

# Huntsville City Schools 2017 – 2018 Pacing Guide Biology and **Honors Biology** Ninth Grade

*\*This pacing guide encompasses Regular and **Honors Biology**. Items specified for **Honors Biology** has been colored coded in **Red**.  
TEXTBOOK:*

*Regular Biology: **Miller & Levine** (has the parrot on it), **Honors Biology: Campbell Biology Concepts and Connections book***

*\*The chapters that are listed for the Regular and **Honors Biology** books does not necessary mean you are utilizing the entire chapter, just the sections that pertains to the Standards.*

*The Biology Compendium mirrors the standards. Below is the link to the Compendium:*

*<http://hudsonalpha.s3.amazonaws.com/wp-content/uploads/2016/08/01151501/Alabama-Biology-Compendium.pdf>*

*\*Suggested Labs for both Regular and **Honors** are LTF, ASIM (look for information concerning summer training), HudsonAlpha, and Virtual labs. They have not been divided by Regular or Honors, it is based off training and availability of materials. Forms and different virtual lab resources are at the end of the pacing guide.*

*\*Crash Course Video on all of the standard subjects are excellent and can be found at  
["https://www.khanacademy.org/science/biology/crash-course-bio-ecology"](https://www.khanacademy.org/science/biology/crash-course-bio-ecology).*

*\*Bozeman science video are found at ["http://www.bozemanscience.com/biology-main-page/"](http://www.bozemanscience.com/biology-main-page/)*

*\*Alabama Technology Education Standards (<http://alex.state.al.us/standardAll.php?grade=9&subject=TC2&summary=2>)*

*The following standards are to be incorporated into daily lessons:*

- 3.) Demonstrate advanced technology skills, including compressing, converting, importing, exporting, and backing up files.
- 5.) Utilize advanced features of spreadsheet software, including creating charts and graphs, sorting and filtering data, creating formulas, and applying functions.
- 8.) Practice safe uses of social networking and electronic communication.
- 9.) Practice ethical and legal use of technology systems and digital content.
- 11.) Critique digital content for validity, accuracy, bias, currency, and relevance.
- 12.) Use digital tools to publish curriculum-related content.
- 13.) Demonstrate collaborative skills using curriculum-related content in digital environments.
- 16.) Create a product that integrates information from multiple software applications.

# Huntsville City Schools 2017 – 2018 Pacing Guide

## Biology and **Honors Biology** Ninth Grade: *First Nine Weeks*

**KEY TERMS:** The key terms below are suggested for Regular Biology and are a required part of **Honors Biology**

<p><b>Standard 1:</b></p> <ul style="list-style-type: none"> <li>● Amino Acid</li> <li>● Carbohydrate</li> <li>● Disaccharide</li> <li>● Element</li> <li>● Fatty Acid</li> <li>● Functional Group</li> <li>● Inorganic</li> <li>● Lipid</li> <li>● Monomer</li> <li>● Monosaccharide</li> <li>● Nucleic Acid</li> <li>● Nucleotide</li> <li>● Organic</li> <li>● Polymer</li> <li>● Polysaccharide</li> <li>● Protein</li> </ul> <p><b>Background Vocabulary</b></p> <ul style="list-style-type: none"> <li>● Scientific Method</li> <li>● Dependent/Independent Variables</li> <li>● SI Units (Length, Volume, Mass)</li> <li>● Atom (Proton/Neutron/Electron)</li> <li>● Elements</li> <li>● Molecule/Compound</li> <li>● Isotopes</li> <li>● Ions</li> <li>● Bonds (Ionic, Covalent, Hydrogen, Chemical)</li> <li>● Chemical Reactions (Reactants/Products)</li> <li>● Enzymes (Catalyst, Subtracts)</li> <li>● Activation Energy</li> </ul>	<p><b>Standard 5:</b></p> <ul style="list-style-type: none"> <li>● Acid</li> <li>● Active transport</li> <li>● Adhesion</li> <li>● Base</li> <li>● Buffer</li> <li>● Cohesion</li> <li>● Diffusion</li> <li>● Endocytosis</li> <li>● Exocytosis</li> <li>● Feedback mechanisms</li> <li>● Fluid Mosaic Model</li> <li>● Homeostasis</li> <li>● Hydrogen bond</li> <li>● Hypertonic</li> <li>● Hypotonic</li> <li>● Ion</li> <li>● Isotonic</li> <li>● Mixture</li> <li>● Nonpolar</li> <li>● Osmosis</li> <li>● Passive transport</li> <li>● pH scale</li> <li>● Polar</li> <li>● Selectively permeable</li> <li>● Semipermeable</li> <li>● Solute</li> <li>● Solution</li> <li>● Solvent</li> </ul>	<p><b>Standard 2:</b></p> <ul style="list-style-type: none"> <li>● Animal Cell</li> <li>● Bacteria</li> <li>● Cell</li> <li>● Cell Membrane</li> <li>● Cell Theory</li> <li>● Cell wall</li> <li>● Central vacuole</li> <li>● Centriole</li> <li>● Chloroplast</li> <li>● chromatin</li> <li>● Contractile vacuole</li> <li>● Cytoplasm</li> <li>● Cytoskeleton</li> <li>● DNA</li> <li>● Eukaryote</li> <li>● Golgi apparatus</li> <li>● Hydrophilic head</li> <li>● Hydrophobic tail</li> <li>● Lipid bilayer</li> <li>● Lysosome</li> <li>● Mitochondrion</li> <li>● Nucleus</li> <li>● Organelle</li> <li>● Plant Cell</li> <li>● Prokaryote</li> <li>● Ribosome</li> <li>● Rough endoplasmic reticulum</li> <li>● Smooth endoplasmic reticulum</li> <li>● Vacuole</li> </ul>	<p><b>Standard 6:</b></p> <ul style="list-style-type: none"> <li>● Aerobic</li> <li>● Anaerobic</li> <li>● ATP (adenosine triphosphate)</li> <li>● ATP synthase</li> <li>● Autotroph</li> <li>● Calorie</li> <li>● Calvin cycle</li> <li>● Cellular respiration</li> <li>● Chlorophyll</li> <li>● Electron transport chain</li> <li>● Fermentation</li> <li>● Glycolysis</li> <li>● Heterotroph</li> <li>● Krebs cycle</li> <li>● Light dependent reaction</li> <li>● Light independent reaction</li> <li>● Matrix</li> <li>● NAD<sup>+</sup>/NADH</li> <li>● NADP<sup>+</sup></li> <li>● Photosynthesis</li> <li>● Photosystem</li> <li>● Pigment</li> <li>● Pyruvic acid</li> <li>● Stroma</li> <li>● Thylakoid</li> </ul>
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Standard	Resources	Approximate Pacing Number of Days
<p>Initial Introduction: Select appropriate laboratory glassware, balances, time measuring equipment, and optical instruments to conduct an experiment.</p> <p>A. Describing the steps of the scientific method</p> <p>B. Comparing controls, dependent variables, and independent variables</p> <p>C. Using appropriate SI units for measuring length, volume, and mass</p> <p>D. Identifying laboratory equipment/tools and safe laboratory procedures when handling chemicals and using Bunsen burners</p> <p><b>(Safety Contracts Required—Click link to download contract and test) <a href="#">Safety Contract</a>, <a href="#">Safety Test</a></b></p>	<p><b>Textbook: Miller &amp; Levine Chapter 1 The Nature of Life page 2-29</b></p> <p><b>Honors: Textbook: Campbell Biology Concepts and Connections: pgs. 9-10</b></p> <p><b>Suggested LTF Labs:</b>            Vitruvian Man Meets the Scientific Method            Line &amp; Bars Graphs            Green Bean, The Wonderful Fruit            Come Fly with Me</p> <p><b>Suggested ASIM Labs:</b>  <b>****ASIM Biology Safety Rules and Safety Contract</b>            Tools of the Trade            Toilet Paper Strength Lab</p>	<p>3 Blocks</p>
<p>1. Use models to compare and contrast how the structural characteristics of carbohydrates, nucleic acids, proteins, and lipids define their function in organisms.</p> <p><b>Background Knowledge:</b></p> <p>A. Identify subatomic particles and describe how they are arranged in atoms</p> <p>B. Compare the types of bonding between atoms to form molecules</p> <p>C. Explain the difference between organic and inorganic compounds</p> <p>D. Describe the function of enzymes, including how enzyme-substrate specificity works in biochemical reactions</p> <p>E. Explain the fundamental principles of the pH scale and the consequences of having the different concentrations of hydrogen and hydroxide ions</p>	<p><b>Textbook: Miller &amp; Levine Chapter 2 The Chemistry of Life p. 32-57</b></p> <p><b>Honors: Campbell Biology Concepts and Connections: Chapter 3: The Molecules of Cells pgs. 32-47</b>            (Background)</p> <p><b>Chapter 2: The Chemical Basis of Life pgs. 16-30</b></p> <p><b>Chapter 5: Enzymes 5.11-5.15; pgs. 81-85</b></p> <p><b>Suggested LTF Labs:</b></p> <ul style="list-style-type: none"> <li>• McMush</li> <li>• Enzyme Activity</li> <li>• Teaching Strategy for Enzymes</li> </ul> <p><b>Suggested ASIM Labs</b></p> <ul style="list-style-type: none"> <li>• Enzyme Applications</li> <li>• Acids, Bases, and pH</li> <li>• Macromolecules Lab</li> </ul> <p><b>Suggested Free to Teach Labs:</b>            Molecules of Life</p>	<p>6 Blocks</p>

