

# **Unit 7: Ethics and Biotechnology (Life Science)**

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Content Area: **Science**  
Course(s): **Biotechnology**  
Time Period:  
Length: **15 days, Grade 10 Academy**  
Status: **Published**

### **Title Section**

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## **Department of Curriculum and Instruction**



**Belleville Public Schools**

**Curriculum Guide**

**BIOTECHNOLOGY, GRADE 10 ACADEMY**

**ETHICS AND BIOTECHNOLOGY**

**Belleville Board of Education**

**102 Passaic Avenue**

**Belleville, NJ 07109**

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Board Approved: September 23, 2019

## **Unit Overview**

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Ethics and related issues in all areas of science are increasingly gaining attention among the public, scientists, politicians, and others. As new biotechnology applications emerge, discussions and increased awareness of ethical concerns associated with these applications will almost always precede the actual development of the application. This chapter emphasizes that increasingly, ethical thinking and decision making will be important skills for the future.

## **Enduring Understanding**

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Bioethics considers social and moral aspects and potential outcomes of the use of biological and medical technologies. Students will be encouraged to think about bioethics and ask questions, to think about how to ask the right questions, acquire all the facts, and make decisions based on information rather than emotional

reactions. Students will learn the art of debate in this unit

## **Essential Questions**

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What are the 2 leading approaches to ethical thought, and how do they differ?

What ethical issues are associated with genome editing and germ-line gene modification?

Describe the risks and ethics of editing human embryos

Should humans and other animals be cloned for any reason?

What is the difference between being a person and a human being?

## **Exit Skills**

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UPON COMPLETION OF THIS UNIT, STUDENTS SHOULD BE ABLE TO:

- Define bioethics and explain how it relates to biotechnology
- Understand and apply different approaches to ethical thought
- Identify potential ethical dilemmas associated with biotechnology, including the use of evidence that relies on a scientific understanding to evaluate
- Pose questions and approaches that address the ethical problems identified in this chapter
- Identify outcomes and pitfalls associated with different ethical approaches
- Discuss interactions among science, economics, communication, and public policy for ethically-challenging issues in biotechnology
- Understand and explain controversies and ethical issues surrounding genetic testing, stem cells, genetic modified organisms, cloning, regenerative medicine, genome editing, and other bioethical topics.
- Analyze the ethical issue of genetic privacy for more than one perspective to demonstrate an

## **New Jersey Student Learning Standards (NJSL-S)**

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|                       |  |
|-----------------------|--|
| 9-12.HS-LS3-1.LS1.A.1 | All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins.  |
| 9-12.HS-LS1-1.LS1.A.2 | All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells.   |
| 9-12.HS-LS3-1.LS3.A.1 | Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. Not all DNA codes for a protein; some segments of DNA are involved in regulatory or structural functions, and some have no as-yet known function. |

## **Interdisciplinary Connections**

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Upon completion of this section, please remove all remaining descriptions, notes, outlines, examples and/or illustrations that are not needed or used.

Please list all and any additional **Interdisciplinary Connections/Cross-Curricular** New Jersey Student Learning Standards that link to this unit, and which are not included in the NJSLS section above.

|                  |   |
|------------------|---|
| LA.WHST.9-10.2.D | Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.                       |
| LA.WHST.9-10.2.E | Establish and maintain a style and tone appropriate to the audience and purpose (e.g., formal and objective for academic writing) while attending to the norms and conventions of the discipline in which they are writing. |
| LA.WHST.9-10.9   | Draw evidence from informational texts to support analysis, reflection, and research.   |
| LA.WHST.9-10.10  | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.                  |

