GCS Curriculum Map for GCHS Biology
(Modules 1-4)

Semester at a Glance
PACING GUIDE

Module	1	2	3	4	
Unit Title	**Unit 1: Cytology**	**Unit 2: Macromolecules**	**Unit 3: Protein Synthesis and Cell Division**	**Unit 4: Genetics**	**Modules 5-7**
Time Frame	**BIO.1.4 (3 days) BIO.1.3 (4 days) BIO.3.3 (2 days) BIO.3.1 (2 days)**	**BIO.1.1 (4 days) BIO.1.2 (2 days)**	**BIO.1.5 (4 days) BIO.2.1 (2 days) BIO.2.2 (2 days)**	**BIO.6.1 (2 days) BIO.6.2 (3 days) BIO.7.1 (3 days) BIO.7.3 (3 days) BIO.7.2 (3 days)**	
Standards	**BIO.1 & BIO.3**	**BIO.1**	**BIO.1 & BIO.2**	**BIO.6 & BIO.7**	
ELD Standards	**ELD-SC.9-12.Explain.Expressive ELD-SC.9-12.Argue.Expressive**	**ELD-SC.9-12.Explain.Expressive ELD-SC.9-12.Argue.Expressive**	**ELD-SC.9-12.Explain.Expressive ELD-SC.9-12.Argue.Expressive**	**ELD-SC.9-12.Explain.Expressive ELD-SC.9-12.Argue.Expressive**	
Essential Questions	**• During observation I saw that the differences between prokaryotes and eukaryotes are_____. • When considering this current scientific topic, it is important to examine**	**• The data provided about the four macromolecules _____, _____, _____, _____ shows that they are essential for life because they _____. • During the**	**• The solution to determining the amino acids that code for a specific protein is _____. • Based on the principle of cell division, we can infer that this process is essential for _____.**	**• The model of meiosis shows the phases _____, which are essential in sexual reproduction because _____. • We can predict the variables and possibilities that can come from cross**	

	homeostasis through _____.	**experiment I saw how an enzyme acted as a _____ in a biochemical reaction by observing _____.**		**breeding using _____. These can be associated with these types of inheritance _____.**	
Performance Events	**CLICK HERE**	**CLICK HERE**	**CLICK HERE**	**CLICK HERE**	

Unit 1: Cytology **Essential Questions:** ● During observation I saw that the differences between prokaryotes and eukaryotes are_____. ● When considering this current scientific topic, it is important to examine homeostasis through _____.	**Timeline:** 3 weeks
Performance Event: CLICK HERE	
SWBAT: (Mastery Objectives) Students will be able to: ● Identify prokaryotic and eukaryotic cells based on their differences ● Construct a model of a cell including organelles and their functions within the cell ● Identify the products and reactants in photosynthesis ● Determine if photosynthesis is aerobic or anaerobic respiration ● Demonstrate how cellular respiration converts chemical energy into ATP ● Explain homeostasis through describing cell transport and diffusion of molecules across the cell membrane ● Identify environmental conditions that would affect homeostasis such as heart rate, temperature, and moisture	

Vertical Alignment		
Previous Grade Level Standards	**Grade Level Standards**	**Next Grade Level Standards**
LS.7.1 Understand the processes, structures and functions of living organisms that enable them to survive, reproduce and carry out the basic	**LS.Bio.1 Analyze how the relationship between structure and function supports life processes within organisms.** ● LS.Bio.1.4 Construct explanations to compare	**Not Applicable**

functions of life.	prokaryotic and eukaryotic cells in terms of structures and degree of complexity. ● LS.Bio.1.3 Use models to explain how the structure of organelles determines its function and supports overall cell processes. **LS.Bio.3 Analyze the relationship between biochemical processes and energy use.** ● LS.Bio.3.3 Use models to illustrate how cellular respiration [aerobic and anaerobic] transforms chemical energy into ATP. ● LS.Bio.3.1 Carry out investigations to explain how homeostasis is maintained through feedback mechanisms.	
Instructional Resources		
Tier III Vocabulary: ● Prokaryotic/prokaryote ● Eukaryotic/eukaryote ● Animal ● fungi ● Protist ● membrane-bound ● chromosome (linear) ● plasmid (circular) ● Membrane ● cell size ● complexity ● cell ● Nucleus ● Organelle ● plasma membrane ● cell wall ● chloroplast ● Cilia ● Cytoplasm,	**Performance Tasks:** ● **Cell City Activity** ● **Cell Transport Mini-Project**	**Additional Resources:** ● Khan Academy Videos ● EdPuzzle Videos (Cells, Cell Organelles, Prokaryotes vs. Eukaryotes, Stem cells, etc.) ● Biology Materials folder ● Scientific Method Helicopter Lab ● Stations Activities

• Cytoskeleton • endoplasmic reticulum (smooth/rough) • Vesicles • Flagella • Golgi apparatus • Lysosome • Mitochondria • Ribosome • Vacuole • Chlorophyll • Microscope • Homeostasis • Phospholipid • selective permeability • transport proteins • Structure • function • Stability • Homeostasis • Balance • Temperature • pH • Regulation • feedback mechanism • feedback loop • active transport • passive transport • Diffusion • osmosis • concentration gradient • ATP • cell membrane • Semipermeable • Solute • solvent		

• Molecules • Particles • Equilibrium • Stimulus • Response • Input • Output • external environment • internal environment • pump • matter cycling • energy flow • cellular respiration • aerobic respiration • anaerobic respiration • Fermentation • lactic acid • alcohol • Mitochondria • Carbohydrates • Glucose • Water • Oxygen • carbon dioxide • ATP • Reactants • Products • chemical reaction • Heterotroph • Enzyme • Bonds • Molecule • Photosynthesis • Glycogen • starch		

Remediation Skills, Extensions and Considerations:

Remediation:
- Additional foldable of cell organelles
- Cell organelle card sort
- Photosynthesis and Cellular Respiration Science Reading Comprehension

Extensions:
- Cell organelle stations

Considerations:
Students struggle with:
- Prokaryote vs Eukaryote and understanding the differences in complexity, specifically which contains a nucleus and which does not.
- Remembering the functions of each organelle within the cell.
- The makeup of the cell membrane.
- The differences in the types of cell transport.
- The differences between stimulus and response.