	<p><b>Students may need a brief review of basic chemistry concepts. The following videos can serve as brief reviews:</b></p> <p><b>Dogs Teach Chemistry — YouTube®</b> This video clip uses cute dogs to review simple chemistry concepts: <b>bit.ly/dogs-teaching-chemistry</b></p> <p>This video clip reviews basic information about bonding and molecules: <b>bit.ly/dogs-teaching-chemistry-bonding</b></p> <p><b>Chemistry Basics — Science with the Amoeba Sisters</b> Video clip of animated amoeba cartoons reviews basic chemistry: <b>bit.ly/chemistry-basics-amoebas</b></p>	
<p>5. Plan and carry out investigations to explain feedback mechanisms (e.g., sweating and shivering) and cellular processes (e.g., active and passive transport) that maintain homeostasis.</p> <p>a. Plan and carry out investigations to explain how the unique properties of water (e.g., polarity, cohesion, adhesion) are vital to maintaining homeostasis in organisms.</p> <p><b>Background Information:</b></p> <p>A. Explain how the cell membrane controls movement of substances both into and out of the cell and within the cell in terms of a fluid mosaic model</p>	<p><b>Textbook: Miller &amp; Levine Chapter 7 Cell Structure and Function page 208-217</b> <b>Honors: Campbell Biology Concepts and Connections: Chapter 5: The Working Cell, pgs. 72-82</b></p> <p><b>Suggested LTF Labs</b></p> <ul style="list-style-type: none"> <li>● Gatekeepers</li> <li>● Diffusion Confusion — NMSI Laying the Foundation Lesson</li> <li>● Osmosis lab using both dialysis tubing and potatoes to explore osmosis.</li> </ul> <p><b>Suggested ASIM Labs</b></p> <ul style="list-style-type: none"> <li>● Onion Cell Diffusion — Alabama Science in Motion C2aOnionDif</li> </ul> <p><b>Other labs:</b></p> <ul style="list-style-type: none"> <li>● Phospholipid &amp; Membrane Transport — 3D Molecular Designs (for purchase)</li> <li>● Foam model phospholipids and cell membranes. This kit was distributed at GREAT workshops 2016/17.</li> <li>● <a href="http://www.hudsonalpha.org/GREAT">www.hudsonalpha.org/GREAT</a></li> <li>● Build-A-Membrane — Genetic Science Learning Center</li> <li>● Using paper cut-outs and a box top, students build a model of a cell membrane.</li> <li>● <a href="http://bit.ly/build-a-membrane">bit.ly/build-a-membrane</a></li> </ul>	<p>3 Blocks</p>