## Learning Objectives

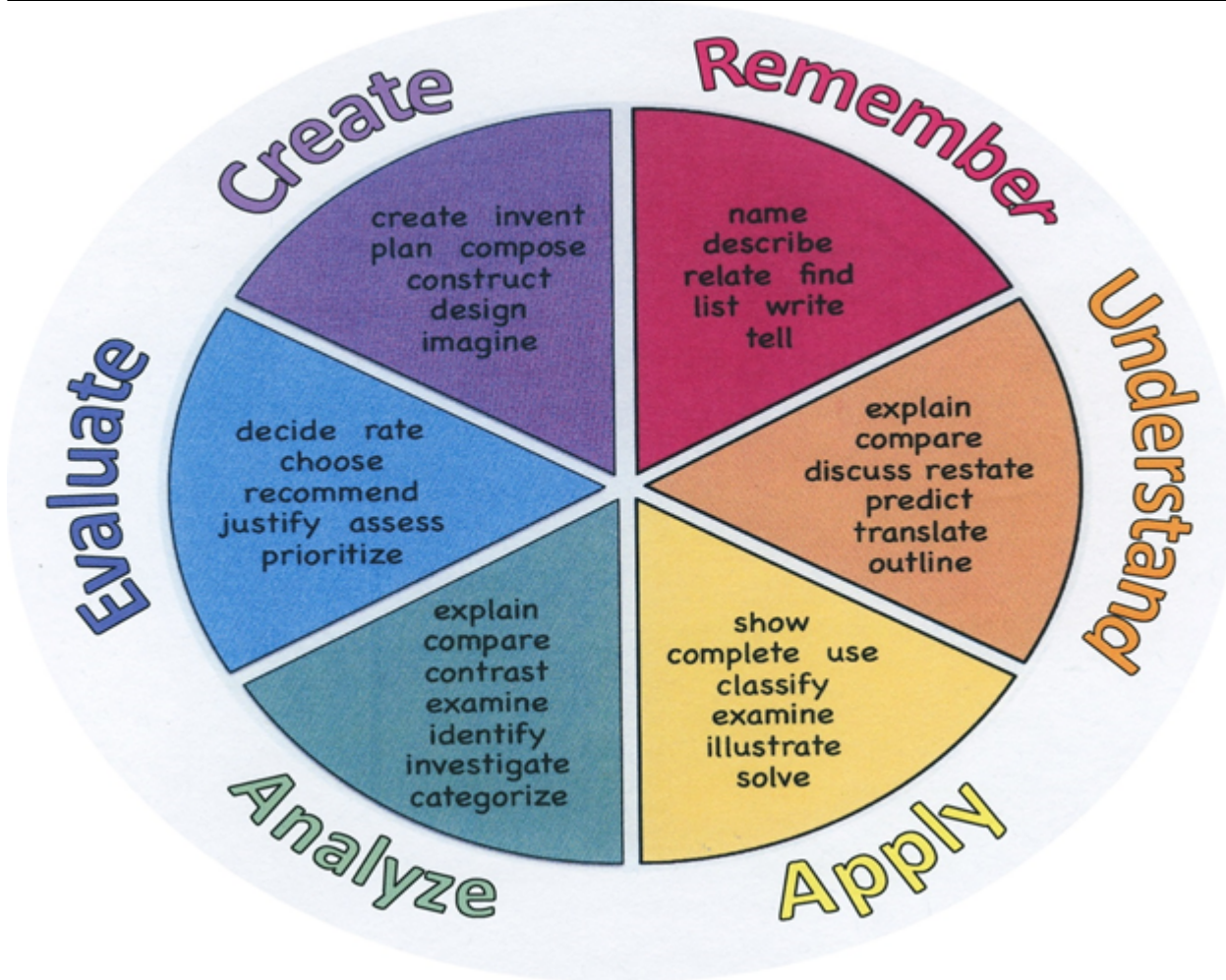
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- Analyze the ethical issue of genetic privacy for more than one perspective to demonstrate an understanding of bioethical concepts

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

| Remember  | Understand    | Apply      | Analyze       | Evaluate  | Create      |
|-----------|---------------|------------|---------------|-----------|-------------|
| Choose    | Classify      | Choose     | Categorize    | Appraise  | Combine     |
| Describe  | Defend        | Dramatize  | Classify      | Judge     | Compose     |
| Define    | Demonstrate   | Explain    | Compare       | Criticize | Construct   |
| Label     | Distinguish   | Generalize | Differentiate | Defend    | Design      |
| List      | Explain       | Judge      | Distinguish   | Compare   | Develop     |
| Locate    | Express       | Organize   | Identify      | Assess    | Formulate   |
| Match     | Extend        | Paint      | Infer         | Conclude  | Hypothesize |
| Memorize  | Give Examples | Prepare    | Point out     | Contrast  | Invent      |
| Name      | Illustrate    | Produce    | Select        | Critique  | Make        |
| Omit      | Indicate      | Select     | Subdivide     | Determine | Originate   |
| Recite    | Interrelate   | Show       | Survey        | Grade     | Organize    |
| Select    | Interpret     | Sketch     | Arrange       | Justify   | Plan        |
| State     | Infer         | Solve      | Breakdown     | Measure   | Produce     |
| Count     | Match         | Use        | Combine       | Rank      | Role Play   |
| Draw      | Paraphrase    | Add        | Detect        | Rate      | Drive       |
| Outline   | Represent     | Calculate  | Diagram       | Support   | Devise      |
| Point     | Restate       | Change     | Discriminate  | Test      | Generate    |
| Quote     | Rewrite       | Classify   | Illustrate    |           | Integrate   |
| Recall    | Select        | Complete   | Outline       |           | Prescribe   |
| Recognize | Show          | Compute    | Point out     |           | Propose     |
| Repeat    | Summarize     | Discover   | Separate      |           | Reconstruct |

|           |   |  |  |  |                                |
|-----------|---|--|--|--|--------------------------------|
| Reproduce | Tell<br>Translate<br>Associate<br>Compute<br>Convert<br>Discuss<br>Estimate<br>Extrapolate<br>Generalize<br>Predict | Divide<br>Examine<br>Graph<br>Interpolate<br>Manipulate<br>Modify<br>Operate<br>Subtract |  |  | Revise<br>Rewrite<br>Transform |
|-----------|---|--|--|--|--------------------------------|



