

**Science:  
Biology  
Unit 9: Science and Technology**

<b>Essential Understandings</b>	<ul style="list-style-type: none"> <li>▪ Technological advances in genetics impact all aspects of society and the environment.</li> </ul>
<b>Essential Questions</b>	<ul style="list-style-type: none"> <li>▪ How do technological advances affect the environment and society?</li> </ul>
<b>Essential Knowledge</b>	<ul style="list-style-type: none"> <li>▪ Technological advances in genetics impact all aspects of society.</li> <li>▪ Understanding technology is critical to the future of policy regarding science.</li> </ul>
<b>Vocabulary</b>	<ul style="list-style-type: none"> <li>▪ <u>Terms:</u> <ul style="list-style-type: none"> <li>○ genetic engineering, selected breeding/artificial selection, gel electrophoresis, transgenic organism, recombinant DNA, cloning, human genome, genetic counseling, gene therapy, bioethics, stem cell</li> </ul> </li> </ul>
<b>Essential Skills</b>	<ul style="list-style-type: none"> <li>▪ Interpret a DNA fingerprint.</li> <li>▪ Model transformation.</li> <li>▪ Distinguish between gene cloning and organismal cloning.</li> <li>▪ Understand the various ways stem cells can be used in society.</li> </ul>
<b>Related Maine Learning Results</b>	<p><u>Science and Technology</u></p> <p>A. Unifying Themes</p> <p>A1. Systems Students apply an understanding of systems to explain and analyze man-made and natural phenomena.</p> <p>a. Analyze a system using the principles of boundaries, subsystems, inputs, outputs, feedback, or the system's relation to other systems and design.</p> <p>b. Explain and provide examples that illustrate how it may not always be possible to predict the impact of changing some part of a man-made or natural system.</p> <p>A2. Models Students evaluate the effectiveness of a model by comparing its predictions to actual observations from the physical setting, the living environment, and the technological world.</p> <p>A3. Constancy and Change Students identify and analyze examples of constancy and change that result from varying types and rates of change in physical, biological, and technical systems with and without counterbalances.</p>

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<p><b>Related Maine Learning Results</b></p>	<p>A4. Scale Students apply understanding of scale to explain phenomena in physical, biological, and technological systems.</p> <ul style="list-style-type: none"><li>a. Describe how large changes of scale may change how physical and biological systems work and provide examples.</li><li>b. Mathematically represent large magnitudes of scale.</li></ul> <p>B. The Skills and Traits of Scientific Inquiry and Technological Design</p> <p>B1. Skills and Traits of Inquiry Students methodically plan, conduct, analyze data from, and communicate results of in-depth scientific investigations, including experiments guided by a testable hypothesis.</p> <ul style="list-style-type: none"><li>a. Identify questions, concepts, and testable hypotheses that guide scientific investigations.</li><li>b. Design and safely conduct methodical scientific investigations, including experiments with controls.</li><li>c. Use statistics to summarize, describe, analyze, and interpret results.</li><li>d. Formulate and revise scientific investigations and models using logic and evidence.</li><li>e. Use a variety of tools and technologies to improve investigations and communications.</li><li>f. Recognize and analyze alternative explanations and models using scientific criteria.</li><li>g. Communicate and defend scientific ideas.</li></ul> <p>B2. Skills and Tools of Technological Design Students use a systemic process, tools and techniques, and a variety of materials to design and produce a solution or product that meets new needs or improves existing designs.</p> <ul style="list-style-type: none"><li>a. Identify new problems or a current design in need of improvement.</li><li>b. Generate alternative design solutions.</li><li>c. Select the design that best meets established criteria.</li><li>d. Use models and simulations as prototypes in the design planning process.</li><li>e. Implement the proposed design solution.</li><li>f. Evaluate the solution to a design problem and the consequence of that solution.</li></ul>
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<p><b>Related Maine Learning Results</b></p>	<p>C. The Scientific and Technological Enterprise</p> <p>C1. Understandings of Inquiry Students describe key aspects of scientific investigations: that they are guided by scientific principles and knowledge, that they are performed to test ideas, and that they are communicated and defended publicly.</p> <ul style="list-style-type: none"><li>a. Describe how hypotheses and past and present knowledge guide and influence scientific investigations.</li><li>b. Describe how scientists defend their evidence and explanations using logical arguments and verifiable results.</li></ul> <p>C2. Understandings About Science and Technology Students explain how the relationship between scientific inquiry and technological design influences the advancement of ideas, products, and systems.</p> <ul style="list-style-type: none"><li>a. Provide an example that shows how science advances with the introduction of new technologies and how solving technological problems often impacts new scientific knowledge.</li><li>b. Provide examples of how creativity, imagination, and a good knowledge base are required to advance scientific ideas and technological design.</li><li>c. Provide examples that illustrate how technological solutions to problems sometimes lead to new problems or new fields of inquiry.</li></ul> <p>C3. Science, Technology, and Society Students describe the role of science and technology in creating and solving contemporary issues and challenges.</p> <ul style="list-style-type: none"><li>a. Explain how science and technology influence the carrying capacity and sustainability of the planet.</li><li>b. Explain how ethical, societal, political, economic, and cultural factors influence personal health, safety, and the quality of the environment.</li><li>c. Explain how ethical, societal, political, economic, religious, and cultural factors influence the development and use of science and technology.</li></ul>
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<b>Related Maine Learning Results</b>	<p>C4. History and Nature of Science Students describe the human dimensions and traditions of science, the nature of scientific knowledge, and historical episodes in science that impacted science and society.</p> <ol style="list-style-type: none"> <li>a. Describe the ethical traditions in science including peer review, truthful reporting, and making results public.</li> <li>b. Select and describe one of the major episodes in the history of science including how the scientific knowledge changed over time and any important effects on science and society.</li> <li>c. Give examples that show how societal, cultural, and personal beliefs and ways of viewing the world can bias scientists.</li> <li>d. Provide examples of criteria that distinguish scientific explanations from pseudoscientific ones.</li> </ol>
<b>Sample Lessons And Activities</b>	<ul style="list-style-type: none"> <li>▪ DNA Extraction</li> <li>▪ Interpreting DNA Fingerprints</li> <li>▪ Virtual Cloning</li> <li>▪ Modeling Transformation</li> </ul>
<b>Sample Classroom Assessment Methods</b>	<ul style="list-style-type: none"> <li>▪ Quiz</li> <li>▪ Chapter Test</li> <li>▪ Lab Reports</li> </ul>
<b>Sample Resources</b>	<ul style="list-style-type: none"> <li>▪ <u>Publications:</u> <ul style="list-style-type: none"> <li>○ <u>Biology</u> – Kenneth Miller and Josephine Levine</li> <li>○ Scientific Journals</li> </ul> </li> <li>▪ <u>Videos:</u> <ul style="list-style-type: none"> <li>○ <u>Cycle of Life</u> series</li> </ul> </li> <li>▪ <u>Other Resources:</u> <ul style="list-style-type: none"> <li>○ Internet resources</li> </ul> </li> </ul>