ELD Standard 1: Social and Instructional Language *Multilingual Learners communicate for Social and Instructional purposes within the school setting.*

ELD-SI.4-12.Narrate
● Identify and raise questions about what might be unexplained, missing, or left unsaid

ELD-SI.4-12.Inform
● Describe the parts and wholes of a system
● Sort, clarify, and summarize relationships

ELD-SI.4-12.Explain
● Generate and convey initial thinking
● Follow and describe cycles and sequences of steps or procedures and their causes and effects
● Compare changing variables, factors, and circumstances
● Offer alternatives to extend or deepen awareness of factors that contribute to particular outcomes
● Act on feedback to revise understandings of how or why something is or works in particular ways

ELD-SI.4-12.Argue
● Generate questions about different perspectives
● Clarify and elaborate ideas based on feedback

● Refine claims and reasoning based on new information or evidence
ELD Standard 4: Language for Science *Multilingual Learners communicate information, ideas, and concepts necessary for academic success in the content area of Science.* **ELD-SC.9-12.Explain.Expressive Construct scientific explanations that:** ● Describe reliable and valid evidence from multiple sources about a phenomenon ● Establish neutral or objective stance in how results are communicated ● Develop reasoning to illustrate and/or predict the relationships between variables in a system or between components of a system ● Summarize and refine solutions referencing scientific knowledge, evidence, criteria, and/or trade-offs **ELD-SC.9-12.Argue.Expressive Construct scientific arguments that:** ● Introduce and contextualize topic/phenomenon in current scientific or historical episodes in science ● Defend or refute a claim based on data and evidence ● Establish and maintain an appropriate tone and stance (neutral/objective or biased/subjective) ● Signal logical relationships among reasoning, evidence, data, and/or models when making and defending a claim, counterclaim, and/or rebuttal.
LIS STRATEGIES (Targeted Strategies per lesson identified in Canvas)

<table>
<tr><td colspan="2">Unit 2: Macromolecules
Essential Questions:
● The data provided about the four macromolecules _____, _____, _____, _____ shows that they are essential for life because they _____.
● During the experiment I saw how an enzyme acted as a _____ in a biochemical reaction by observing _____.</td><td>Timeline: 1.5 weeks</td></tr>
<tr><td colspan="3">Performance Event: CLICK HERE</td></tr>
<tr><td colspan="3">SWBAT: (Mastery Objectives)
Students will be able to:
● Identify lipids, proteins, carbohydrates, and nucleic acids based on their basic structure and functions
● Describe how each of the four macromolecules are essential for life
● Provide examples of each of the four macromolecules
● Demonstrate how enzymes are a catalyst for biochemical reactions
● Identify the enzyme, substrate, and product in an enzyme diagram
● Explain environmental factors such as pH, temperature, and concentration</td></tr>
<tr><td colspan="3">Vertical Alignment</td></tr>
<tr><td>Previous Grade Level Standards</td><td>Grade Level Standards</td><td>Next Grade Level Standards</td></tr>
<tr><td>LS.7.1 Understand the processes, structures and functions of living organisms that enable them to survive, reproduce and carry out the basic functions of life.</td><td>LS.Bio.1 Analyze how the relationship between structure and function supports life processes within organisms.
● LS.Bio.1.1 Construct an explanation to illustrate relationships between structure and function of major macromolecules essential for life.
● LS.Bio.1.2 Carry out investigations to illustrate how enzymes act as catalysts for biochemical reactions and how environmental factors affect enzyme activity.</td><td>Not Applicable</td></tr>
<tr><td colspan="3">Instructional Resources</td></tr>
<tr><td>Tier III Vocabulary:
● Monomer
● Polymer
● Carbohydrate</td><td>Performance Tasks:
● Macromolecules and Disorders Poster
● Macromolecules and Unkowns Lab</td><td>Additional Resources
● Khan Academy Videos
● EdPuzzle Videos (Macrmolecules)
● Biology Materials folder
● Stations Activities</td></tr>
</table>

• Monosaccharide • Polysaccharide • Protein • amino acid • Polypeptide • Lipid • nucleic acid • Metabolism • Acid • Base • pH • Homeostasis • elements (C,H,O,N,P) • Catalyst • Glucose • Cellulose • Phospholipid • RNA • DNA • Enzyme • Protein • Catalyst • activation energy • Reactants • Products • Denature • Temperature • pH • Buffer • Substrate • active site • enzyme-substrate complex • specificity (substrate to enzyme) • Homeostasis • Structure		

● function		

Remediation Skills, Extensions and Considerations:

Remediation:
- Macromolecules organizer
- Enzyme-substrate complex cut and paste
- Macromolecules guided reading comprehension

Extensions:
- Macromolecules stations activity

Considerations:
Students struggle with:
- Understanding the difference between monomer and polymer
- Identifying each macromolecule based on examples

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ELD-SI.4-12.Narrate
● Connect stories with images and representations to add meaning
● Identify and raise questions about what might be unexplained, missing, or left unsaid

ELD-SI.4-12.Inform
● Sort, clarify, and summarize relationships
● Summarize most important aspects of information

ELD-SI.4-12.Explain
● Generate and convey initial thinking
● Follow and describe cycles and sequences of steps or procedures and their causes and effects
● Compare changing variables, factors, and circumstances

ELD-SI.4-12.Argue
● Support or challenge an opinion, premise, or interpretation
● Clarify and elaborate ideas based on feedback
● Refine claims and reasoning based on new information or evidence

ELD Standard 4: Language for Science *Multilingual Learners communicate information, ideas, and concepts necessary for academic success in the*

content area of Science.