## Suggested Activities & Best Practices

Read Chapter 13, pages 343-365

Case Studies

Questions on pages 364-365

Debates with Law classes

Vocabulary Quiz

Chapter test

## **Assessment Evidence - Checking for Understanding (CFU)**

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Check Answers to questions (Formative)

Analyze Debates for content, research, and presentation (Formative)

Chapter Test (Summative)

Class Discussions (Formative)

Benchmark #4 (Benchmark)

- Admit Tickets
- Anticipation Guide
- Common Benchmarks
- Compare & Contrast
- Create a Multimedia Poster
- DBQ's
- Define
- Describe

- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Fist- to-Five or Thumb-Ometer
- Illustration
- Journals
- KWL Chart
- Learning Center Activities
- Multimedia Reports
- Newspaper Headline
- Outline
- Question Stems
- Quickwrite
- Quizzes
- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide
- Surveys
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Top 10 List
- Unit review/Test prep
- Unit tests
- Web-Based Assessments
- Written Reports

## **Primary Resources & Materials**

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**PRIMARY RESOURCES: Introduction to Biotechnology, 4th ed. 2019(text book)**

## **Ancillary Resources**

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Introduction to Biology Companion Website: [www.pearsonhighered.com/biotechnology](http://www.pearsonhighered.com/biotechnology)



Activities from DNAi.org

Journal articles provided and researched for case studies in Chapter 13

Internet

myDNA @ DNAi.org

## **Technology Infusion**

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Chromebooks and internet for research

Pearson companion website

Science Direct search engine

MYDNAi.org



## Alignment to 21st Century Skills & Technology

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|                   |  |
|-------------------|--|
| CRP.K-12.CRP1     | Act as a responsible and contributing citizen and employee.  |
| CRP.K-12.CRP1.1   | Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.  |
| CRP.K-12.CRP2     | Apply appropriate academic and technical skills.   |
| CRP.K-12.CRP2.1   | Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.  |
| CRP.K-12.CRP10    | Plan education and career paths aligned to personal goals.   |
| CRP.K-12.CRP10.1  | Career-ready individuals take personal ownership of their own education and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the pathways available to them and the time, effort, experience and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the education and experiential process, and they recognize that nearly all career paths require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals. |
| CRP.K-12.CRP11    | Use technology to enhance productivity.  |
| CRP.K-12.CRP11.1  | Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.   |
| CRP.K-12.CRP12    | Work productively in teams while using cultural global competence.   |
| CRP.K-12.CRP12.1  | Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.   |
| CAEP.9.2.12.C.1   | Review career goals and determine steps necessary for attainment.  |
| CAEP.9.2.12.C.2   | Modify Personalized Student Learning Plans to support declared career goals.   |
| CAEP.9.2.12.C.6   | Investigate entrepreneurship opportunities as options for career planning and identify the knowledge, skills, abilities, and resources required for owning and managing a business.  |
| CAEP.9.2.12.C.7   | Examine the professional, legal, and ethical responsibilities for both employers and employees in the global workplace.  |
| TECH.8.1.12.A.CS1 | Understand and use technology systems.   |

|                   |  |
|-------------------|--|
| TECH.8.1.12.D     | Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.   |
| TECH.8.1.12.D.CS1 | Advocate and practice safe, legal, and responsible use of information and technology.  |
| TECH.8.2.12.B     | Technology and Society: Knowledge and understanding of human, cultural and society values are fundamental when designing technology systems and products in the global society.  |
| TECH.8.2.12.B.3   | Analyze ethical and unethical practices around intellectual property rights as influenced by human wants and/or needs.   |
| TECH.8.2.12.B.5   | Research the historical tensions between environmental and economic considerations as driven by human needs and wants in the development of a technological product, and present the competing viewpoints to peers for review. |
| TECH.8.2.12.B.CS2 | The effects of technology on the environment.  |
| TECH.8.2.12.B.CS3 | The role of society in the development and use of technology.  |

## **21st Century Skills/Interdisciplinary Themes**

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Upon completion of this section, please remove all remaining descriptions, notes, outlines, examples and/or illustrations that are not needed or used.

Please list only the **21st Century/Interdisciplinary Themes** that will be incorporated into this unit.

