

# Unit: Cells and Genetics

Content Area: **Science**  
Course(s): **Integrated Science 6**  
Time Period: **1 marking period**  
Length: **8 Weeks**  
Status: **Published**

## Unit Overview

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Use evidence to explore traits, survival, and reproduction; the structure and functions of body systems and cells; genes and inheritance of traits, mutations, and engineering and genetics.

## Transfer

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Students will be able to independently use their learning to:

- Describe how your own traits for survival and reproduction affect your day-to-day life.
- Use models to show that other organisms' traits can inspire solutions to engineering problems.

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For more information, read the following article by Grant Wiggins.

[http://www.authenticeducation.org/ae\\_bigideas/article.lasso?artid=60](http://www.authenticeducation.org/ae_bigideas/article.lasso?artid=60)

## Meaning

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## Understandings

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Students will understand...

- how an organism's traits help it survive in its environment or help it have offspring that survive.
- the body is made of smaller and smaller subsystems that work together to make a functioning organism.

- all living things are made of one or more cells.
- genes are the instructions for many of your physical and behavioral traits.
- mutations and genetic engineering tools can affect an organism's traits.

## **Essential Questions**

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Students will keep considering...

- How do organisms meet their needs and respond to threats in their environment?
- What physical and behavioral traits help organisms reproduce?
- How do your body systems work together?
- How do organs, tissues, and cells work together to make up your body systems?
- How does your nervous system sense and respond to a constantly changing environment?
- What do living things have in common?
- How do parts of a cell function to keep it alive?
- How do genes determine traits?
- Why do people who are related look similar, but not exactly alike?
- Which affects an organism's traits more, its genes or its environment?
- How can mutations affect an organism's traits?
- How can society use technology to influence the traits of organisms?

## **Application of Knowledge and Skill**

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### **Students will know...**

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- how an organism's traits help it survive in its environment or help it have offspring that survive.
- the body is made of smaller and smaller subsystems that work together to make a functioning organism.
- all living things are made of one or more cells.
- genes are the instructions for many of your physical and behavioral traits.

- mutations and genetic engineering tools can affect an organism's traits.

## Students will be skilled at...

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- Obtaining information using various texts, text features (e.g. headings, table of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question.
- Developing a model to represent patterns in the natural world.
- Making observations from several sources to construct an evidence-based account for natural phenomena.
- Using evidence (e.g. measurements, observations patterns) to construct or support an explanation or design.
- Making observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon.
- Analyzing and interpret data to make sense of phenomena using logical reasoning.

## Academic Vocabulary

Lesson 1	Lesson 4	Lesson 7	Lesson 9	Lesson 12
starvation	magnification	cell membrane	asexual reproduction	selective breeding
dehydration	cell	DNA	sexual reproduction	genetic engineering
suffocation	tissue	ribosome	genetic variation	genetically modified organism
predation	cross section	protein	random	gene therapy
physical trait		cytoplasm	probability	
criteria	<b>Lesson 5</b>	organelle	dominate allele	
constraints	nervous system	nucleus	recessive allele	
behavioral trait	neuron	mitochondria	Punnett square	
species	spinal cord	chloroplast		
	brain	cell wall	<b>Lesson 10</b>	
<b>Lesson 2</b>	nerve		independent variable	
reproduction	stimulus	<b>Lesson 8</b>	dependent variable	
courtship behavior	sense receptors	gene	controlled variables	
model		expressed gene	genetic disorder	
germinate	<b>Lesson 6</b>	genetics		
	multicellular	chromosome	<b>Lesson 11</b>	
<b>Lesson 3</b>	unicellular	allele	mutation	
skeletal system	cell theory		mutagen	
muscular system	virus		cancer	
organ			genetic carrier	

digestive system				
respiratory system				
circulatory system				
excretory system				
reproductive system				

## Learning Goal 1

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Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.

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SCI.MS-ETS1-3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
SCI.MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
SCI.MS-ETS1-4	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
SCI.MS-LS1-4	Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.

## Target 1

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Lesson 1- Gather evidence from a variety of sources about specialized plant and animal traits and explain how the traits increase the chances that the organisms will survive.

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## Learning Goal 2

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Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

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SCI.MS-ETS1-3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new
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solution to better meet the criteria for success.

SCI.MS-ETS1-4

Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

SCI.MS-ETS1-1

Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

SCI.MS-LS1-5

Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

## Target 1

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Lesson 2- Gather information about traits that increase the chances that an organism will reproduce and its offspring will survive. Compare arguments explaining why one species did not survive.

- Lesson 2- Gather information about traits that increase the chances that an organism will reproduce and its offspring will survive. Compare arguments explaining why one species did not survive.

## Learning Goal 3

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Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

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SCI.MS-ETS1-1

Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

SCI.MS-ETS1-4

Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

SCI.MS-LS1-3

Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

## Target 1

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Lesson 3- Compare and contrast the body systems and how they interact.

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## Learning Goal 4

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Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain

for immediate behavior or storage as memories.

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SCI.MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
SCI.MS-ETS1-4	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
SCI.MS-LS1-8	Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

## **Target 1**

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Lesson 5- Find out about the nervous system and how it functions.

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## **Learning Goal 5**

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Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.

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SCI.MS-LS1-1	Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
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## **Target 1**

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Lesson 6- Analyze pictures and microscope slides to discover that all living things are made of cells. Learn about the unicellular organisms living in your environment.

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## **Learning Goal 6**

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Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.

- Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.

SCI.MS-LS1-2

Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.