	<ul style="list-style-type: none"> <li>● Homeostasis (and the Cell Membrane King) — Science with the Amoeba Sisters</li> <li>● Video clip on homeostasis <a href="http://bit.ly/cell-membrane-king">bit.ly/cell-membrane-king</a></li> </ul> <p><b>Videos:</b>  <i>Crash course Biology Series: Biological Molecules (You are what you Eat), That's Why Carbon is a Tramp, Water (Liquid is Awesome)</i></p>	
<p>2. Obtain, evaluate, and communicate information to describe their function and diversity of organelles and structures in various types of cells (e.g., muscle cells having a large amount of mitochondria, plasmids in bacteria, and chloroplasts in plant cells).</p> <p><b>Background Information:</b></p> <p>A. Analyze the similarities and differences among (a) plant versus animal cells and (b) eukaryotic versus prokaryotic cells</p>	<p><b>Textbook: Miller &amp; Levine Chapter 7 Cell Structure and Function page 188-208</b>  <b>Honors: Campbell Biology Concepts and Connections: Chapter 4: A Tour of the Cell, pgs. 50-70</b>  <b>Chapter 5: The Working Cell, pgs. 72-80</b></p> <p><b>Suggested LTF Labs</b></p> <ul style="list-style-type: none"> <li>● Larger is not Always Better</li> </ul> <p><b>Suggested ASIM Labs:</b></p> <ul style="list-style-type: none"> <li>● Reading Comprehension: ASIM: Magnetic Cell,</li> <li>● Comparing Plant &amp; Animal Cells</li> <li>● Introduction to the Microscope</li> <li>● Using the Microscope</li> <li>● Cell Size Lab</li> <li>● Osmosis in Onion Cells</li> <li>● Osmosis &amp; Diffusion</li> <li>● Rubber Egg Magnetic Cell: C6MagCel, students use magnetic manipulatives to illustrate and compare and contrast organelles found in a variety of cell types. <a href="http://bit.ly/AMSTI-ASIM">bit.ly/AMSTI-ASIM</a></li> </ul> <p><b>Videos:</b>  <i>Crash course Biology Series: In da Club, Membranes and Transport. Mitosis (Splitting up is Complicated)</i></p>	<p>6 Blocks</p>

<p>6. Analyze and interpret data from investigations to explain the role of products and reactants of photosynthesis and cellular respiration in the cycling of matter and the flow of energy.</p> <p>a. Plan and carry out investigations to explain the interactions among pigments, absorption of light, and reflection of light.</p>	<p><b>Textbook: Miller &amp; Levine Chapter 9 Cellular Respiration p. 250 – 267</b>  <b>Textbook: Miller &amp; Levine Chapter 8 Photosynthesis p. 224-247</b></p> <p><b>Honors: Campbell Biology Concepts and Connections:</b>  <b>Chapter 6: How Cells Harvest Energy pgs. 88-104</b>  <b>Chapter 7: Photosynthesis: Using Light to Make Food pgs. 106-121</b></p> <p><b>Suggested LTF Labs</b></p> <ul style="list-style-type: none"> <li>● Yeast and molasses</li> <li>● Cricket Respiration</li> <li>● Sinkers and Floaters (factors effecting photosynthesis)</li> <li>● Light, Dark, Does it really Matter?</li> </ul> <p><b>Suggested ASIM Labs:</b></p> <ul style="list-style-type: none"> <li>● Yeast (Aerobic Respiration)</li> <li>● Light, Dark, Does it really Matter?</li> <li>● Picking out the Pigments</li> <li>● Photosynthetic Pigments</li> <li>● Or Leaf Disk Photosynthesis</li> <li>● Factors Affecting Photosynthesis</li> <li>● Root &amp; Stem Structure</li> <li>● Make a Flower</li> </ul> <p><b>Videos:</b>  The Private Life of Plants with David Attenborough Series.  <a href="http://www.davidattenborough.co.uk/dvds/private_life_of_plants.php">www.davidattenborough.co.uk/dvds/private_life_of_plants.php</a>  Crash course Biology Series: Photosynthesis (#8) Respiration (#7)</p>	<p>4 Blocks</p>
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**Huntsville City Schools**  
**2017 – 2018 Pacing Guide**  
**Biology and Honors Biology Ninth Grade: *Second Nine Weeks***

<b>Key Terms:</b>		
<p><b>Standard 4:</b></p> <ul style="list-style-type: none"> <li>• Anaphase</li> <li>• Apoptosis</li> <li>• Asexual reproduction</li> <li>• Benign tumor</li> <li>• Binary fission</li> <li>• Blastocyst</li> <li>• Cancer</li> <li>• Carcinomas</li> <li>• Cell cycle</li> <li>• Cell division</li> <li>• Centriole</li> <li>• Centromere</li> <li>• Chromatid</li> <li>• Chromatin</li> <li>• Chromosome</li> <li>• Cyclin</li> <li>• Cytokinesis</li> <li>• Differentiation</li> <li>• Embryo</li> <li>• Growth factor</li> <li>• Interphase</li> <li>• Malignant tumor</li> <li>• Metaphase</li> <li>• Metastasis</li> </ul>	<p><b>Standard 4 continue:</b></p> <ul style="list-style-type: none"> <li>• Mitosis</li> <li>• Mitotic phase</li> <li>• Prophase</li> <li>• Sarcomas</li> <li>• Sexual reproduction</li> <li>• Sister chromatids</li> <li>• Stem cell</li> <li>• Telophase</li> </ul> <p><b>Standard 11:</b></p> <ul style="list-style-type: none"> <li>• Allele</li> <li>• Codominance</li> <li>• Diploid</li> <li>• Fertilization</li> <li>• Gametes</li> <li>• Gene</li> <li>• Genetics</li> <li>• Genotype</li> <li>• Haploid</li> <li>• Heterozygous</li> <li>• Homologous</li> <li>• Homozygous</li> <li>• Hybrid</li> <li>• Incomplete dominance</li> <li>• Independent assortment</li> <li>• Meiosis</li> <li>• Trait</li> </ul>	<p><b>Standard 11 continue:</b></p> <ul style="list-style-type: none"> <li>• Multiple allele</li> <li>• Phenotype</li> <li>• Polygenetic trait</li> <li>• Principle of Dominance</li> <li>• Probability</li> <li>• Punnett<sub>s</sub>quare</li> <li>• Segregation</li> <li>• Tetrad</li> </ul> <p><b>Standard 12:</b></p> <ul style="list-style-type: none"> <li>• Autosome</li> <li>• Base pairing</li> <li>• Bioinformatics</li> <li>• DNA polymerase</li> <li>• Gel electrophoresis</li> <li>• Genome</li> <li>• Genomics</li> <li>• Karyotype</li> <li>• Non-disjunctive</li> <li>• Pedigree</li> <li>• Replication</li> <li>• Restriction enzyme</li> <li>• Sex chromosome</li> <li>• Sex linked gene</li> <li>• Telomere</li> </ul>