- Communication and Collaboration
- Creativity and Innovation
- Critical thinking and Problem Solving
- ICT (Information, Communications and Technology) Literacy
- Information Literacy
- Life and Career Skills
- Media Literacy

## **21st Century Skills**

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Please list only the **21st Century Skills** that will be incorporated into this unit.

- Civic Literacy
- Environmental Literacy
- Financial, Economic, Business and Entrepreneurial Literacy
- Global Awareness

- Health Literacy

## **Differentiation**

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Small Group Instruction- Students will work in groups of 4 to answer questions and internet searches on page 364 & 365

Visual Presentation- power point given with notes for this section

Work with higher functioning students on debates and case studies in chapter 13

Heterogeneous grouping for debate project

### **Differentiations:**

- Small group instruction
- Small group assignments
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions
- Use manipulatives
- Center-based instruction
- Token economy
- Study guides
- Teacher reads assessments allowed
- Scheduled breaks
- Rephrase written directions
- Multisensory approaches
- Additional time
- Preview vocabulary
- Preview content & concepts
- Story guides
- Behavior management plan
- Highlight text
- Student(s) work with assigned partner
- Visual presentation
- Assistive technology
- Auditory presentations
- Large print edition
- Dictation to scribe
- Small group setting

### **Hi-Prep Differentiations:**

- Alternative formative and summative assessments
- Choice boards

- Games and tournaments
- Group investigations
- Guided Reading
- Independent research and projects
- Interest groups
- Learning contracts
- Leveled rubrics
- Literature circles
- Multiple intelligence options
- Multiple texts
- Personal agendas
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products
- Varying organizers for instructions

#### **Lo-Prep Differentiations**

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

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

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Provide modifications as dictated in the student's IEP/504 Plan for case study on chapter 13

Students working with Assigned Partner for group questions on pages 364 & 365 and DNAI.org activities

- printed copy of board work/notes provided
- additional time for skill mastery

- assistive technology
- behavior management plan
- Center-Based Instruction
- check work frequently for understanding
- computer or electronic device utilizes
- extended time on tests/ quizzes
- have student repeat directions to check for understanding
- highlighted text visual presentation
- modified assignment format
- modified test content
- modified test format
- modified test length
- multiple test sessions
- multi-sensory presentation
- preferential seating
- preview of content, concepts, and vocabulary
- Provide modifications as dictated in the student's IEP/504 plan
- reduced/shortened reading assignments
- Reduced/shortened written assignments
- secure attention before giving instruction/directions
- shortened assignments
- student working with an assigned partner
- teacher initiated weekly assignment sheet
- Use open book, study guides, test prototypes

## **English Language Learning (ELL)**

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Google Translate allowed in room and using MY DNA website

Sit student with bilingual partner of same language

Use google translate to complete lab journal entry

Create a multimedia debate with the group, with you as the lead in your native language

- teaching key aspects of a topic. Eliminate nonessential information
- using videos, illustrations, pictures, and drawings to explain or clarify
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning;

- allowing students to correct errors (looking for understanding)
- allowing the use of note cards or open-book during testing
- decreasing the amount of work presented or required
- having peers take notes or providing a copy of the teacher's notes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using computer word processing spell check and grammar check features
- using true/false, matching, or fill in the blank tests in lieu of essay tests

## **At Risk**

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Tutoring by Peers: ask for help with questions on pages 364& 365

Using videos, illustrations, pictures, and drawings to explain or clarify

- allowing students to correct errors (looking for understanding)
- teaching key aspects of a topic. Eliminate nonessential information
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
- allowing students to select from given choices
- allowing the use of note cards or open-book during testing
- collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test.
- decreasing the amount of work presented or required
- having peers take notes or providing a copy of the teacher's notes
- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using authentic assessments with real-life problem-solving
- using true/false, matching, or fill in the blank tests in lieu of essay tests
- using videos, illustrations, pictures, and drawings to explain or clarify

## **Talented and Gifted Learning (T&G)**

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Take lead in all sections of debates with law classes.

Complete extra case study on page 365: The GTEEx Project, Cadavers, and Family Rights

- Above grade level placement option for qualified students
- Advanced problem-solving
- Allow students to work at a faster pace
- Cluster grouping
- Complete activities aligned with above grade level text using Benchmark results
- Create a blog or social media page about their unit
- Create a plan to solve an issue presented in the class or in a text
- Debate issues with research to support arguments
- Flexible skill grouping within a class or across grade level for rigor
- Higher order, critical & creative thinking skills, and discovery
- Multi-disciplinary unit and/or project
- Teacher-selected instructional strategies that are focused to provide challenge, engagement, and growth opportunities
- Utilize exploratory connections to higher-grade concepts
- Utilize project-based learning for greater depth of knowledge

## **Sample Lesson**

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See sample in Unit 1.