Newtown Public Schools

BOE C&I Sub Committee Meeting
February 18, 2026

BOE Conference Room 1
Municipal Building
3 Primrose Street
Newtown, CT 06470
5:30 PM

As citizens of our community, we will conduct ourselves in accordance with Newtown's Core Character Attributes as displayed in our character tree. We will be responsible for our actions and show respect for each other. We will interact peacefully, productively, and politely. We will be trustworthy and honest and show compassion toward others. Newtown's continued success is contingent upon our ability to persevere, to follow through with our commitments, and to stay focused on the greater good.

AGENDA

1. **CALL TO ORDER**
2. **PUBLIC PARTICIPATION**
3. **APPROVAL OF MINUTES**
4. **NEW BUSINESS**
   A. Review and possible action on the 7th and 8th Grade Middle School Science Curriculum
5. **PUBLIC PARTICIPATION**
6. **ADJOURNMENT**

BOE C&I Sub Committee Meeting
January 27, 2026

BOE Conference Room 1
3 Primrose Street
Newtown, CT 06470

MINUTES

In attendance:
Frank Purcaro, Assistant Superintendent
Chris Gilson
John Vouros
Don Ramsey
Sarah Connell, Clerk
Amy Deeb
Joanna Diaz
Abigail Marks
Jessica Metz

1. **CALL TO ORDER**
    a. Mr. Ramsey called the meeting to order at 5:34 pm.

2. **PUBLIC PARTICIPATION**
    a. None

3. **APPROVAL OF MINUTES**

MOTION: *Mr. Vouros moves to approve the minutes of December 16, 2025. Mr. Gilson seconded. Motion passes unanimously.*

4. **NEW BUSINESS**
    a. The committee heard a comprehensive presentation on the American Studies course currently offered at the high school by Ms. Metz and Ms. Diaz.
        i. This course is a 11th grade course that integrates English Language Arts and Social Studies over a two period block. It will satisfy junior-year English and Social Studies requirements. The current enrollment is 23 students but historically can go as high as 90-100.
        ii. Within the course's four units, it has a focus on interdisciplinary learning, critical thinking, synthesis, and student engagement by connecting historical context with literature and student voice.
    b. Ms. Metz and Ms. Diaz also highlighted several intentional revisions made to this new curriculum. Some changes are as follows: Increased emphasis on voice, choice and equity, addition of more hands-on, project based learning experiences, removal of redundant or less effective assignments, inclusion of more diverse perspectives and adjustments to assessments to improve accessibility and alignment across disciplines.
        i. It was noted that these changes were informed by student engagement, feedback and instructional effectiveness.