ELD-SC.9-12.Explain.Expressive Construct scientific explanations that:
- Describe reliable and valid evidence from multiple sources about a phenomenon
- Establish neutral or objective stance in how results are communicated
- Develop reasoning to illustrate and/or predict the relationships between variables in a system or between components of a system
- Summarize and refine solutions referencing scientific knowledge, evidence, criteria, and/or trade-offs

ELD-SC.9-12.Argue.Expressive Construct scientific arguments that:
- Introduce and contextualize topic/phenomenon in current scientific or historical episodes in science
- Defend or refute a claim based on data and evidence
- Establish and maintain an appropriate tone and stance (neutral/objective or biased/subjective)
- Signal logical relationships among reasoning, evidence, data, and/or models when making and defending a claim, counterclaim, and/or rebuttal.

LIS STRATEGIES (Targeted Strategies per lesson identified in Canvas)

Unit 3: Protein Synthesis and Cell Division **Essential Questions:** ● The solution to determining the amino acids that code for a specific protein is _____. ● Based on the principle of cell division, we can infer that this process is essential for _____.	**Timeline:** 2 weeks

Performance Event: CLICK HERE

SWBAT: (Mastery Objectives)

Students will be able to:

- Describe the structure, function, and location of DNA and RNA
- Summarize DNA replication to include the three steps, unwinding, base pairing, and joining
- Explain protein synthesis in the correct order using transcription and translation
- Identify the role of mRNA, rRNA, and tRNA in protein synthesis
- Transcribe and translate DNA making amino acid chains
- Use a amino acid chains and a Codon Chart to find the appropriate proteins
- Illustrate how cellular division results in reproduction, growth, and repair of organisms
- Use a diagram to identify the phases of mitosis
- Explain that proteins regulate gene expression that results in cellular differentiation
- Identify specialized cells and their specific functions
- Describe how problems in replication can cause uncontrolled cell growth

Vertical Alignment

Previous Grade Level Standards	Grade Level Standards	Next Grade Level Standards
LS.7.2 Understand the relationship of the mechanisms of reproduction, patterns of inheritance, and potential variation among offspring.	**LS.Bio.1 Analyze how the relationship between structure and function supports life processes within organisms.** ● LS.Bio.1.5 Construct an explanation to summarize how DNA and RNA direct the synthesis of proteins. **LS.Bio.2 Analyze the growth and development processes of organisms.** ● LS.Bio.2.1 Use models to illustrate how cellular division results in the reproduction, growth, and repair of organisms. ● LS.Bio.2.2 Construct an explanation to illustrate that proteins regulate gene	**Not Applicable**

	expression resulting in cellular differentiation, specialized cells with specific functions, and uncontrolled cell growth.	
Instructional Resources		
Tier III Vocabulary: ● DNA ● RNA ● Protein ● amino acid ● double helix ● nitrogenous base ● Adenine ● Guanine ● Cytosine ● Thymine ● Uracil ● Deoxyribose ● Ribose ● Phosphate ● hydrogen bond ● Template ● Transcription ● Translation ● mRNA ● tRNA ● cell ● Nucleus ● Ribosome ● Nucleotide ● base pair ● peptide/polypeptide ● Codon ● Sequence ● Expression	**Performance Tasks:** ● **Transcription and Translation Activities** ● **Popplet/Thinking Map Activity** ● **Alien Genetics Activity** ● **Mutations (Sesame Street Video)** ● **DNA Extraction Lab**	**Additional Resources** ● Khan Academy Videos ● EdPuzzle Videos (DNA, RNA, DNA and RNA,Enzymes, Mutations, Mitosis, etc.) ● Amoeba Sisters Videos ● Biology Materials folder ● Bill Nye Genes!

• Chromosome • gene • Mitosis • Growth • Maintenance • cell cycle • cell signaling • DNA replication • Chromosomes • Diploid • Haploid • identical • Multicellular • Nucleus • daughter cell • parent cell • DNA • Tissue • Organ • asexual reproduction • somatic or body cells • Interphase • Growth 1 • Synthesis • DNA replication • Growth 2 • Mitosis • Prophase • Metaphase • Anaphase • Telophase • Cytokinesis • binary fission • Mitosis • stem cell • Differentiation		

• Signaling • cell cycle • DNA/gene expression • Protein • DNA replication • Chromosomes • Checkpoints • Mutation • Identical • Multicellular • Nucleus • daughter cell • parent cell • specialized cell • cell function • Tissue • Organ • System • Cancer • Benign • Malignant • Metastasize • Growth • Tumor		

Remediation Skills, Extensions and Considerations:

Remediation:
- Transcription and translation matching
- Transcription and translation model
- Meiosis foldable
- Meiosis label and coloring sheet