Standard	Resources	Approximate Pacing Number of Days
<p>4. Develop and use models to explain the role of the cell cycle during growth and maintenance in multicellular organisms (e.g., normal growth and/or uncontrolled growth resulting in tumors)</p>	<p><b>Textbook: Miller &amp; Levine Chapter 10 Cell Growth and Division p. 272-303</b>  <b>Honors: Campbell Biology Concepts and Connections: Chapter 8: The Cellular Basis of Reproduction pgs. 125-135</b></p> <p><b>Suggested Labs</b></p> <ul style="list-style-type: none"> <li>• <b>Cell Cycle and Cancer</b> — Students will explore the phases, checkpoints, and protein regulators of the cell cycle in this highly interactive animation. <a href="http://bit.ly/cell-cycle-and-cancer">bit.ly/cell-cycle-and-cancer</a></li> <li>• <b>Mitosis Video</b> — <a href="http://www.youtube.com/user/AmoebaSisters">www.youtube.com/user/AmoebaSisters</a></li> <li>• <b>The Cell Cycle</b> — <a href="http://bit.ly/AMSTI-ASIM">bit.ly/AMSTI-ASIM</a></li> <li>• <b>Cell Cycle &amp; Mitosis Tutorial</b> — <a href="http://bit.ly/cell-cycle-and-mitosis">bit.ly/cell-cycle-and-mitosis</a></li> <li>• <b>3D Cell Cycle</b> — Student will create a 3D model of a part of the cell cycle. <a href="http://www.hudsonalpha.org/compendium">www.hudsonalpha.org/compendium</a></li> </ul>	<p>5 Blocks</p>
<p>11. Analyze and interpret data collected from probability calculations to explain the variation of expressed traits within a population.</p> <ol style="list-style-type: none"> <li>Use mathematics and computation to predict phenotypic and genotypic ratios and percentages by constructing Punnett squares, including using both homozygous and heterozygous allele pairs.</li> <li>Develop and use models to demonstrate codominance, incomplete dominance, and Mendel's laws of segregation and independent assortment.</li> <li>Analyze and interpret data (e.g., pedigree charts, family and population studies) regarding Mendelian and complex genetic disorders (e.g., sickle-cell</li> </ol>	<p><b>Textbook: Miller &amp; Levine Chapter 11 Mendel &amp; Meiosis p. 306-335</b>  <b>Honors: Campbell Biology Concepts and Connections: Chapter 9: Patterns of Inheritance pgs. 152-178</b></p> <p><b>Suggested LTF Labs</b>  Mendel &amp; His Peas  Autosomal Dominance  Cell Division</p> <p><b>Suggested ASIM Labs</b>  Modeling Meiosis &amp; Mendel (HudsonAlpha Chromosocks)  Alkaptonuria  Dragon Genetics</p>	<p>10 Blocks</p>



<p>anemia, cystic fibrosis, type 2 diabetes) to determine patterns of genetic inheritance and disease risks from both genetic and environmental factors.</p> <p>12. Develop and use a model to analyze the structure of chromosomes and how new genetic combinations occur through the process of meiosis.</p> <p>a. Analyze data to draw conclusions about genetic disorders caused by errors in meiosis (e.g., Down syndrome, Turner syndrome).</p>	<p><b>Textbook: Miller &amp; Levine Chapter 14 Human Heredity p. 390-415</b>  <b>Honors: Campbell Biology Concepts and Connections: Chapter 8: The Cellular Basis of Reproduction pgs. 135-151</b></p> <p><b>Suggested ASIM Labs</b>  Modeling Meiosis &amp; Mendel (HudsonAlpha Chromosocks)</p> <p><b>Video:</b>  <i>Crash course Biology Series: Meiosis (Where the Sex Starts)</i></p>	<p>5 Blocks</p>
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**Huntsville City Schools**  
**2017 – 2018 Pacing Guide**  
**Biology and Honors Biology Ninth Grade--- Third Nine Weeks**

<b>Key Terms:</b>		
<p><b>Standard 3:</b></p> <ul style="list-style-type: none"> <li>● Anticodon</li> <li>● Bacteriophage</li> <li>● Base pairing</li> <li>● Blastocyst</li> <li>● Central Dogma Theory</li> <li>● Codon</li> <li>● Exon</li> <li>● Frameshift mutation</li> <li>● Gene expression</li> <li>● Genetic code</li> <li>● Homeobox gene</li> <li>● Homeotic gene</li> <li>● Hox gene</li> <li>● Intron</li> <li>● Mitosis</li> <li>● mRNA</li> <li>● Multipotent</li> <li>● Mutagen</li> <li>● Mutation</li> <li>● Operator</li> <li>● Operon</li> <li>● Pluripotent</li> <li>● Point mutation</li> <li>● Polypeptide</li> <li>● Polyploidy</li> <li>● Promotor</li> <li>● RNA</li> <li>● RNA interference</li> </ul>	<p><b>Standard 3 continue:</b></p> <ul style="list-style-type: none"> <li>● RNA polymerase</li> <li>● rRNA</li> <li>● Stem cell</li> <li>● Totipotent</li> <li>● Transcription</li> <li>● Transformation</li> <li>● Translation</li> <li>● Tumor</li> </ul>	<p><b>Standard 13:</b></p> <ul style="list-style-type: none"> <li>● Archaea</li> <li>● Bacteria</li> <li>● Binomial Nomenclature</li> <li>● Clad</li> <li>● Cladogram</li> <li>● Class</li> <li>● Derived character</li> <li>● Domain</li> <li>● Eukarya</li> <li>● Family</li> <li>● Genus</li> <li>● Kingdom</li> <li>● Monophyletic group</li> <li>● Order</li> <li>● Phylogeny</li> <li>● Phylum</li> <li>● Systematics</li> <li>● Taxon</li> <li>● Virus</li> </ul>