## Target 1

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Lesson 7- Investigate the parts of different kinds of cells. Depict the different mechanisms that allow cells to take in nutrients and get rid of waste

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## Learning Goal 7

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Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.

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SCI.HS-ETS1-1

Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

SCI.HS-ETS1-3

Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

SCI.HS-ETS1-2

Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

SCI.MS-LS3-1

Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.

## Target 1

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Lesson 8- Model the relationship between DNA, genes, and chromosomes and learn how to visualize these materials. Find out about how genes actually lead to traits.

- Lesson 8- Model the relationship between DNA, genes, and chromosomes and learn how to visualize these materials. Find out about how genes actually lead to traits.

## Learning Goal 8

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Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.

- Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.

SCI.MS-LS3-2

Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.

## Target 1

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Lesson 9- Predict how asexual and sexual reproduction lead to different inherited trait combinations, and model how alleles and traits are inherited.

- Lesson 9- Predict how asexual and sexual reproduction lead to different inherited trait combinations, and model how alleles and traits are inherited.

## Target 2

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Lesson 10- Experiment to test the roles of genes and the environment in determining plant growth, and analyze several factors that influence human height.

- Lesson 10- Experiment to test the roles of genes and the environment in determining plant growth, and analyze several factors that influence human height.

## Learning Goal 9

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Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

- Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

SCI.MS-ETS1-3

Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

SCI.MS-ETS1-2

Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

SCI.MS-ETS1-1

Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

SCI.MS-LS4-5

Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

## Target 1

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Lesson 11- Model how mutations can change the structure and thus function of a protein. Investigate examples



of mutations and how each affects the organism's survival.

- Lesson 11- Model how mutations can change the structure and thus function of a protein. Investigate examples of mutations and how each affects the organism's survival.

## **Formative Assessment and Performance Opportunities**

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- Lesson Game
- Interactive Tutorial
- Interactive Student Notebook
- Vocabulary Cards
- Class Participation
- Performance Assessments

## **Summative Assessment**

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LinkIt! Common Assessment

NGSS- Designed Lesson Assessment: Traits for Survival

NGSS- Traits for Reproductions

NGSS- Designed Lesson Assessment: Interacting Body Systems

NGSS- Designed Lesson Assessment: Levels of Organization

NGSS- Designed Lesson Assessment: Controlling Body Systems

NGSS- Designed Lesson Assessment: Cell Theory

NGSS- Designed Lesson Assessment: Parts of Cells

NGSS- Designed Lesson Assessment: Proteins, Genes, and Chromosomes

NGSS- Designed Lesson Assessment: Inheriting Genes

NGSS- Designed Lesson Assessment: Genes and the Environment

NGSS- Designed Lesson Assessment: Genetic Mutations

NGSS- Designed Lesson Assessment: Engineering and Genetics

## **Accommodations/Modifications**

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### **Quicker Coverage**

- Instead of having students dissect their own frogs, show them the series of videos in the slides that demonstrate how to do the frog dissection. Then have students continue on to the related discussion. (Lesson 3)
- Students are asked to color the body parts that make up the human body model. To save time, have students cut and place the parts without coloring them in. (Lesson 3)
- Students grow plants over a five-day period. Instead of having students grow their own plants, provide images and/or data on how different plants would grow to different heights in varying conditions over a certain period. (Lesson 10)

### **Deeper Coverage (Advanced Learners)**

- Students can investigate the topic by conducting further research and writing/presentating an explanation.
- Have students suggest alternative explanations that are supported by the available evidence.
- Have students write predictions.
- Introduce students to the double helix shape of DNA and have them model it with clay. (Lesson 8)
- Classification game. (Lesson 9)
- Have students examine how their results were similar to or different from those found by other groups. (Lesson 10)

### **English Language Learners**

- Pre-teach science vocabulary.
- Print presentation slides.
- Allow students to use pictures.
- Use students' background knowledge.
- Work with a reading partner.
- Use text audio.
- Play videos multiple times, as needed.
- Conduct research in native language.

### **Students with Special Needs**

- Use graphic organizers.
- Assign students specific roles.
- Place students in mixed ability pairs.
- Conduct pre-reading session.
- Provide guiding questions to help them explain their responses.
- At each station, adjust the microscope so that it is appropriately focused on the slide. Have students ask for assistance if they need to refocus the microscope or have trouble viewing the slide. (Lesson 4)

## Unit Resources

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TCI Online Manual/ Materials

Vocabulary Cards

TCI Kit

Student chromebooks

## 21st Century Life and Careers

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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.CRP4.1

Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

CRP.K-12.CRP5.1

Career-ready individuals understand the interrelated nature of their actions and regularly

make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.

CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.
CRP.K-12.CRP7.1	Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.
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.CRP11.1	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.CRP12.1	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.

## Interdisciplinary Connections

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MA.6.RP.A.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
LA.RL.6.4	Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the impact of a specific word choice on meaning and tone.
MA.6.NS.C.5	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
LA.W.6.1.A	Introduce claim(s) and organize the reasons and evidence clearly.
LA.W.6.1.B	Support claim(s) with clear reasons and relevant evidence, using credible sources and demonstrating an understanding of the topic or text.
LA.W.6.2.B	Develop the topic with relevant facts, definitions, concrete details, quotations, or other information and examples.

LA.W.6.2.D	Use precise language and domain-specific vocabulary to inform about or explain the topic.
MA.6.EE.A.4	Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them).
LA.W.6.7	Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate.
LA.W.6.8	Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.
LA.W.6.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
MA.6.EE.C.9	Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.
MA.6.G.A	Solve real-world and mathematical problems involving area, surface area, and volume.
MA.6.SP.A.1	Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.