Unit 4 - Vertebrates (Life Science)

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Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

ZOOLOGY, GRADE 11-12

UNIT 4 - VERTEBRATES

Belleville Board of Education

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Unit Overview

Purpose of the Unit: Students will become familiar with the concept that the phylum of Chordata exhibits distinctive hallmarks- 1) dorsal, tubular nerve cord overlying 2) a supportive notochord 3) pharyngeal slits 4) endostyle for filter feeding, and 5) a post anal tail for propulsion. The further study of aquatic fish with distinctive gills, appendages, and if present in the form of fins, skin with scales of dermal origin. Fish are defined in the evolutionary sense as all vertebrates that are not tetrapods. The evolutionary transition between water to land leaves a series of alteration cumulatively fitted to vertebrate life on land. Amphibians have the only recorded transition from water to land in both their ontogeny and phylogeny. They are considered quasiterrestrial. Amphibians, with well-developed limbs, redesigned sensory and respiratory systems, and modifications of the postcranial skeleton for supporting the body in air, have completed the conquest to land. Though with the development of shell less eggs and gill-breathing larvae, they are still tied to the water for their life cycle. Students will become familiar with the concept that the vertebrate class, Aves, there are over 9000 species and outnumber all other vertebrates except fishes. These animals are known to inhabit every continent and climate. Birds unique feature that distinguishes them from all other animals are feathers. Despite over 150 million years of evolution, they have proliferated and adapted to specialized niches and ways of life. In addition to feathers, birds have forelimbs modified into wings and hind limbs specialized for walking, swimming, and perching. A bird's entire anatomy is organized around flight. They afford a rapidly adjusting digestive system to process energy-rich diets and a high pressure circulatory system and finely tuned nervous system. Culminating the study of Earth's organisms, Mammals, with their highly developed nervous system and numerous adaptations, occupy every environment on Earth that supports life. This class, Mammalia, are essentially adaptive, but have been influenced by humans along their evolutionary tract. This class will be studied from origin and evolution of structural and functional adaptations, migration, reproduction, and populations.

Enduring Understanding

• Animals have evolved over time which has led to animal diversity

• Scientists group animals based on shared characteristics

• Every species has a specific fundamental or realized niche

• Mammals and birds have evolved over time which allows for greater success in survival

• Mechanisms of speciation have led to greater diversity of vertebrates

• Every species has a specific fundamental or realized niche

Essential Questions

• How do structural differences in animals function to meet similar needs?

• How do vertebrates vary from invertebrates physiologically and anatomically?

• What characteristics influence survival rate?

Exit Skills

By the end of Unit 4 Students will know:

• The characteristics that define a vertebrate

• The differences between the two major classes of fish

• The differences between amphibians and reptiles

• The principles of evolution and classification

• The concept of species

• The evidence for evolution

• Learn skull anatomy and technical terminology

New Jersey Student Learning Standards (NJSLS-S)

NextGen Science Standards

9-12.HS-LS3-1	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
9-12.HS-LS2-7	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
9-12.HS-LS4-5	Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.
9-12.HS-LS3-2	Make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
9-12.HS-LS4-2	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
9-12.HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
9-12.HS-LS2-8	Evaluate evidence for the role of group behavior on individual and species' chances to survive and reproduce.
9-12.HS-LS4-1	Communicate scientific information that common ancestry and biological evolution are

	supported by multiple lines of empirical evidence.
9-12.HS-LS1-1	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells.
9-12.HS-LS2-6	Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
9-12.HS-LS1-4	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
9-12.HS-LS3-1.1	Asking questions and defining problems in 9-12 builds on K-8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.
9-12.HS-LS4-3.1.1	students observe patterns in systems at different scales and cite patterns as empirical evidence for causality in supporting their explanations of phenomena. They recognize classifications or explanations used at one scale may not be useful or need revision using a different scale; thus requiring improved investigations and experiments. They use mathematical representations to identify certain patterns and analyze patterns of performance in order to reengineer and improve a designed system.
9-12.HS-LS3-1.1.1	Ask questions that arise from examining models or a theory to clarify relationships.
9-12.HS-LS1-2.2	Developing and Using Models
9-12.HS-LS1-4.2.1	Use a model based on evidence to illustrate the relationships between systems or between components of a system.
9-12.HS-LS1-1.6	Constructing Explanations and Designing Solutions
9-12.HS-LS1-1.6.1	Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.
9-12.HS-LS4-2.6.1	Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.
9-12.HS-LS2-6.7.1	Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments.
9-12.HS-LS2-6.7.1	students understand much of science deals with constructing explanations of how things change and how they remain stable. They quantify and model changes in systems over very short or very long periods of time. They see some changes are irreversible, and negative feedback can stabilize a system, while positive feedback can destabilize it. They recognize systems can be designed for greater or lesser stability.
9-12.HS-LS3-2.7.1	Make and defend a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence.
9-12.HS-LS4-1.8.1	Communicate scientific information (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).
9-12.HS-LS3-1.LS1.A.1	All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins.
9-12.HS-LS1-1.LS1.A.1	Systems of specialized cells within organisms help them perform the essential functions of life.
9-12.HS-LS1-2.LS1.A.1	Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.