Standard	Resources	Approximate Pacing Number of Days
<p>3. Formulate an evidence-based explanation regarding how the composition of deoxyribonucleic acid (DNA) determines the structural organization of proteins.</p> <p>a. Obtain and evaluate experiments of major scientists and communicate their contributions to the development of the structure of DNA and to the development of the central dogma of molecular biology.</p> <p>b. Obtain, evaluate, and communicate information that explains how advancements in genetic technology (e.g., Human Genome Project, Encyclopedia of DNA Elements [ENCODE] project, 1000 Genomes Project) have contributed to the understanding as to how a genetic change at the DNA level may affect proteins and, in turn, influence the appearance of traits.</p> <p>c. Obtain information to identify errors that occur during DNA replication (e.g., deletion, insertion, translocation, substitution, inversion, frame-shift, point mutations).</p>	<p>Textbook: Miller &amp; Levine Chapter 12 DNA pages 336-359, Chapter 13 RNA and Protein Synthesis pages 360-389,</p> <p><b>Honors: Campbell Biology Concepts and Connections:</b>  <b>Chapter 10: Molecular Biology of the Gene pgs. 180-190</b>  <b>Chapter 11: How Genes are Controlled</b>  <b>11.1-11.10 Pgs. 210-220</b>  <b>Chapter 12: DNA Technology and Genomics</b>  <b>Pgs. 230-250</b></p> <p><b>Suggested LTF Labs:</b></p> <ul style="list-style-type: none"> <li>• Proteins, The Essence of Life</li> <li>• The trp Operon</li> <li>• Introduction to Gel Electrophoresis</li> </ul> <p><b>Suggested ASIM Labs:</b></p> <ul style="list-style-type: none"> <li>• Hudson Alpha Disorder Detectives</li> <li>• Hudson Alpha Genes &amp; ConSEQUENCES</li> <li>• Manipulating DNA</li> <li>• Genes and ConSEQUENCES</li> </ul> <p><b>Videos:</b>  The Tryptophan Operon: DNA tube.com</p> <p>Howard Hughes Medical Institute Holiday Lectures in Science: Scanning Life's Matrix: Genes, Proteins and Small Molecules</p> <p><a href="http://www.hhmi.org/biointeractive/browse?kw=&amp;sort_by=search_api_aggregation_1&amp;items_per_page=25&amp;field_bio_for_mat_type[0]=23448">http://www.hhmi.org/biointeractive/browse?kw=&amp;sort_by=search_api_aggregation_1&amp;items_per_page=25&amp;field_bio_for_mat_type[0]=23448</a></p> <p><b>Crash course Biology Series:</b> DNA Structure and Replication, DNA, HotPockets: The longest word ever.</p>	<p>14 Blocks</p>

<p>13. Obtain, evaluate, and communicate information to explain how organisms are classified by physical characteristics, organized into levels of taxonomy, and identified by binomial nomenclature (e.g., taxonomic classification, dichotomous keys).</p> <p>a. Engage in argument to justify the grouping of viruses in a category separate from living things.</p>	<p><b>Textbook: Miller &amp; Levine Chapter 18 Classification p. 508-535</b></p> <p><b>Honors: Campbell Biology Concepts and Connections: Chapter 15 section 15-15, pgs. 308-309</b></p>	<p>3 blocks</p>
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**Biology and Honors Biology Ninth Grade: *Fourth Nine Weeks***

<b>Key Terms</b>				
<p><b>Standard 7:</b></p> <ul style="list-style-type: none"> <li>● Abiotic factor</li> <li>● Autotroph</li> <li>● Biome</li> <li>● Biosphere</li> <li>● Biotic factor</li> <li>● Carnivore</li> <li>● Chemosynthesis</li> <li>● Community</li> <li>● Consumer</li> <li>● Detrivore</li> <li>● Ecology</li> <li>● Ecosystem</li> <li>● Herbivore</li> <li>● Heterotroph</li> <li>● Omnivore</li> <li>● Photosynthesis</li> <li>● Population</li> <li>● Primary producer</li> <li>● Primary Producer</li> <li>● Scavenger</li> <li>● Species</li> </ul>	<p><b>Standard 8:</b></p> <ul style="list-style-type: none"> <li>● Biogeochemical cycle</li> <li>● Biomass</li> <li>● Denitrification</li> <li>● Ecological pyramid</li> <li>● Food chain</li> <li>● Food web</li> <li>● Limiting nutrient</li> <li>● Nitrogen fixation</li> <li>● Nutrient</li> <li>● Phytoplankton</li> <li>● Trophic level</li> <li>● Zooplankton</li> </ul> <p><b>Standard 9:</b></p> <ul style="list-style-type: none"> <li>● Age structure</li> <li>● Carrying capacity</li> <li>● Emigration</li> <li>● Exponential growth</li> <li>● Immigration</li> <li>● Logistic growth</li> <li>● Population density</li> </ul>	<p><b>Standard 10:</b></p> <ul style="list-style-type: none"> <li>● Demographic transition</li> <li>● Demography</li> <li>● Density dependent limiting factor</li> <li>● Density independent limiting factor</li> <li>● Limiting factor</li> </ul> <p><b>Standard 14:</b></p> <ul style="list-style-type: none"> <li>● Adaptation</li> <li>● Analogous structure</li> <li>● Artificial selection</li> <li>● Biogeography</li> <li>● Evolution</li> <li>● Fitness</li> <li>● Fossil</li> <li>● Homologous structure</li> <li>● Natural selection</li> <li>● Vestigial structure</li> </ul>	<p><b>Standard 15:</b></p> <ul style="list-style-type: none"> <li>● Allele frequency</li> <li>● Behavioral isolation</li> <li>● Bottleneck effect</li> <li>● Directional selection</li> <li>● Disruptive selection</li> <li>● Founder effect</li> <li>● Gene pool</li> <li>● Genetic drift</li> <li>● Genetic equilibrium</li> <li>● Geographic isolation</li> <li>● Hardy-Weinberg principle</li> <li>● Molecular clock</li> <li>● Polygenic trait</li> <li>● Reproductive isolation</li> <li>● Sexual selection</li> <li>● Single gene trait</li> <li>● Speciation</li> <li>● Species</li> <li>● Stabilization selection</li> <li>● Temporal isolation</li> </ul>	<p><b>Standard 16:</b></p> <ul style="list-style-type: none"> <li>● Adaptive radiation</li> <li>● Background extinction</li> <li>● Coevolution</li> <li>● Convergent evolution</li> <li>● Endosymbiotic Theory</li> <li>● Era</li> <li>● Extinct</li> <li>● Geologic time scale</li> <li>● Half-life</li> <li>● Index fossil</li> <li>● Macroevolutionary patterns</li> <li>● Paleontologist</li> <li>● Period</li> <li>● Plate tectonics</li> <li>● Punctuated equilibrium</li> <li>● Radiometric dating</li> <li>● Relative dating</li> </ul>