Extensions:
- DNA/RNA puzzle to practice transcription and translation

Considerations:

Students struggle with:

- Pairing DNA vs pairing RNA. They need to remember that Thymine is only found in DNA and Uracil in RNA.
- Understanding that somatic and body cells are the same thing.
- The difference between haploid and diploid

ELD Standard 1: Social and Instructional Language *Multilingual Learners communicate for Social and Instructional purposes within the school setting.*

ELD-SI.4-12.Narrate

- Identify and raise questions about what might be unexplained, missing, or left unsaid
- Recount and restate ideas to sustain and move dialogue forward
- Create closure, recap, and offer next steps

ELD-SI.4-12.Inform

- Define and classify facts and interpretations; determine what is known vs. unknown
- Report on explicit and inferred characteristics, patterns, or behavior
- Describe the parts and wholes of a system
- Sort, clarify, and summarize relationships
- Summarize most important aspects of information

ELD-SI.4-12.Explain

- Generate and convey initial thinking
- Follow and describe cycles and sequences of steps or procedures and their causes and effects
- Compare changing variables, factors, and circumstances
- Offer alternatives to extend or deepen awareness of factors that contribute to particular outcomes
- Act on feedback to revise understandings of how or why something is or works in particular ways

ELD-SI.4-12.Argue

- Support or challenge an opinion, premise, or interpretation
- Clarify and elaborate ideas based on feedback
- Evaluate changes in thinking, identifying trade-offs
- Refine claims and reasoning based on new information or evidence

ELD Standard 4: Language for Science *Multilingual Learners communicate information, ideas, and concepts necessary for academic success in the content area of Science.*

ELD-SC.9-12.Explain.Expressive Construct scientific explanations that:

- Describe reliable and valid evidence from multiple sources about a phenomenon

- Establish neutral or objective stance in how results are communicated
- Develop reasoning to illustrate and/or predict the relationships between variables in a system or between components of a system
- Summarize and refine solutions referencing scientific knowledge, evidence, criteria, and/or trade-offs

ELD-SC.9-12.Argue.Expressive Construct scientific arguments that:
- Introduce and contextualize topic/phenomenon in current scientific or historical episodes in science
- Defend or refute a claim based on data and evidence
- Establish and maintain an appropriate tone and stance (neutral/objective or biased/subjective)
- Signal logical relationships among reasoning, evidence, data, and/or models when making and defending a claim, counterclaim, and/or rebuttal.

LIS STRATEGIES (Targeted Strategies per lesson identified in Canvas)

Unit 4: Genetics **Essential Questions:** ● The model of meiosis shows the phases _____, which are essential in sexual reproduction because _____. ● We can predict the variables and possibilities that can come from cross breeding using _____. These can be associated with these types of inheritance _____.	**Timeline:** 3 weeks

Performance Event: CLICK HERE

SWBAT: (Mastery Objectives)

Students will be able to:

- Use models to explain how DNA is passed from parents to offspring through the steps of meiosis
- Identify oogenesis and spermatogenesis while also identifying the number of chromosomes passed by each
- Explain the phases of meiosis through identifying changes to structures within the cell during each phase
- Describe the importance of only sharing half of the genetics from each parent in fertilization and sexual reproduction
- Explain how new genetic combinations during meiosis result in genetic variations that can be inherited
- Identify possible mutations that may result during the replication process of meiosis
- Describe how mutations caused by environmental factors differ from mutations that may happen during meiosis
- Identify genetic crosses to build Punnett Squares based on parent chromosomes
- Predict the percentage of offspring that might result from that particular cross
- Identify and describe genetic crosses associated with mendelian inheritance, codominance, incomplete dominance, multiple alleles, and sex-linked inheritance
- Summarize how traits result from interactions of genetic factors such as alleles or multiple alleles
- Explain how environmental factors may impact traits
- Analyze and interpret data that explains why polygenic traits will result in a wide range of phenotypes

Vertical Alignment

Previous Grade Level Standards	Grade Level Standards	Next Grade Level Standards
LS.7.2 Understand the relationship of the mechanisms of reproduction, patterns of inheritance, and potential variation among offspring.	**LS.Bio.6 Understand genetic mechanisms for variation.** ● LS.Bio.6.1 Use models to explain how DNA is passed from parents to offspring through the processes of meiosis and fertilization in sexual reproduction. ● LS.Bio.6.2 Construct an explanation to summarize how inheritable genetic variations may result from: new genetic combinations in meiosis,mutations during replication, or mutations caused by environmental factors.	**Not Applicable**

	LS.Bio.7 Understand types of inheritance and how the environment can influence traits. ● LS.Bio.7.1 Use mathematics and computational thinking to predict the variation and distribution of expressed traits based on: Mendelian inheritance, co-dominance, incomplete dominance, multiple alleles, and sex-linked inheritance. ● LS.Bio.7.2 Analyze and interpret data to explain how polygenic traits result in a wide range of phenotypes. ● LS.Bio.7.3 Construct an explanation to summarize how traits result from interactions of genetic factors (multiple genes and/or alleles) and environmental factors.	
Instructional Resources		
Tier III Vocabulary: ● independent assortment ● crossing over ● Recombination ● homologous, chromosome ● Chromatin ● Centromere ● Centriole ● sister chromatids ● equator (metaphase plane) ● spindle fibers ● Diploid ● Haploid ● Meiosis I ● Meiosis II ● Fertilization ● sexual reproduction	**Performance Tasks:** ● **Meiosis StopMotion Video** ● **Design a Minion Activity** ● **Case Study: Old Kentucky Blues** ● **Case Study: Sickness and Health** ● **Genetic Disorders Presentation**	**Additional Resources** ● Khan Academy Videos ● EdPuzzle Videos (Meiosis, Gregor Mendel, Sex-Linked Traits, Codominance, Incomplete Dominance, Pedigrees, etc.) ● Amoeba Sisters Videos ● Biology Materials folder ● Genetics Vocabulary