9-12.HS-LS1-1.LS1.A.2	All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells.
9-12.HS-LS1-4.LS1.B.1	In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism.
9-12.HS-LS2-7.LS2.C.1	Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species.
9-12.HS-LS2-8.LS2.D.1	Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives.
9-12.HS-LS3-1.LS3.A.1	Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. Not all DNA codes for a protein; some segments of DNA are involved in regulatory or structural functions, and some have no as-yet known function.
9-12.HS-LS3-2.LS3.B.1	In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation. Environmental factors can also cause mutations in genes, and viable mutations are inherited.
9-12.HS-LS3-2.LS3.B.2	Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors.
9-12.HS-LS4-1.LS4.A.1	Genetic information provides evidence of evolution. DNA sequences vary among species, but there are many overlaps; in fact, the ongoing branching that produces multiple lines of descent can be inferred by comparing the DNA sequences of different organisms. Such information is also derivable from the similarities and differences in amino acid sequences and from anatomical and embryological evidence.
9-12.HS-LS4-2.LS4.B.1	Natural selection occurs only if there is both
9-12.HS-LS4-3.LS4.B.1	Natural selection occurs only if there is both
9-12.HS-LS4-3.LS4.B.1.1	variation in the genetic information between organisms in a population and
9-12.HS-LS4-2.LS4.B.1.1	variation in the genetic information between organisms in a population and
9-12.HS-LS4-2.LS4.B.1.2	variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals.
9-12.HS-LS4-3.LS4.B.1.2	variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals.
9-12.HS-LS4-3.LS4.B.2	The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population.
9-12.HS-LS4-2.LS4.C.1	Evolution is a consequence of the interaction of four factors:
9-12.HS-LS4-6.LS4.C.1	Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species.
9-12.HS-LS4-5.LS4.C.1	Changes in the physical environment, whether naturally occurring or human induced, have

	thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species.
9-12.HS-LS4-4.LS4.C.1	Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not.
9-12.HS-LS4-3.LS4.C.1	Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not.
9-12.HS-LS4-2.LS4.C.1.1	the potential for a species to increase in number,
9-12.HS-LS4-2.LS4.C.1.2	the genetic variation of individuals in a species due to mutation and sexual reproduction,
9-12.HS-LS4-2.LS4.C.1.3	competition for an environment's limited supply of the resources that individuals need in order to survive and reproduce, and
9-12.HS-LS4-2.LS4.C.1.4	the ensuing proliferation of those organisms that are better able to survive and reproduce in that environment.
9-12.HS-LS4-5.LS4.C.2	Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' evolution is lost.
9-12.HS-LS4-3.LS4.C.2	Adaptation also means that the distribution of traits in a population can change when conditions change.
9-12.HS-LS4-6.LS4.D.1	Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value.
9-12.HS-LS2-7.LS4.D.1	Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction).
9-12.HS-LS2-7.LS4.D.2	Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value.

Interdisciplinary Connections

MA.S-ID.A	Summarize, represent, and interpret data on a single count or measurement variable

MA.S-ID.B	Summarize, represent, and interpret data on two categorical and quantitative variables
LA.RST.11-12.1	Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.
LA.RST.11-12.2	Determine the central ideas, themes, or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
MA.S-IC.A	Understand and evaluate random processes underlying statistical experiments
LA.RST.11-12.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
LA.RST.11-12.4	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 11-12 texts and topics.
MA.S-IC.B	Make inferences and justify conclusions from sample surveys, experiments, and observational studies
LA.RST.11-12.5	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
LA.RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
LA.RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
LA.RST.11-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
LA.WHST.11-12.1	Write arguments focused on discipline-specific content.
LA.WHST.11-12.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
LA.WHST.11-12.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LA.WHST.11-12.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
LA.WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
LA.WHST.11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.