Standard	Resources	Approximate Pacing Number of Days
<p>14. Analyze and interpret data to evaluate adaptations resulting from natural and artificial selection that may cause changes in populations over time (e.g., antibiotic-resistant bacteria, beak types, peppered moths, pest-resistant crops).</p> <p>15. Engage in argument from evidence (e.g., mathematical models such as distribution graphs) to explain how the diversity of organisms is affected by overpopulation of species, variation due to genetic mutations, and competition for limited resources.</p> <p>16. Analyze scientific evidence (e.g., DNA, fossil records, cladograms, biogeography) to support hypotheses of common ancestry and biological evolution.</p>	<p><b>Textbook: Miller &amp; Levine Chapter 16 Darwin’s Theory of Evolution pages 448-479</b>  <b>Textbook: Miller &amp; Levine Chapter 17 Evolution of Populations pages 480-507</b>  <b>Textbook: Miller &amp; Levine Chapter 19 History of Life pages 536-569</b></p> <p><b>Honors: Campbell Biology Concepts and Connections:</b>  <b>Chapter 13: How Populations Evolve pgs. 254-274</b>  <b>Chapter 14: The Origin of Species pgs. 276-290</b>  <b>Chapter 15: Tracing Evolutionary History 15.4-15.6 &amp; 15.9-15.19 only pgs. 297-298 pgs. 302-315</b></p> <p><b>Suggested LTF Labs:</b></p> <ul style="list-style-type: none"> <li>• Classification Webquest</li> <li>• Bean Baby Bunnies</li> <li>• Hardy Har Har</li> <li>• Life in the Cold</li> <li>• Mystery of the Chicken &amp; the Egg</li> <li>• Quackers &amp; Cottontails</li> </ul> <p><b>Suggested ASIM Labs:</b></p> <ul style="list-style-type: none"> <li>• Bird Adaptation</li> <li>• Bead Bug Lab</li> <li>• Pepper Moth Lab</li> <li>• Classification of Living Things</li> <li>• Whale Evolution</li> <li>• Molecular Evolution</li> <li>• Which Beak is Best?</li> </ul> <p><b>Videos:</b>  What Darwin Never Knew</p>	<p>10 Blocks</p>

	<p>The “Evolution” Series: specify “Extinction” and “Great Transformations”</p> <p>Howard Hughes Medical Institute Holiday Lectures in Science:</p> <ul style="list-style-type: none"> <li>• Evolution: Constant Change and Common Threads</li> <li>• Evolution: Fossils, Genes and Mousetraps</li> </ul> <p><a href="http://www.hhmi.org/biointeractive/browse?kw=&amp;sort_by=search_api_aggregation_1&amp;items_per_page=25&amp;field_bio_format_type[0]=23448">http://www.hhmi.org/biointeractive/browse?kw=&amp;sort_by=search_api_aggregation_1&amp;items_per_page=25&amp;field_bio_format_type[0]=23448</a></p>	
<p>7. Develop and use models to illustrate examples of ecological hierarchy levels, including biosphere, biome, ecosystem, community, population, and organism.</p> <p>8. Develop and use models to describe the cycling of matter (e.g., carbon, nitrogen, water) and flow of energy (e.g., food chains, food webs, biomass pyramids, ten percent law) between abiotic and biotic factors in ecosystems.</p> <p>9. Use mathematical comparisons and visual representations to support or refute explanations of factors that affect population growth (e.g., exponential, linear, logistic).</p> <p>10. Construct an explanation and design a real-world solution to address changing conditions and ecological succession caused by density-dependent and/or density-independent factors.</p>	<p><b>Textbook: Miller &amp; Levine Chapter 3 The Biosphere pages 62-93</b></p> <p><b>Textbook: Miller &amp; Levine Chapter 4 Ecosystems and Communities pages 94-127</b></p> <p><b>Honors: Campbell Biology Concepts and Connections:</b></p> <p><b>Chapter 34: The Biosphere: An Introduction to Earth’s Diverse Environments Pgs. 679-696</b></p> <p><b>Chapter 36: Population Ecology pgs. 722-735</b></p> <p><b>Chapter 37: Communities and Ecosystems pgs. 738-758</b></p> <p><b>Chapter 38: Conservation Biology 38.1-38.6 Only pgs. 760-769</b></p> <p><b>Suggested LTF Labs:</b></p> <ul style="list-style-type: none"> <li>• I’m Depending on You</li> <li>• Call of the Wild</li> <li>• Lemmings of Norway</li> <li>• White Tail Rising</li> <li>• Biodiversity in the Wetlands</li> </ul> <p><b>Suggested ASIM Lab:</b></p> <ul style="list-style-type: none"> <li>• Biomes</li> <li>• Predator-Prey Population</li> <li>• Food Chain, Food Web, Energy Pyramid Magnetic Manipulative</li> <li>• Into the Forest</li> </ul>	<p>10 Blocks</p>

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|--|---|--|
|  | <ul style="list-style-type: none"><li>● Limiting Factors</li><li>● Fish Factors</li><li>● Exponential Population Growth</li><li>● Carbon/Nitrogen/Water Cycle Lab</li></ul> |  |
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## Other Suggested Resources

Concept	Resource Type	Title/Link	Time	Miscellaneous
Chemical Bonds	Modeling & Simulation program	Chemical Bonds (Concord Consortium) <a href="http://concord.org/stem-resources/chemical-bonds">http://concord.org/stem-resources/chemical-bonds</a>	Varies	Allows students to explore different kinds of bonds and adjust electronegativity to see how it affects chemical bonds.
Carbohydrates	Video	Paul Anderson Video on Carbohydrates <a href="http://www.schooltube.com/video/f1d5321446cd4d218fec/Carbohydrates">http://www.schooltube.com/video/f1d5321446cd4d218fec/Carbohydrates</a>	Approximately 9 minutes	
Lipids	Video	Paul Anderson Video on Lipids <a href="http://www.schooltube.com/video/65e387f387a54419b293/Lipids">http://www.schooltube.com/video/65e387f387a54419b293/Lipids</a>	Approximately 7 minutes	
Proteins	Video	Paul Anderson Video on Proteins <a href="http://www.schooltube.com/video/23a264b1f3a84784a3e7/Proteins">http://www.schooltube.com/video/23a264b1f3a84784a3e7/Proteins</a>	Approximately 9 minutes	
Proteins	Games	Fold-It <a href="http://fold.it/portal/">http://fold.it/portal/</a>	Varies	Allows students to learn how

