

Living Environment Skills (from NYS Core Curriculum)

LE 1. Manipulate a compound microscope to view microscopic objects

LE 2. Determine the size of a microscopic object, using a compound microscope

LE 3. Prepare a wet mount slide

LE 4. Use appropriate staining techniques

LE 5. Design and use a Punnett square or a pedigree chart to predict the probability of certain traits

LE 6. Classify living things according to a student-generated scheme and an established scheme

LE 7. Interpret and/or illustrate the energy flow in a food chain, energy pyramid, or food web

LE 8. Identify pulse points and pulse rates

LE 9. Identify structure and function relationships in organisms

NOTE: Activities marked with an asterisk (*) can be omitted for time constraints, and these lesson times are not included in the week blocks.

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		<i>Title</i>	<i>Key Concepts and Processes</i>	<i>Advance Prep Notes to teachers</i>	<i>Teaching periods¹</i>	<i>Assessment</i>	<i>Alignment to NYS Core Curriculum</i>
WEEK 1	54	Investigating Human Traits Students collect data on six human characteristics and discuss causes of human variation	Genetics, gene, trait, inherited, heredity, characteristic	Need chart paper, markers, meter sticks, graph paper; copy student pages; prepare graphs	1-2	Activity: DCI-od (TG p. a-3)	LE 2.1b, 3.1a, GS 2, GS 3
	55	Plants Have Genes, Too! Students germinate seeds and use information about the parent plants to predict offspring color	Genetics, trait, inherited, offspring	Need masking tape, permanent markers, prepare seeds for distribution	1-2	AQ 2 UC (TG p. a-4)	LE 2.1a, 2.2a
	56	Joe's Dilemma After reading a fictional story about a child who may have Marfan's Syndrome, students watch a video on this genetic disease.	gene	Need blank overhead transparencies, preview and cue video	2	AQ 2 UC (TG p. a-4)	LE 2.1a, 2.2a, 2.2c,
WEEK 2	57	Copycat A reading about the differences between sexual and asexual reproduction at the cellular level.	cell, heredity, offspring, asexual & sexual reproduction, clone, fertilization, mutation		1-2		LE 2.1c, 2.1d, 2.1e,
	58*	Creature Features Students develop models to investigate the inheritance of a trait in imaginary creatures.	gene, trait, sexual reproduction, offspring, inherited, modeling, hypothesis	need chart paper, blue and orange markers; copy student sheets; prepare templates	1-2	Activity: GI (TG p. a-6)	LE 2.1e, 2.2a, 2.2c

¹ Teaching periods are based on a 45-50 minute class period. Times are estimates and actual time needed may vary.

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	59 Gene Combo Students model the inheritance of single-gene traits by analyzing data from coin tosses.	gene, inherited, fertilization, allele, dominant, random recessive, probability	need pennies; copy student sheet; small cups (optional)	1–2	Activity: DCI-od (TG p. a-3) AQ 5: UC (TG p. a-4)	LE 2.1b, 2.1e, 2.2a, 2.2c
	60 Mendel, First Geneticist Students read about Gregor Mendel’s experiments with pea plants.	gene, trait, allele, sexual reproduction, offspring, dominant, recessive, probability, random		1	AQ 1: DCI-od (TG p. a-3)	LE 2.2a, 2.2b, 2.2c, 3.1a, GS 4
WEEK 3	61 Gene Squares Students use Punnett squares to predict the approximate frequencies of traits among offspring.	allele, dominant, recessive, carrier, heterozygous, homozygous, Punnett square	copy student sheet; colored pencils (optional)	2–3		LE 2.2c, LE 5
	62 Analyzing Genetic Data Students quantify and analyze results of the seeds germinated in Activity 55.	allele, dominant, recessive, heterozygous, homozygous, mutation, trait	need plants from seeds germinated in Activity 55	1	Activity: DCI-ad (TG p. a-3) AQ 4a: UC (TG p. a-4)	LE 2.2a, 2.2b,
	63 Show Me the Genes! Students read about the behavior of chromosomes and the function of DNA during sexual reproduction.	cell, gene, allele, chromosome, DNA, fertilization, mutation, nucleus, sexual reproduction		2		LE 2.1a, 2.1b, 2.1c, 2.1e
	64* Nature and Nurture Students design an experiment to investigate the effect of the environment on seedling color.	gene, allele, trait, heredity, heterozygous, homozygous, nature vs. nurture	need masking tape, permanent markers; prepare seeds for distribution	2-3	Activity: CM (TG p. a-5) DCI-rdp (TG p. a-3) AQ 1: DCI-aid (TG p. a-3)	LE 2.2a, 2.2b, 3.1b