Learning Objectives

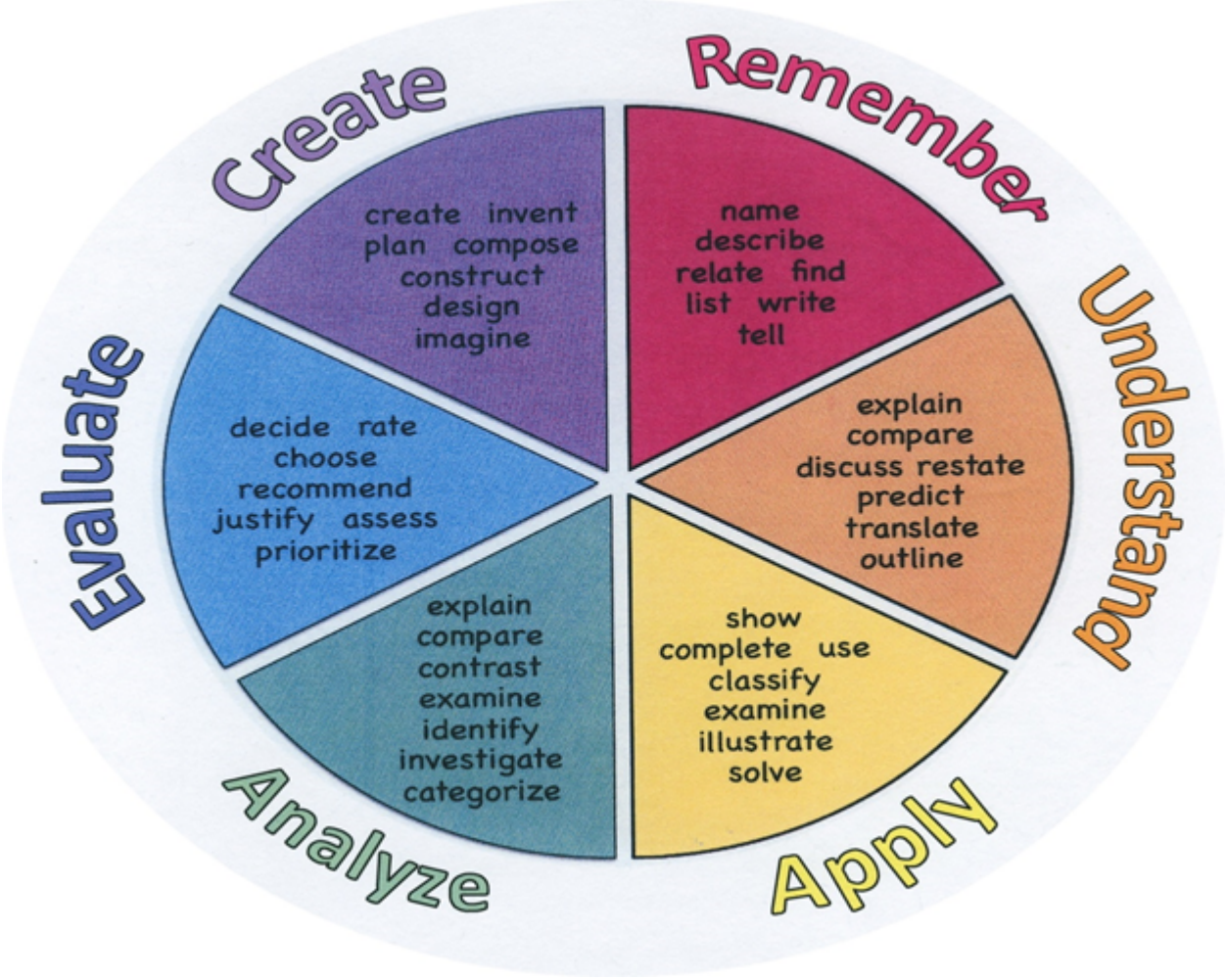
Students will be able to...