				proteins form based on the amino acids and their properties
Protein Folding	Hands On Activity	Amino Acid Starter Kit (Set of 3) <a href="http://www.carolina.com/dna-model-kits/amino-acid-starter-kit-set-of-3-kits/211129.pr?question=protein+folding">http://www.carolina.com/dna-model-kits/amino-acid-starter-kit-set-of-3-kits/211129.pr?question=protein+folding</a>	Approximately 1 to 2 class periods	Available through Carolina. Enough for 3 groups. (A larger version of this kit was included in the 2012 GREAT workshop resource tub.)
Cell Membrane	Interactive Animation	Cell Membrane <a href="http://www.johnkyrk.com/cellmembrane.html">http://www.johnkyrk.com/cellmembrane.html</a>	Varies	Website also has tap on top left corner for options for other biology interactive animations.
Cells	Virtual Fly Through Video	Virtual Cell <a href="http://vcell.ndsu.nodak.edu/animations/flythrough/movie-flash.htm">http://vcell.ndsu.nodak.edu/animations/flythrough/movie-flash.htm</a>	Approximately 6 ½ minutes	A video showing the cell and organelles in a “fly through” type of view. (Takes time to buffer as the file is a little large.)

Prokaryotic & Eukaryotic Cells	Website (multiple resources)	Cells Alive! <a href="http://www.cellsalive.com">www.cellsalive.com</a>	Varies	Includes animations, puzzles, diagrams, etc.
Diffusion, Osmosis, & Active Transport	Model & Simulation	Diffusion, Osmosis & Active Transport (Concord Consortium) <a href="http://concord.org/stem-resources/diffusion-osmosis-and-active-transport">http://concord.org/stem-resources/diffusion-osmosis-and-active-transport</a>	Varies	
Cellular Respiration	Interactive Animation with Text	Cellular Respiration (Concord Consortium) <a href="http://concord.org/stem-resources/cellular-respiration">http://concord.org/stem-resources/cellular-respiration</a>	Varies	
Photosynthesis	Interactive Animation	Illuminating Photosynthesis (PBS) <a href="http://www.pbs.org/wgbh/nova/nature/photosynthesis.html">http://www.pbs.org/wgbh/nova/nature/photosynthesis.html</a>	Varies	Printable version also available.
Photosynthesis	Song with Lyrics	Photosynthesis Song with Lyrics to Taylor Swift's "I Knew You Were Trouble" <a href="https://www.youtube.com/watch?v=ww33L0lD37I&amp;safe=active">https://www.youtube.com/watch?v=ww33L0lD37I&amp;safe=active</a>	Approximately 4 min	Lyrics on Screen
Mitosis	Rap Video with Lyrics	Mitosis Rap <a href="http://www.youtube.com/watch?v=15uFuvkN97I&amp;safe=active">http://www.youtube.com/watch?v=15uFuvkN97I&amp;safe=active</a>	Approximately 4 minutes	
Reproduction	Interactive	Asexual vs Sexual Reproduction <a href="http://learn.genetics.utah.edu/content/variation/reproduction/">http://learn.genetics.utah.edu/content/variation/reproduction/</a>	Varies	
Monohybrid Cross	Video	Monohybrid Cross Punnett Squares Basics <a href="http://www.schooltube.com/video/8b3bd9430ac04abf9787/The%20Punnett%20Square%20Explained">http://www.schooltube.com/video/8b3bd9430ac04abf9787/The%20Punnett%20Square%20Explained</a>	Approximately 11 minutes	
Dihybrid Cross	Video	Dihybrid Cross Punnett Squares <a href="http://www.schooltube.com/video/859fb55120c169f8c462/Dihybrid%20Cross%20Vodcast">http://www.schooltube.com/video/859fb55120c169f8c462/Dihybrid%20Cross%20Vodcast</a>	Approximately 12 minutes	

Genetics	Game	Geniverse <a href="http://concord.org/stem-resources/geniverse">http://concord.org/stem-resources/geniverse</a>	Varies	
Genetic Variations	Slide Video	Sources of variation <a href="http://learn.genetics.utah.edu/content/variation/sources/">http://learn.genetics.utah.edu/content/variation/sources/</a>	Varies	
Genetics	Rap Video	Genetics Rap <a href="http://www.youtube.com/watch?v=0OnwOKiMVb8&amp;safe=active">http://www.youtube.com/watch?v=0OnwOKiMVb8&amp;safe=active</a>	Approximately 4 minutes	
Genetic Mutations	Text with graphics	Mutations <a href="http://learn.genetics.utah.edu/content/variation/mutation/">http://learn.genetics.utah.edu/content/variation/mutation/</a>	Varies	
Translation	Printable	Amino Acid Codon Chart <a href="http://www.teacherspayteachers.com/Product/Chart-of-Amino-Acids-Names-and-Abbreviations-and-Codons-messenger-RNA-codons-158776">http://www.teacherspayteachers.com/Product/Chart-of-Amino-Acids-Names-and-Abbreviations-and-Codons-messenger-RNA-codons-158776</a>	NA	
Genomics	Video	Cracking Your Genetic Code (NOVA) <a href="http://video.pbs.org/video/2215641935/">http://video.pbs.org/video/2215641935/</a>	53 minutes	
Biotechnology	Interactive Timeline	Progress of Science Digital Timeline <a href="http://timeline.hudsonalpha.org/">http://timeline.hudsonalpha.org/</a>	Varies	
Electrophoresis	Virtual Lab	Virtual Electrophoresis <a href="http://learn.genetics.utah.edu/content/labs/gel/">http://learn.genetics.utah.edu/content/labs/gel/</a>	Varies	
DNA	Virtual Lab	DNA Extraction <a href="http://learn.genetics.utah.edu/content/labs/extraction/">http://learn.genetics.utah.edu/content/labs/extraction/</a>	Varies	