• Nondisjunction • chromosomal condition • Karyotype • body cells (somatic) • sex cells (gametes: sperm-male; egg- female) • XX • XY • zygote • Mutation • Error • DNA replication • radiation exposure • chemical exposure • Meiosis • Gene • amino acid • Transcription • Translation • Gamete • Sperm • Egg • body cell • Variation • Allele • chromosomal condition • Parent • Offspring • Pattern • phenotype • genotype, homozygous • heterozygous • dominant, recessive • monohybrid cross • Punnett square • pedigree		

• inheritance, codominance • incomplete dominance • alleles • sex-linked inheritance • trait • probability • blood type • ratio • percentage • Parent • offspring • Pattern • Phenotype • Genotype • Inheritance • multiple genes • Polygenic • independent assortment • gene expression • Trait • Probability • bell-shaped distribution • bell curve • Frequency • spectrum (variety) • Genes • environment • Twins • Disease • Diet • Nutrition • Stress • Height • gene expression • Exercise • protein production		

● cellular differentiation ● Hormones ● tropism		

Remediation Skills, Extensions and Considerations:

Remediation:
- Matching vocabulary and definition interactive notebook activity
- Build a meiosis diagram
- Meiosis foldable
- Punnett square card sort
- Punnett square practice worksheet

Extensions:
- Movie: GATTACA - with discussion questions

Considerations:
Students struggle with:
- The difference between genotype and phenotype
- Identifying heterozygous vs homozygous, dominant and recessive
- Moving from basic Mendelian inheritance to more complex inheritance such as X-Linked and blood types

ELD Standard 1: Social and Instructional Language *Multilingual Learners communicate for Social and Instructional purposes within the school setting.*

ELD-SI.4-12.Narrate
● Share ideas about one's own and others' lived experiences and previous learning
● Identify and raise questions about what might be unexplained, missing, or left unsaid

ELD-SI.4-12.Inform
● Define and classify facts and interpretations; determine what is known vs. unknown
● Report on explicit and inferred characteristics, patterns, or behavior

ELD-SI.4-12.Explain
● Generate and convey initial thinking
● Compare changing variables, factors, and circumstances

ELD-SI.4-12.Argue

● Clarify and elaborate ideas based on feedback ● Evaluate changes in thinking, identifying trade-offs
ELD Standard 4: Language for Science *Multilingual Learners communicate information, ideas, and concepts necessary for academic success in the content area of Science.* **ELD-SC.9-12.Explain.Expressive Construct scientific explanations that:** ● Describe reliable and valid evidence from multiple sources about a phenomenon ● Establish neutral or objective stance in how results are communicated ● Develop reasoning to illustrate and/or predict the relationships between variables in a system or between components of a system ● Summarize and refine solutions referencing scientific knowledge, evidence, criteria, and/or trade-offs **ELD-SC.9-12.Argue.Expressive Construct scientific arguments that:** ● Introduce and contextualize topic/phenomenon in current scientific or historical episodes in science ● Defend or refute a claim based on data and evidence ● Establish and maintain an appropriate tone and stance (neutral/objective or biased/subjective) ● Signal logical relationships among reasoning, evidence, data, and/or models when making and defending a claim, counterclaim, and/or rebuttal.
LIS STRATEGIES (Targeted Strategies per lesson identified in Canvas)

GCS Curriculum Map for GCHS Biology (Modules 5-7)

Semester at a Glance: PACING GUIDE

Unit	5	6	7
Unit Title	Unit 5: Biotechnology	Unit 6: Evolution	Unit 7: Ecology
Time Frame	BIO.8.1 (2 days) BIO.8.2 (1 days)	BIO.9.1 (1 days) BIO.9.2 (1 days) BIO.9.3 (2 days) BIO.9.4 (2 days) BIO.10.1 (2 days) BIO.10.2 (2 days)	BIO.3.2 (1 days) BIO.4.1 (2 days) BIO.4.2 (2 days) BIO.3.3 (1 days) BIO.5.1 (2 days) BIO.5.2 (1 days)
Standards	BIO.8	BIO.9 & BIO.10	BIO.3 BIO.4 & BIO.5
ELD Standards	ELD-SC.9-12.Explain.Expressive ELD-SC.9-12.Argue.Expressive	ELD-SC.9-12.Explain.Expressive ELD-SC.9-12.Argue.Expressive	ELD-SC.9-12.Explain.Expressive ELD-SC.9-12.Argue.Expressive
Essential Questions	• During the observation of gel electrophoresis I saw that the DNA _____, • Based on the principle of using banding patterns of DNA to compare individuals, it can be inferred that _____.	• When considering this current scientific topic of evolution it is important to examine factors that alter natural selection. Those factors include _____. • The cladogram and phylogenetic tree can be used to determine organism relationship by _____. • The data shows evidence of evolution through _____.	• Based on the principles of aerobic and anaerobic respiration, we can infer that they are different by _____. • The food chain, food web, and food pyramid show that energy _____.
Performance Events	CLICK HERE	CLICK HERE	CLICK HERE