- Explain characteristics that differentiate vertebrates from invertebrates
- Compare and contrast the characteristics of fishes, amphibians, reptiles, birds and mammals
- Differentiate between the classes of vertebrates
- Explain the importance of Amphioxus
- Explain the difference between venomous and poisonous
- Apply knowledge to develop a common name for a fictitious species of mammals and apply the rules of binomial classification to provide specific evidence
- Apply concepts of micro- and macro- evolution to produce an evolutionary story for the fictitious animal
- Interpret simple data sets and make inferences and conclusions from that data
- Practice making primary observations on archaeologically observed phenomena
- Make logical arguments linking present-day observations on objects to past behaviors
- Understand the definition of domestication and the difference between captive and domestic animals
- Differentiate between observations and interpretations

Action Verbs: Below are examples of action verbs associated with each level of the Revised Bloom's Taxonomy.

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 Generalize Predict	Subtract			



Suggested Activities & Best Practices

- Crash Course Videos with associated questions
- Lab- Perch Dissection
- Lab- Dogfish Shark Dissection
- Lab- Frog Dissection
- Lab- Turtle Dissection
- Lab- Pigeon Dissection
- Lab- Fetal Pig Dissection
- Group research project - Animal Behavior
- Understanding taxonomic principles, binomial nomenclature, and cladograms

Assessment Evidence - Checking for Understanding (CFU)

Google Classroom Assignment (Formative)

QUIA Quiz (Summative)

Pear Deck (Alternate)

Lab Reports (Alternate)

Common, Department Quarterly Benchmarks (Benchmark)

Oncourse Assessment Tools (Formative)

Unit Test/Quiz (Summative)

"Do Now/Exit Ticket" Activity (Formative)

- Admit Tickets
- Compare & Contrast
- Crash Course Video Questions
- Create a Multimedia Poster
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Illustration
- Journals
- KWL Chart
- Lab- Dogfish Shark Dissection

- Lab- Fetal Pig Dissection
- Lab- Frog Dissection
- Lab- Perch Dissection
- Lab- Pigeon Dissection
- Lab- Turtle Dissection
- Multimedia Reports
- Outline
- QuarterlyBenchmarks
- Quizzes
- Self- assessments
- Study Guide
- Surveys
- Teacher Observation Checklist
- Think, Pair, Share
- Unit review/Test prep
- Unit tests
- Web-Based Assessments
- Written Reports

Primary Resources & Materials

Textbook: *Biology*, Miller and Levine

Chromebook: Online access to textbook and digital resources from *Biology,* Miller and Levine

Ancillary Resources

YouTube videos - Crash Course series with associated question worksheets

Animal models

Diagram package

Compound light microscopes

Selection of prepared slides showing properties of tissue types

Dissection kits

Various preserved animal specimens

Technology Infusion

Student-issued Chromebooks will be used to access Pearson online course materials for use in the classroom and from home

Interactive digital content available through Pearson EasyBridge will serve as in class material, at home learning, and extension activities for differentiated use

YouTube videos for lesson enhancement and differentiation (Crash Course video series with associated question worksheets0

Google Classroom will be used to disseminate course information and better communicate with students and parents beyond the classroom walls

Google Suite will be used to help drive the Google Classroom experience and better integrate it into every-day use

Prezi will be used to serve as an alternative to Google Slides or MS PowerPoint to give students an option for presentation software