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WEEK 4	65	Breeding Critters-More Traits Students create imaginary critter offspring to model patterns of inheritance.	allele, chromosome, diversity, dominant, gene, recessive, trait	need pennies, colored pencils; prepare materials (e.g. cut straws); copy student sheet	2-3	AQ 8: UC (TG p. a-4)	LE 2.1e, 2.2a, 2.2b, 2.2c, 3.1a
	66	Patterns in Pedigrees Students use Punnett squares and pedigrees to analyze patterns of inheritance.	allele, trait, carrier, heterozygous, homozygous, pedigree, incomplete dominance, co-dominance	copy student sheet	2		LE 2.2a, 2.2c, LE 5
	67	What Would You Do? Students re-visit the Marfan scenario from Activity 56 and discuss the trade-offs of genetic testing.	trait, dominant, DNA, heterozygous, homozygous, mutation, probability		1-2	AQ 2: UC (TG p. a-4) AQ 3: ET-uet (TG p. a-2) CM (TG p. a-5)	LE 2.1a, 2.1b, 2.2a
	68*	Searching for the Lost Children After being introduced to a story about children lost during war, students apply blood group genetics to match parent and children.	allele, co-dominance	copy student sheets	2	Activity: UC (TG p. a-4)	LE 2.1e, 2.2a, 2.2b, 2.2c
WEEK 5	69	Evidence from DNA Students perform a DNA fingerprinting simulation to generate different-sized pieces of DNA.	DNA, DNA fingerprinting	need tape and scissors; copy student sheets	1-2		LE 2.1a

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	70 Finding the Lost Children Students use DNA fingerprints to gather additional evidence about the lost children introduced in Activity 68.	DNA, DNA fingerprinting, chromosome	need scissors; copy student sheet	1-2	AQ 2: DCI-aid (TG p. a-3)	LE 2.1a, GS 8
	71* Should We? Students learn about the work of Dr. Mary-Claire King, who helped families in Argentina find their lost children.	ethics, trade-offs, duties, goals, rights	copy student sheet	2-3	AQ 1: GI (TG p. a-6) AQ 2: ET-uet (TG p. a-2) CM	LE 2.1a, 2.1e, GS 8
	89 Here Today Gone Tomorrow Students read about extinct mammoths and modern elephants and discuss whether to save endangered elephants	Endangered species, extinct, evidence, tradeoffs		1	AQ 4 ET-uet (TG p. a-2)	LE 3.1b, 3.2a, 3.2b
WEEK 6	90 Figuring Out Fossils Students examine eight different fossils as evidence for extinct species.	Extinct, species, evidence, fossil, geological time scale	Copy student sheets	2-3	AQ 3 CM (TG p. a-5)	LE 3.2b, 3.2c
	91* Fossilized Footprints Students interpret a series of fossil footprints	Volcano, magma, landform, model, using literacy		1-2	AQ 4 UC (TG p. a-4)	LE 3.2a, 3.2c, GS 4, GS 7
	92 A Time for Change Students develop a geologic-style personal time scale and then construct a geologic time scale.	extinction, geological time scale, fossil	need rulers; copy student sheets	2-3		LE 3.2c, 3.2d, GS 3, GS 7