<table>
<tr><td colspan="2">Unit 5: Biotechnology
Essential Questions:
● During the observation of gel electrophoresis I saw that the DNA _____,
● Based on the principle of using banding patterns of DNA to compare individuals, it can be inferred that _____.</td><td>Timeline: 1 week</td></tr>
<tr><td colspan="3">Performance Event: <u>CLICK HERE</u></td></tr>
<tr><td colspan="3">SWBAT: (Mastery Objectives)
Students will be able to:
● Recognize the importance and use of various biotechnology tools.
● Identify and describe the gel electrophoresis process.
● Identify banding patterns of DNA to compare individuals.
● Can recognize the similar species have similar DNA sequences.</td></tr>
<tr><td colspan="3">Vertical Alignment</td></tr>
<tr><td>Previous Grade Level Standards</td><td>Grade Level Standards</td><td>Next Grade Level Standards</td></tr>
<tr><td>LS.7.2 Understand the relationship of the mechanisms of reproduction, patterns of inheritance, and potential variation among offspring.</td><td>LS.Bio.8 Understand applications of genetics and Biotechnology.
● LS.Bio.8.1 Analyze and interpret data to compare DNA samples.
● LS.Bio.8.2 Obtain and communicate information that summarizes the impact of biotechnology applications on the individual, society, and the environment, including agriculture and medicine</td><td><u>Not Applicable</u></td></tr>
<tr><td colspan="3">Instructional Resources</td></tr>
<tr><td>Tier III Vocabulary:
● DNA
● nucleotide sequence
● banding pattern
● relatedness, identity
● Electrophoresis
● restriction enzyme
● Similarity</td><td>Performance Tasks:
● Gel Electrophoresis Lab (If equipment is available)</td><td>Additional Resources
● Khan Academy Videos
● EdPuzzle Videos (Forensics, Gel Electrophoresis, etc.)
● Amoeba Sisters Videos
● Biology Materials Folder
● Extra Gel examples</td></tr>
</table>

• DNA fingerprint • DNA sequencing • Forensics • parentage • probable • Biotechnology • Bioethics • Credible • GMOs • Clone • CRISPR • Vaccine • stem cells		

Remediation Skills, Extensions and Considerations:

Remediation:
- Biotechnology CRISPR podcast activity
- Gel Electrophoresis stations activity

Extensions:
- Biotechnology CRISPR podcast activity
- Canva or other app presentations
- StopMotions or other unique applications
- Bring in forensic analyst
- Complete short forensic mystery game

Considerations:
- Ethical considerations when discussing the topics of biotechnology: designer babies, gene therapy, forensics, etc.
- Emotional considerations when discussing biotechnology: designer babies, gene therapy, forensics, etc.

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- Sort, clarify, and summarize relationships
- Summarize most important aspects of information

ELD-SI.4-12.Explain
- Compare changing variables, factors, and circumstances
- Offer alternatives to extend or deepen awareness of factors that contribute to particular outcomes

ELD-SI.4-12.Argue
- Generate questions about different perspectives
- Support or challenge an opinion, premise, or interpretation
- Evaluate changes in thinking, identifying trade-offs
- Refine claims and reasoning based on new information or evidence

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ELD-SC.9-12.Explain.Expressive Construct scientific explanations that:
- Describe reliable and valid evidence from multiple sources about a phenomenon
- Establish neutral or objective stance in how results are communicated
- Develop reasoning to illustrate and/or predict the relationships between variables in a system or between components of a system
- Summarize and refine solutions referencing scientific knowledge, evidence, criteria, and/or trade-offs

ELD-SC.9-12.Argue.Expressive Construct scientific arguments that:
- Introduce and contextualize topic/phenomenon in current scientific or historical episodes in science
- Defend or refute a claim based on data and evidence
- Establish and maintain an appropriate tone and stance (neutral/objective or biased/subjective)
- Signal logical relationships among reasoning, evidence, data, and/or models when making and defending a claim, counterclaim, and/or rebuttal.

LIS STRATEGIES (Targeted Strategies per lesson identified in Canvas)

Unit 6: Evolution **Essential Questions:** ● When considering this current scientific topic of evolution it is important to examine factors that alter natural selection. Those factors include _____. ● The cladogram and phylogenetic tree can be used to determine organism relationship by _____. ● The data shows evidence of evolution through _____.	**Timeline:** 2.5 weeks
Performance Event: CLICK HERE	
SWBAT: (Mastery Objectives) Students will be able to: ● Identify factors that alter natural selection: geographic isolation, pesticide resistance, antibiotic resistance, etc. ● Use data and evidence to discuss evolution: molecular biology (e.g., DNA sequences, genes, proteins), embryology, comparative anatomy (e.g., homologous structures, vestigial structures), and the fossil record. ● Demonstrate how factors can influence survival and reproduction within a population or species (overproduction of offspring, inherited variation, limited resources, and struggle to survive) ● Describe adaptations of organisms such as organism behaviors, morphology, and/or physiology. ● Examine and discuss how changes to the environment (e.g., deforestation, overfishing, application of fertilizers, drought, flood, and the rate of change of the environment) affects populations and species. ● Identify and describe how natural selection influences populations over time. ● Discuss how changing environmental select for adaptations that may result in the evolution of a new species or extinction. ● Identify the levels of classification of organisms. ● Use a dichotomous key to classify organisms. ● Use cladograms and phylogenetic tree to determine organism relatedness and time of appearance in geologic history.	