PCR	Virtual Lab	PCR <a href="http://learn.genetics.utah.edu/content/labs/pcr/">http://learn.genetics.utah.edu/content/labs/pcr/</a>	Varies	
Evolution	Multiple Videos	Evolution <a href="http://www.hhmi.org/biointeractive/origin-species">http://www.hhmi.org/biointeractive/origin-species</a>	Darwin Video 30 minutes Finch Video 15 minutes Lizard Video 17 minutes	
Adaptations	Modeling & Simulation	Adaptations <a href="http://concord.org/stem-resources/mystery-plants-mystery">http://concord.org/stem-resources/mystery-plants-mystery</a>	Varies	
Phylogenetic Trees	Interactive	Phylogenetic Trees <a href="http://www.hhmi.org/biointeractive/creating-phylogenetic-trees-dna-sequences">http://www.hhmi.org/biointeractive/creating-phylogenetic-trees-dna-sequences</a>	Varies	
Phylogenetic Trees	Interactive	Seashell Sorting <a href="http://www.hhmi.org/biointeractive/sorting-seashells">http://www.hhmi.org/biointeractive/sorting-seashells</a>	Varies	
Embryology	Interactive	Embryology <a href="http://www.pbs.org/wgbh/nova/evolution/guess-embryo.html">http://www.pbs.org/wgbh/nova/evolution/guess-embryo.html</a>	Varies	
Evolution in Populations	Virtual Lab	Stickleback Evolution Lab <a href="http://www.hhmi.org/biointeractive/stickleback-evolution-virtual-lab">http://www.hhmi.org/biointeractive/stickleback-evolution-virtual-lab</a>	Varies	
Dichotomous Keys & Cladograms	Printable Activity	Dichotomous Keys & Cladograms Activity <a href="http://www.nsta.org/highschool/connections/201312StudentActivityHandout.pdf">http://www.nsta.org/highschool/connections/201312StudentActivityHandout.pdf</a>	Varies	

Flower Anatomy	Lab	Flower Dissection <a href="http://www.battaly.com/science/flowerlab_no.htm">http://www.battaly.com/science/flowerlab_no.htm</a>	1 class period	
Flower Anatomy	Lab	Flower Dissection <a href="http://naturalsciences.sdsu.edu/classes/lab2.6/lab2.6.html#anchor20015960">http://naturalsciences.sdsu.edu/classes/lab2.6/lab2.6.html#anchor20015960</a>	1 class period	
Humans & The Environment	Case Study	Ecotourism: Who Benefits? <a href="http://sciencecases.lib.buffalo.edu/cs/collection/detail.asp?case_id=359&amp;id=359">http://sciencecases.lib.buffalo.edu/cs/collection/detail.asp?case_id=359&amp;id=359</a>	varies	
Carbon Cycle	Case Study	Dust to Dust <a href="http://sciencecases.lib.buffalo.edu/cs/collection/detail.asp?case_id=246&amp;id=246">http://sciencecases.lib.buffalo.edu/cs/collection/detail.asp?case_id=246&amp;id=246</a>	varies	
Humans & The Environment	Case Study	Can Suminoe Oysters Save Chesapeake Bay? <a href="http://sciencecases.lib.buffalo.edu/cs/collection/detail.asp?case_id=428&amp;id=428">http://sciencecases.lib.buffalo.edu/cs/collection/detail.asp?case_id=428&amp;id=428</a>	varies	
Humans & The Environment	Case Study	Nutrient Cycles and Pollution <a href="http://sciencecases.lib.buffalo.edu/cs/collection/detail.asp?case_id=487&amp;id=487">http://sciencecases.lib.buffalo.edu/cs/collection/detail.asp?case_id=487&amp;id=487</a>	Varies	
Humans & The Environment	Case Study	The Effects of Coyote Removal in Texas <a href="http://sciencecases.lib.buffalo.edu/cs/collection/detail.asp?case_id=438&amp;id=438">http://sciencecases.lib.buffalo.edu/cs/collection/detail.asp?case_id=438&amp;id=438</a>	Varies	

Math in Science	Videos	Mathematics in Science <a href="http://learn.genetics.utah.edu/content/math/">http://learn.genetics.utah.edu/content/math/</a>	Varies	
Population Growth	Modeling & Simulations	Modeling Populations <a href="http://concord.org/stem-resources/african-lions-modeling-populations">http://concord.org/stem-resources/african-lions-modeling-populations</a>	Varies	
Population Growth	Case Study	Too Many Deer <a href="http://sciencecases.lib.buffalo.edu/cs/collection/detail.asp?case_id=174&amp;id=174">http://sciencecases.lib.buffalo.edu/cs/collection/detail.asp?case_id=174&amp;id=174</a>	Varies	
Math in Science	Case Study	Mathematics in Conservation <a href="http://sciencecases.lib.buffalo.edu/cs/collection/detail.asp?case_id=693&amp;id=693">http://sciencecases.lib.buffalo.edu/cs/collection/detail.asp?case_id=693&amp;id=693</a>	Varies	

**Listed below are the technology standards for grades nine through twelve. You are to make every effort to incorporate the applicable standards into your daily classroom lessons. These standards should be noted in your lesson plans.**

## **Alabama Technology Standards Ninth – Twelfth Grade**

### **Operations and Concepts**

Students will:

2. Diagnose hardware and software problems.  
Examples: viruses, error messages  
Applying strategies to correct malfunctioning hardware and software  
Performing routine hardware maintenance  
Describing the importance of antivirus and security software
3. Demonstrate advanced technology skills, including compressing, converting, importing, exporting, and backing up files.  
Transferring data among applications  
Demonstrating digital file transfer  
Examples: attaching, uploading, downloading
4. Utilize advanced features of word processing software, including outlining, tracking changes, hyperlinking, and mail merging.
5. Utilize advanced features of spreadsheet software, including creating charts and graphs, sorting and filtering data, creating formulas, and applying functions.
6. Utilize advanced features of multimedia software, including image, video, and audio editing.

### **Digital Citizenship**



9. Practice ethical and legal use of technology systems and digital content.  
Explaining consequences of illegal and unethical use of technology systems and digital content  
Examples: cyberbullying, plagiarism  
Interpreting copyright laws and policies with regard to ownership and use of digital content  
Citing sources of digital content using a style manual  
Examples: Modern Language Association (MLA), American Psychological Association (APA)

### **Research and Information Fluency**

11. Critique digital content for validity, accuracy, bias, currency, and relevance.

### **Communication and Collaboration**

12. Use digital tools to publish curriculum-related content.  
Examples: Web page authoring software, coding software, wikis, blogs, podcasts
13. Demonstrate collaborative skills using curriculum-related content in digital environments.  
Examples: completing assignments online; interacting with experts and peers in a structured, online learning environment

### **Critical Thinking, Problem Solving, and Decision Making**

14. Use digital tools to defend solutions to authentic problems.  
Example: disaggregating data electronically

### **Creativity and Innovation**

15. Create a product that integrates information from multiple software applications.  
Example: pasting spreadsheet-generated charts into a presentation