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WEEK 7	93	Reading the Rocks Students examine simulated drill cores in order to develop a stratigraphic column.	fossil, geological time scale, law of superposition, stratigraphic column	need rulers, scissors; copy student sheet	1-2	AQ 4: UC (TG p. a-4)	LE 3.2b, 3.2c, GS 4, GS 7
	94	A Meeting of Minds Students role-play an imaginary meeting between Charles Darwin and Jean-Baptiste Lamarck, who present and compare their theories on how evolution occurred.	species, evolution, natural selection, trait, gene, variation, adaptation	picture of a dog (optional)	1-2	AQ 3: UC (TG p. a-4) AQ 3: CM (TG p. a-5)	LE 2.2a, 3.1b
	95*	Hiding in the Background Students use colored toothpicks to model the effect of environment and predation in the process of natural selection.	evolution, natural selection, trait, variation, adaptation, competition	copy student sheet; sunglasses with green lenses (optional)	2-3	Activity: GI (TG p. a-6)	LE 2.2a, 3.1c, 3.2a, 3.2b, GS 8
WEEK 8	96	Battling Beaks Students simulate the effect of natural selection on an imaginary species of “forkbirds.”	evolution, natural selection, species, competition, trait, gene, variation, adaptation, mutation	buy Cheerios™-type cereal; break off fork tines; copy student sheet	2-3	AQ 2: DCI-aid (TG p. a-3)	2.2a, 3.1a, 3.1c, 3.2a, 3.2b, GS 8, 9
	97	Origins of Species A reading about how mutations provide the genetic variation necessary for natural selection.	evolution, natural selection, species, trait, gene, variation, adaptation, mutation		2	AQ 2: CM (TG p. a-5)	LE 2.2a, 3.1a, 3.1b, 3.1c

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	98 Family Histories Students draw and interpret graphs showing changes in the numbers of fossil families in the fish, reptile, and mammal classes over geological time.	evolution, extinction, fossil record, classification, family, class, vertebrates *Could be done as <i>homework</i> .	copy student sheet; colored pencils (optional)	2		LE 3.2b, 3.2c, 3.2d, GS 4
WEEK 9	99* A Whale of a Tale Students investigate anatomical evidence for evolution by comparing whale skeletons.	evolution, natural selection, extinction, fossil record, adaptation	copy student sheet; rulers(optional)	1-2	AQ 2: UC (TG p. a-4)	LE 2.2a, 3.1b, 3.1c, 3.2a, 3.2b, LE 9
	100a People, Birds, Bats Students act as taxonomists as they apply characteristics of five major vertebrate classes to “mystery” organisms.	introduced species, classification, kingdom, phylum, genus, species, invertebrate, vertebrate		1-2		LE 6
	100b * DNA: The Evidence Within Students investigate how DNA sequences can provide evidence for evolution.	evolution, classification, vertebrate, DNA	need scissors; copy student sheet	2-3	AQ 2: CM (TG p. a-5)	LE 2.1a
	101 Birds of a Feather? After reading about the history of the dodo bird and the common pigeon, students discuss the relationship between extinction and evolution.	natural selection, extinction, adaptation, variation, trade-offs		2-3	AQ 4: UC (TG p. a-4) AQ 5b: ET-uet (TG p. a-2)	LE 3.1a, 3.1b, 3.1c, 3.2b

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THE FOLLOWING LESSONS ARE OPTIONAL AND CAN BE FOUND IN THE SEPUP BODY WORKS UNIT						
	57a* Human Reproduction A reading about human reproduction.	Egg, embryo, fertilization, fetus, sexual reproduction, penis, vagina, zygote	Copy student sheets	1-2		LE 1.2i, 1.2i, 2.1e, 2.2a, 4.2a, 4.2b, 4.3b
	57b* Life Cycles of Animals and Plants A reading about the development of reptiles, mammals, birds, angiosperm and gymnosperm plants.	Life cycle, egg, larva, pupa, nymph, complete vs. incomplete metamorphosis, monocot, dicots, angiosperm, gymnosperm	Copy student sheets	1-2	AQ 3: UC	LE 1.2i, 3.1b, 3.1c, 3.2a, 4.1a-b, 4.1c, 4.1d, 4.3c, 4.3d, 4.3e