Vertical Alignment		
Previous Grade Level Standards	**Grade Level Standards**	**Next Grade Level Standards**
LS.8.3 Understand the evolution of organisms over time based on evidence and processes.	**LS.Bio.9 Understand natural selection as a mechanism for biological evolution.** ● LS.Bio.9.1 Analyze and interpret data to summarize how various factors such as geographic isolation, pesticide resistance, antibiotic resistance can influence natural selection. ● LS.Bio.9.2 Construct an explanation to illustrate how common ancestry and biological	**Not Applicable**

	evolution are supported by multiple lines of empirical evidence. ● LS.Bio.9.3 Use models to illustrate the conditions required for natural selection, including the overproduction of offspring, inherited variation, and the struggle to survive. ● LS.Bio.9.4 Construct an explanation to explain how natural selection leads to adaptations within populations. **LS.Bio.10 Analyze evolutionary relationships among organisms.** ● LS.Bio.10.1 Construct explanations to illustrate how varying environmental conditions may result in: changes in the number of individuals of a species, the emergence of new species over time, or the extinction of other species. ● LS.Bio.10.2 Use models (including dichotomous keys, scientific nomenclature, cladograms, phylogenetic trees) to identify organisms and exemplify relationships.	
Instructional Resources		
Tier III Vocabulary: ● geographic isolation ● antibiotic resistance ● pesticide resistance ● natural selection ● evolve (evolution) ● Species ● Trait ● Beneficial ● Survive ● reproduction rate ● Frequency ● distribution ● Evolution	**Performance Tasks:** ● **Natural Selection Simulation** ● **Monster Speciation**	**Additional Resources** ● Khan Academy Videos ● EdPuzzle Videos (Speciation, Natural Selection, Evidence for Evolution, Population growth, , etc.) ● Amoeba Sisters Videos ● Biology Materials Folder ● Bill Nye Evolution!

• DNA sequences • amino acid sequences • anatomical structures • fossil record • embryological development • common ancestry • comparative anatomy • Species • homologous structures • vestigial structures • natural selection • Reproduction • Overpopulation • Competition • Resources • trait • Advantage • Disadvantage • Offspring • 'Fitness' • environmental conditions • Variation • Mutation • inherited • natural selection • Evolution • Species • Speciation • Heritable • genetic variation • Mutation • sexual reproduction • Competition • limited resources • Adaptation • beneficial/favorable		

• selective pressure • Environment • Generation • analogous structures • Emergence • environmental change • Stability • Disturbance • Extinction • speciation • Adaptation • Evolution • Frequency • Gene • Advantageous • Detrimental • population size • genetic variation • selective pressure • Niche • invasive species • dichotomous key • scientific nomenclature • Genus • Species • Cladogram • phylogenetic tree • Relationship • Trait • (common) ancestor • Clade • Node • molecular evidence • Evidence • physical traits • DNA sequences		

● Genes ● proteins		

Remediation Skills, Extensions and Considerations:

Remediation:
- Natural selection and evolution reading comprehension
- Evidence for evolution stations
- Dichotomous key practice
- Cladogram and phylogenetic tree sort

Extensions:
- Additional simulations and lab activities. Many are prebuilt onto labs.
- Breakout room review
- Professor as a Speaker/Guest

Considerations:
- Ethical considerations when discussing the theory of Evolution.
- Clarification of ancestry and species relationships.

ELD Standard 1: Social and Instructional Language *Multilingual Learners communicate for Social and Instructional purposes within the school setting.*

ELD-SI.4-12.Narrate
● Identify and raise questions about what might be unexplained, missing, or left unsaid
● Recount and restate ideas to sustain and move dialogue forward

ELD-SI.4-12.Inform
● Define and classify facts and interpretations; determine what is known vs. unknown
● Report on explicit and inferred characteristics, patterns, or behavior
● Describe the parts and wholes of a system
● Sort, clarify, and summarize relationships
● Summarize most important aspects of information

ELD-SI.4-12.Explain
● Compare changing variables, factors, and circumstances
● Act on feedback to revise understandings of how or why something is or works in particular ways

ELD-SI.4-12.Argue

● Generate questions about different perspectives ● Support or challenge an opinion, premise, or interpretation ● Refine claims and reasoning based on new information or evidence
ELD Standard 4: Language for Science *Multilingual Learners communicate information, ideas, and concepts necessary for academic success in the content area of Science.* **ELD-SC.9-12.Explain.Expressive Construct scientific explanations that:** ● Describe reliable and valid evidence from multiple sources about a phenomenon ● Establish neutral or objective stance in how results are communicated ● Develop reasoning to illustrate and/or predict the relationships between variables in a system or between components of a system ● Summarize and refine solutions referencing scientific knowledge, evidence, criteria, and/or trade-offs **ELD-SC.9-12.Argue.Expressive Construct scientific arguments that:** ● Introduce and contextualize topic/phenomenon in current scientific or historical episodes in science ● Defend or refute a claim based on data and evidence ● Establish and maintain an appropriate tone and stance (neutral/objective or biased/subjective) ● Signal logical relationships among reasoning, evidence, data, and/or models when making and defending a claim, counterclaim, and/or rebuttal.
LIS STRATEGIES (Targeted Strategies per lesson identified in Canvas)

Unit 7: Ecology **Essential Questions:** ● Based on the principles of aerobic and anaerobic respiration, we can infer that they are different by _____. ● The food chain, food web, and food pyramid show that energy _____.	**Timeline:** 1.5 weeks

Performance Event: CLICK HERE

SWBAT: (Mastery Objectives)

Students will be able to:

