

Winslow Township School District
Laboratory Biology Curriculum
Unit 3: DNA & Genetics & Evolution

Overview: Students discover how cellular information passes from one generation to another. Students are introduced to many basic genetics concepts such as questioning how an organism passes characteristics to its offspring and how can the environment have an effect on an organism’s traits. Practical tools will be incorporated into the unit to reinforce how to ask and predict outcomes of a genetic cross in an individual and the following of a trait through generations. Students will focus on patterns of heredity and construct models to demonstrate how genetics is used to study human inheritance. Students construct explanations for the processes of natural selection and evolution and then communicate how multiple line of evidence support these explanations. Students evaluate evidence of the conditions that may result in new species and understand the role of genetic variation in natural selection. Additionally, students can apply concepts of probability to explain trends in population as those trends relate to advantageous heritable traits in a specific environment. Students demonstrate an understanding of these concepts by obtaining, evaluation, and communicating information and construction explanations and designing solutions. The crosscutting concepts of patterns and cause and effect support the development of a deeper understanding.

Overview	Standards for Science	Unit Focus	Essential Questions
Unit 3 DNA & Genetics & Evolution	<ul style="list-style-type: none"> • HS-LS3-1 • HS-LS3-2 • HS-LS3-3 • HS-LS4-1 • HS-LS4-2 • HS-LS4-5 	<ul style="list-style-type: none"> • Model process of protein synthesis. • All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instruction that code for the formation of proteins, which carry out most of the work of cells. • Errors in DNA replication can occur, resulting in mutations, which are a source of genetic variation. • Environmental factors can cause mutations in genes, and viable mutations are inherited. • Evolution is a foundation of modern biology. • The theory of evolution by natural selection explains change in species over time. 	<ul style="list-style-type: none"> • What is the structure of DNA, and how does it direct the making of proteins? • How does an organism pass its characteristics on to its offspring? • How can the outcome of a genetic cross be predicted? • How can a trait be followed through generations? • How can interactions between alleles, genes, and the environment affect an organism’s traits? • How does a cell divide to create cells with exactly half of the original cell’s

Winslow Township School District
Laboratory Biology Curriculum
Unit 3: DNA & Genetics & Evolution

<p><i>Unit 3: Enduring Understandings</i></p>	<ul style="list-style-type: none">• DNA is the molecule of life: it holds heredity and directions to make proteins, the directions necessary to express an organism's genetics• Cellular information is passed from one generation to the next in the form of genes.• Certain genetic outcomes can be predicted by looking at parent alleles.• A species has a set number of chromosomes that must be maintained at time of fertilization.• Species change over time.• Evidence supports evolutionary change.	<p>genetic information?</p> <ul style="list-style-type: none">• What causes some human genetic disorders?• What patterns of biodiversity were observed by Darwin when traveling on the <i>Beagle</i>?• What is Darwin's theory of evolution by natural selection?• What are the main lines of scientific evidence that support Darwin's theory of evolution by natural selection?
---	--	--

Winslow Township School District
Laboratory Biology Curriculum
Unit 3: DNA & Genetics & Evolution

Curriculum Unit 3	Standards		Pacing	
			Days	Unit Days
Unit 3: Genetics & Evolution	HS-LS3-1	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring	10	45
	HS-LS3-2	Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.	17	
	HS-LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population	5	
	HS-LS4-1	Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.	3	
	HS-LS4-2	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment	5	

Winslow Township School District
Laboratory Biology Curriculum
Unit 3: DNA & Genetics & Evolution

	HS-LS4-5	Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species	5	
Assessment, Re-teach and Extension			45	

Winslow Township School District
Laboratory Biology Curriculum
Unit 3: DNA & Genetics & Evolution

Unit 3 Laboratory Biology		
Disciplinary Core Ideas	Indicator #	Indicator
<p>ETS1.A: Defining and Delimiting Engineering Problems The more precisely a design task’s criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1)</p> <p>ETS1.B: Developing Possible Solutions A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4)</p> <p>ETS1.C: Optimizing the Design Solution Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. (MS-ETS1-3)</p>	HS-LS3-1	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring
	HS-LS3-2	Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
	HS-LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population
	HS-LS4-1	Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
	HS-LS4-2	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better

Winslow Township School District
Laboratory Biology Curriculum
Unit 3: DNA & Genetics & Evolution

		able to survive and reproduce in the environment
	HS-LS4-5	Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species

Winslow Township School District
Laboratory Biology Curriculum
Unit 3: DNA & Genetics & Evolution

Unit 3 Laboratory Biology

• Assessment Plan

- Exploratory activities
- Warm-up activities
- Individual/Group Lab report
- Class discussions
- Student Participation
- Teacher Observations

- Quizzes
- Tests
- Authentic assessments and projects
- Exploratory activities
- Presentations
- Current Events

Winslow Township School District
Laboratory Biology Curriculum
Unit 3: DNA & Genetics & Evolution