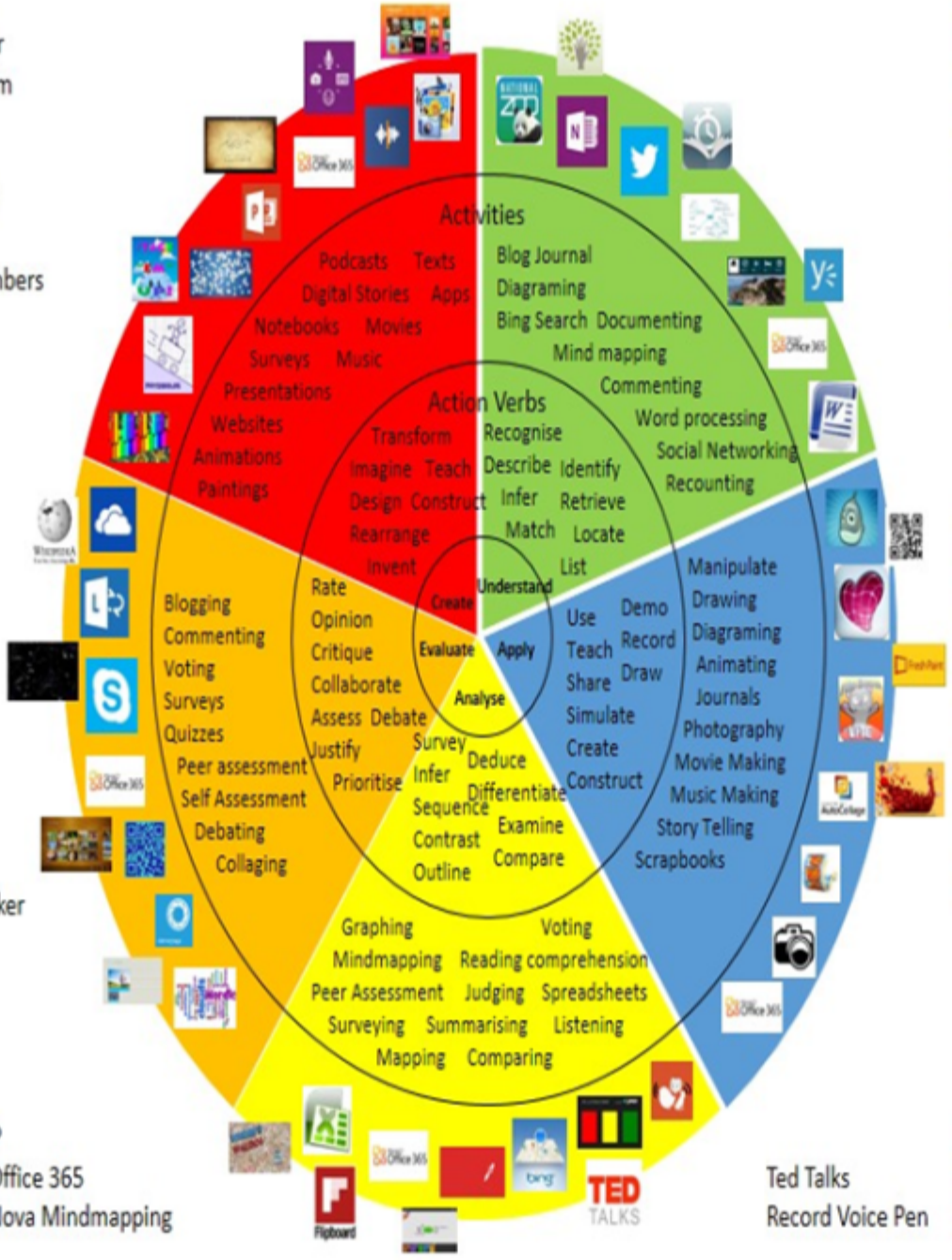
Subscription to Defined STEM website will help students make choices in their own educational journey by selecting topics they are interested in and collaborate with like-minded students in a group project

Use MS Word, Excel, PowerPoint, OneNote will help students become tech savvy as they prepare for their journey into adulthood

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 Office 365
Flipboard 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

CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP1.1	Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP5.1	Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP7.1	Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of

	problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP10.1	Career-ready individuals take personal ownership of their own education and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the pathways available to them and the time, effort, experience and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the education and experiential process, and they recognize that nearly all career paths require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP11.1	Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.
CRP.K-12.CRP12.1	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.
CAEP.9.2.12.C.1	Review career goals and determine steps necessary for attainment.
CAEP.9.2.12.C.2	Modify Personalized Student Learning Plans to support declared career goals.
CAEP.9.2.12.C.3	Identify transferable career skills and design alternate career plans.
TECH.8.1.12	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.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.A.1	Create a personal digital portfolio which reflects personal and academic interests, achievements, and career aspirations by using a variety of digital tools and resources.
TECH.8.1.12.A.3	Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue.
TECH.8.1.12.A.CS2	Select and use applications effectively and productively.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.1.12.B.2	Apply previous content knowledge by creating and piloting a digital learning game or tutorial.
TECH.8.1.12.B.CS1	Apply existing knowledge to generate new ideas, products, or processes.
TECH.8.1.12.B.CS2	Create original works as a means of personal or group expression.
TECH.8.1.12.C	Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
TECH.8.1.12.C.CS1	Interact, collaborate, and publish with peers, experts, or others by employing a variety of digital environments and media.