- Understand the chemical reaction of photosynthesis including reactants and products.
- Identify and describe a glucose molecule based on what is contained in the compound.
- Identify the similarities and differences of both aerobic and anaerobic cellular respiration.
- Recognize and briefly describe an individual organisms' role in the cycling of matter (carbon, nitrogen, phosphorus)
- Identify an organism's niche from a model as a producer, consumer, decomposer, or agent of nitrogen fixation.
- Explain how nutrients from plants allow for flow of energy among organisms (carbon cycle, nitrogen cycle, phosphorous cycle)
- Describe the conservation of matter and flow of energy between organisms and the ecosystem.
- Use a model (food chains, food webs, energy pyramids) to describe the transfer of energy from one trophic level to another.
- Understand and discuss factors that impact the carrying capacity of an ecosystem (e.g., abiotic factors, predator/prey, and competition relationships)
- Research, determine and describe how human activities cause positive or negative changes to the environment.
- Research, determine and describe how human activities impact the abundance and distribution of species.
- Identify and argue solutions for human environmental influences with a focus on benefits and risk factors (e.g., costs, safety, sustainability).

Vertical Alignment

Previous Grade Level Standards	Grade Level Standards	Next Grade Level Standards
LS.8.2 Understand how organisms interact with and respond to the biotic and abiotic factors in their environment.	**LS.Bio.3 Analyze the relationship between biochemical processes and energy use.** ● LS.Bio.3.2 Use models to illustrate how photosynthesis transforms light energy into chemical energy. ● LS.Bio.3.3 Use models to illustrate how cellular respiration [aerobic and anaerobic] transforms chemical energy into ATP. **LS.Bio.4 Analyze the relationships between matter**	**Not Applicable**

	and energy within ecosystems. ● LS.Bio.4.1 Use models to illustrate how processes in organisms contribute to the flow of energy and the cycling of matter within an ecosystem. ● LS.Bio.4.2 Use models to explain the relationship between the flow of energy and cycling of matter among organisms in an ecosystem. **LS.Bio.5 Understand ecosystem dynamics, functioning, and resilience.** ● LS.Bio.5.1 Use mathematics and computational thinking to explain how interactions between organisms (predator/prey, competition) affect carrying capacity and maintain stability in an ecosystem. ● LS.Bio.5.2 Engage in argument from evidence to evaluate various solutions to reduce the impact of human activities on biodiversity and ecosystem health.	
Instructional Resources		
Tier III Vocabulary: ● carbon dioxide ● Water ● Glucose ● Oxygen ● Matter ● Enzyme ● Carbohydrates ● Glycogen ● Starch ● chemical reaction ● Reactant ● (waste) product ● Molecule	**Performance Tasks:** ● **Carbon Footprint Activity and Analysis** ● **Food Web activity**	**Additional Resources** ● Khan Academy Videos ● EdPuzzle Videos (Ecological Relationships, Carbon cycle, Phosphorous Cycle, Nitrogen Cycle , etc.) ● Amoeba Sisters Videos ● Biology Materials Folder

• Bond • Photosynthesis • Input • Output • chemical energy • light energy • Chloroplast • Chlorophyll • Autotroph • cellular respiration • matter cycling • energy flow • cellular respiration • aerobic respiration • anaerobic respiration • Fermentation • lactic acid • alcohol • Mitochondria • Carbohydrates • Glucose • Water • Oxygen • carbon dioxide • ATP • Reactants • Products • chemical reaction • Heterotroph • Enzyme • bonds • Molecule • Photosynthesis, • Glycogen • starch • carrying capacity		

• Community • Competition • Interactions • limiting factors • Organisms • Population • Predator • Prey • Stability • Succession • Symbiosis • exponential growth • logistical growth • Acidification • Biodiversity • Climate • greenhouse gases • Conservation • Deforestation • Dynamics • ecosystem health • Extinction • fossil fuels • Habitat • human impact • invasive species • Mitigation • Overpopulation • Pollution • Preservation • Resilience • Solution • Succession • Restoration • Overfishing • Eutrophication		

● algal bloom		

Remediation Skills, Extensions and Considerations:

Remediation:
- Ecology organizer
- Construct food chain, food web, and food pyramid models
- Predator prey relationship reading activity

Extensions:
- Field trip to Pine Knoll Shores Aquarium
- Field Trip to Prairie Ridge Ecostation
- Virtual guest speakers (Marine Biologist, Environmental Scientist, etc.)

Considerations:
- Be mindful of the vocabulary used that intersects with Earth and Environmental Science

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● Identify and raise questions about what might be unexplained, missing, or left unsaid
● Recount and restate ideas to sustain and move dialogue forward

ELD-SI.4-12.Inform
● Describe the parts and wholes of a system
● Sort, clarify, and summarize relationships

ELD-SI.4-12.Explain
● Generate and convey initial thinking
● Follow and describe cycles and sequences of steps or procedures and their causes and effects

ELD-SI.4-12.Argue
● Evaluate changes in thinking, identifying trade-offs
● Refine claims and reasoning based on new information or evidence

ELD Standard 4: Language for Science *Multilingual Learners communicate information, ideas, and concepts necessary for academic success in the content area of Science.*

ELD-SC.9-12.Explain.Expressive Construct scientific explanations that:
- Describe reliable and valid evidence from multiple sources about a phenomenon
- Establish neutral or objective stance in how results are communicated
- Develop reasoning to illustrate and/or predict the relationships between variables in a system or between components of a system
- Summarize and refine solutions referencing scientific knowledge, evidence, criteria, and/or trade-offs

ELD-SC.9-12.Argue.Expressive Construct scientific arguments that:
- Introduce and contextualize topic/phenomenon in current scientific or historical episodes in science
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