Resources	Activities
<ul style="list-style-type: none"> • Chromebooks • Textbook • Videostreaming • BrainPOP • Puzzlemaker: Game Based Learning Discovery Education <p>Diversity, Equity & Inclusion Educational Resources https://www.nj.gov/education/standards/dei/</p>	<ul style="list-style-type: none"> • Use various forms of expository writing-procedural writing, narrative writing, descriptive writing, labeling, as well as to create visuals, graphs, tables, diagrams and charts. • Use scientific argumentation with exercises on writing claims, using evidence to support your claim and explaining the reasoning behind their claim. • mini-lessons • independent reading • films • website exploration • discussions, dialogues • debates • partner or small group work • student presentations, reports, journals, reflections, • in-class assessments, • written reports, essays, research, and homework • reinforcement of prefix, suffix, root words to build upon general & disciplinary vocabulary
Instructional Best Practices and Exemplars	
<ol style="list-style-type: none"> 1. Identifying similarities and differences 2. Summarizing and note taking 3. Reinforcing effort and providing recognition 4. Homework and practice 5. Nonlinguistic representations 	<ol style="list-style-type: none"> 6. Cooperative learning 7. Setting objectives and providing feedback 8. Generating and testing hypotheses 9. Cues, questions, and advance organizers 10. Manage response rates

Winslow Township School District
Laboratory Biology Curriculum
Unit 3: DNA & Genetics & Evolution

9.1 Personal Financial Literacy, 9.2 Career Awareness, Exploration, Preparation and Training & 9.4 Life Literacies and Key Skills

- 9.2.12.CAP.2: Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs.
- 9.2.12.CAP.3: Investigate how continuing education contributes to one's career and personal growth.
- 9.2.12.CAP.6: Identify transferable skills in career choices and design alternative career plans based on those skills.
- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas
- 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice
- 9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving
- 9.4.12.DC.8: Explain how increased network connectivity and computing capabilities of everyday objects allow for innovative technological approaches to climate protection.
- 9.4.12.GCA.1: Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political, economic, cultural) may work better than others
- 9.4.12.IML.5: Evaluate, synthesize, and apply information on climate change from various sources appropriately
- 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task
- 9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.
- 9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.
- 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem

The implementation of the 21st Century skills and standards for students of the Winslow Township District is infused in an interdisciplinary format in a variety of curriculum areas that include, English language Arts, Mathematics, School Guidance, Social Studies, Technology, Visual and Performing Arts, Science, Physical Education and Health, and World Language.

Additional opportunities to address 9.1, 9.2 & 9.4:

Philadelphia Mint

<https://www.usmint.gov/learn/kids/resources/educational-standards>

Different ways to teach Financial Literacy.

<https://www.makeuseof.com/tag/10-interactive-financial-websites-teach-kids-money-management-skills/>

Winslow Township School District
Laboratory Biology Curriculum
Unit 3: DNA & Genetics & Evolution
Modifications for Special Education/504

Students with special needs: Note: Teachers identify the modification they will use in the unit. Input via 504 and IEP plans will be implemented.

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.

Winslow Township School District
Laboratory Biology Curriculum
Unit 3: DNA & Genetics & Evolution

Modifications for At-Risk Students

Formative and summative data will be used to monitor student success.

- At first signs of failure, student work will be reviewed to determine support.
- This may include parent consultation, basic skills review and differentiation strategies. With considerations to UDL, time may be a factor in overcoming developmental considerations
- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.

Winslow Township School District
Laboratory Biology Curriculum
Unit 3: DNA & Genetics & Evolution

English Language Learners	Modifications for Gifted Students
<p>All WIDA Can Do Descriptors can be found at this link: https://wida.wisc.edu/teach/can-do/descriptors</p> <p><input type="checkbox"/> Grades 9-12 WIDA Can Do Descriptors:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Listening <input type="checkbox"/> Speaking <input type="checkbox"/> Reading <input type="checkbox"/> Writing <input type="checkbox"/> Oral Language <p>Students will be provided with accommodations and modifications that may include:</p> <ul style="list-style-type: none"> • Relate to and identify commonalities in Social Studies studies in student’s home country • Assist with organization • Use of computer • Emphasize/highlight key concepts • Teacher Modeling • Peer Modeling • Label Classroom Materials - Word Walls 	<p>Students excelling in mastery of standards will be challenged with complex, high level challenges related to the topic.</p> <ul style="list-style-type: none"> • Raise levels of intellectual demands • Require higher order thinking, communication, and leadership skills • Differentiate content, process, or product according to student’s readiness, interests, and/or learning styles • Provide higher level texts • Expand use of open-ended, abstract questions • Critical and creative thinking activities that provide an emphasis on research and in-depth study • Enrichment Activities/Project-Based Learning/ Independent Study • Variety of Repertoire: 3- 5 extra song selections • above and beyond expectation for non- auditioned class., high school level selection <p>Additional Strategies may be located at the links:</p> <ul style="list-style-type: none"> ❖ Gifted Programming Standards ❖ Webb’s Depth of Knowledge Levels and/or Revised Bloom’s Taxonomy ❖ REVISED Bloom’s Taxonomy Action Verbs

Winslow Township School District
Laboratory Biology Curriculum
Unit 3: DNA & Genetics & Evolution

Interdisciplinary Connections

ELA:

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts.

RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

Math:

MP.2 Reason abstractly and quantitatively.

MP.4 Model with mathematics.

6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.

7.RP.A.2 Recognize and represent proportional relationships between quantities.

6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

7.EE.B.6 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

Winslow Township School District
Laboratory Biology Curriculum
Unit 3: DNA & Genetics & Evolution

Integration of Computer Science and Design Thinking NJSL 8

8.1.12.IC.1: Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.

8.1.12.IC.3: Predict the potential impacts and implications of emerging technologies on larger social, economic, and political structures, using evidence from credible sources.

8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.