TECH.8.1.12.C.CS2	Communicate information and ideas to multiple audiences using a variety of media and formats.
TECH.8.1.12.C.CS4	Contribute to project teams to produce original works or solve problems.
TECH.8.1.12.D	Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
TECH.8.1.12.D.1	Demonstrate appropriate application of copyright, fair use and/or Creative Commons to an original work.
TECH.8.1.12.D.CS1	Advocate and practice safe, legal, and responsible use of information and technology.
TECH.8.1.12.D.CS2	Demonstrate personal responsibility for lifelong learning.
TECH.8.1.12.E	Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.
TECH.8.1.12.E.CS2	Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
TECH.8.1.12.E.CS3	Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.
TECH.8.1.12.E.CS4	Process data and report results.
TECH.8.1.12.F	Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
TECH.8.1.12.F.CS1	Identify and define authentic problems and significant questions for investigation.
TECH.8.1.12.F.CS2	Plan and manage activities to develop a solution or complete a project.
TECH.8.1.12.F.CS3	Collect and analyze data to identify solutions and/or make informed decisions.

21st Century Skills/Interdisciplinary Themes

- 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

21st Century Skills

- Civic Literacy
- Environmental Literacy
- Global Awareness

Differentiation

Students will be arranged in groups based on results of multiple intelligence surveys and behavioral analysis to allow for collegial collaboration in the classroom.

Students will participate in review games each section using the Kahoot! platform and their Chromebboks to help solidify each section's learning activities.

Students will utilize the Pearson online module to have access to the digital textbook and the alternate versions of the textbook as needed to adjust to the students' current reading levels.

Differentiations:

- Small group instruction
- Small group assignments
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions
- Use manipulatives
- Study guides
- Teacher reads assessments allowed
- Rephrase written directions
- Multisensory approaches
- Additional time
- Preview vocabulary
- Preview content & concepts
- Story guides
- Behavior management plan
- Highlight text
- Student(s) work with assigned partner
- Visual presentation
- Small group setting

Hi-Prep Differentiations:

- Alternative formative and summative assessments
- Games and tournaments
- Group investigations
- Guided Reading
- Independent research and projects
- Interest groups
- Leveled rubrics
- Literature circles
- Multiple intelligence options
- Multiple texts

- Project-based learning
- Problem-based learning
- Tiered activities/assignments
- Varying organizers for instructions

Lo-Prep Differentiations

- Choice of books or activities
- Exploration by interest
- Flexible grouping
- Goal setting with students
- Mini workshops to re-teach or extend skills
- Open-ended activities
- Think-Pair-Share
- Varied supplemental materials

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

Students with IEP's or 504's will be granted the following accommodations (as examples, but not limited to additional accommodations as deemed necessary):

- additional time will be granted to students with special needs to complete all dissection activities in the Unit (as listed in above recommended activities) either before or after school

- standardized chapter/unit tests will be modified in OnCouse Connect to limit answer choices and simplify vocabulary as necessary for better understanding and facility of use

- in the dissection laboratory exercises, students with special needs will be offered an abbreviated procedure to accommodate their levels of understanding

- printed copy of board work/notes provided
- additional time for skill mastery
- behavior management plan
- 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
- multi-sensory presentation
- multiple test sessions
- 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)

To assist ELL students, the following are examples of modifications to instruction (including, but limited to):

-ELL students will be paired with students who are bilingual to assist in translation of English to the students' native language to ease the transition into the exclusive use of English in the classroom setting

-ELL students will be offered videos or illustrations of laboratory procedures to facilitate the understanding of those procedures (ex. pictures of the dissection specimens with labels in two languages)

-ELL students will be offered the Biology textbook written in Spanish, if they are a native Spanish speaker, which aligns to the English-language version of the textbook to facilitate translations and understanding

- teaching key aspects of a topic. Eliminate nonessential information
- using videos, illustrations, pictures, and drawings to explain or clarif
- 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 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

To assist At Risk students, the following are examples of modifications to instruction (including, but limited to):

-students will be presented with a streamlined curriculum removing non-essential information for ease of understanding

-Pearson EasyBridge multisensory lessons can be emplyed to facilitate knowledge

-At Risk students will be allowed to take tests open book

- 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 workpresented 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
- using videos, illustrations, pictures, and drawings to explain or clarify

Talented and Gifted Learning (T&G)

To assist T&G students, the following are examples of modifications to instruction (including, but limited to):

-students can research dinosaurs and compare them to modern-day reptiles

-students can perform additional procedures during pig dissection to model what an autopsy would look like

-students can research animal behavior and present finding to the class

- 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 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