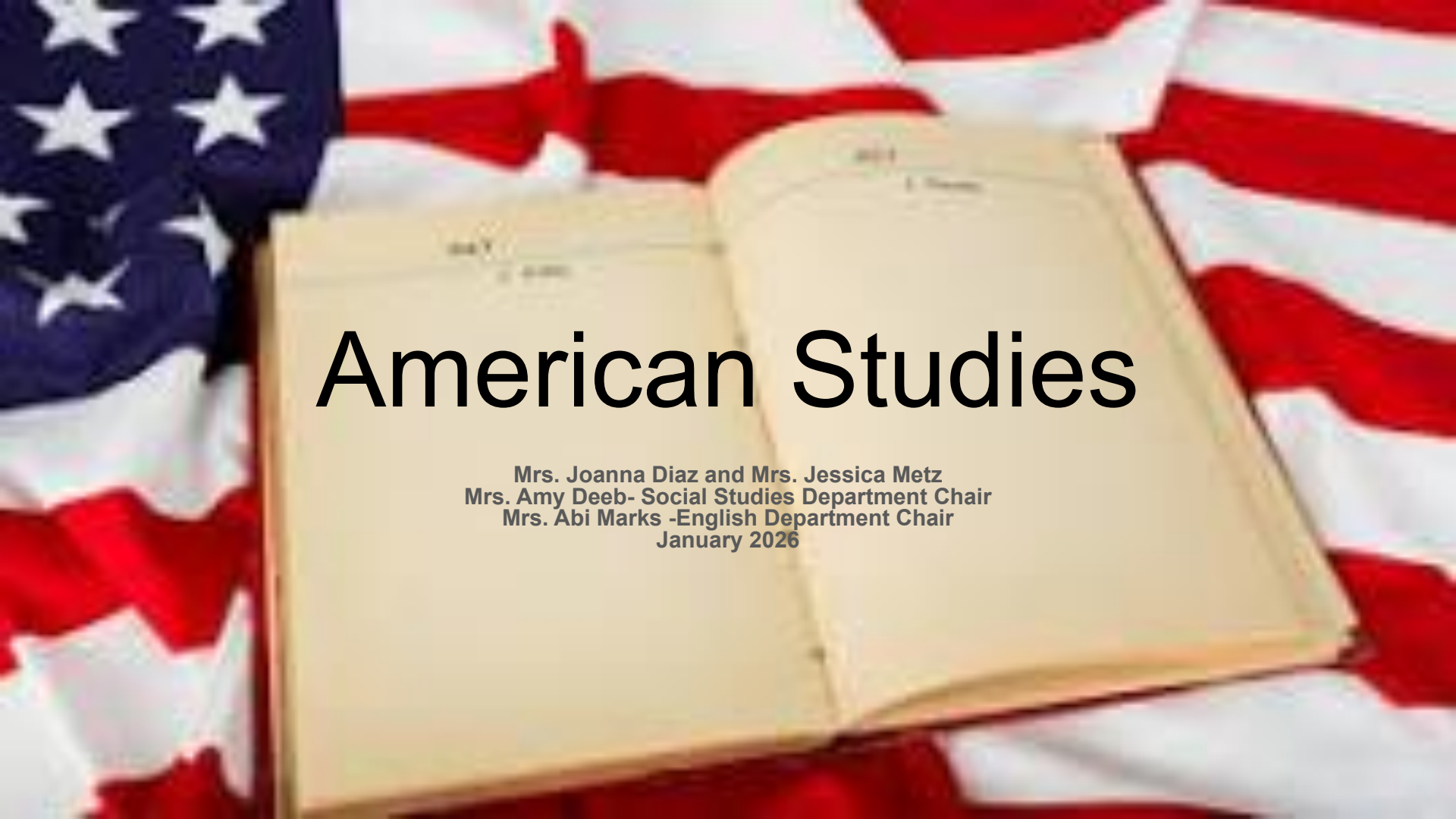
c. The committee members all agreed that the strength of the co-teaching model is strong. They partially loved the use of current events to connect past and present along with student engagement and discussion based learning.
d. The committee also hoped to see the number of enrolled students rise in the next year.
    i. Ms. Metz and Ms. Diaz noted that a recent student stated that they appreciated taking this course as an integrated course rather than two separate courses and they believe this is how most students feel.

MOTION: *Mr. Vouros made a motion to approve the American Studies curriculum as presented and recommend it to the full Board. Mr. Ramsey seconded. Motion passes unanimously.*

5. **PUBLIC PARTICIPATION**
    a. None
6. **ADJOURNMENT**

MOTION: *Mr. Vouros made a motion to adjourn the meeting. Mr. Ramsey seconded. Motion passes unanimously.*

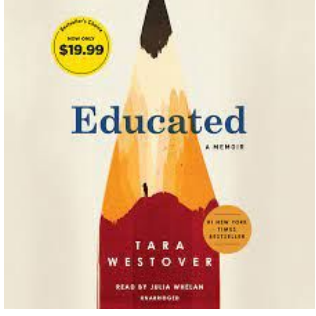
Meeting adjourned at 6:33 pm.



American Studies

Mrs. Joanna Diaz and Mrs. Jessica Metz
Mrs. Amy Deeb- Social Studies Department Chair
Mrs. Abi Marks -English Department Chair
January 2026

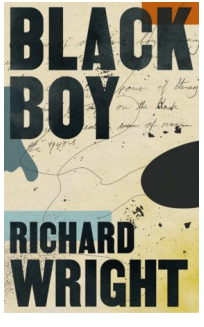
Unit 1: What is an American?

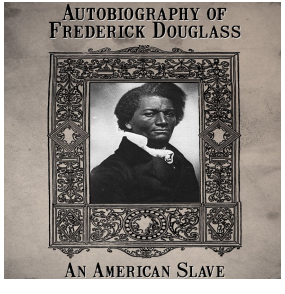


Lens: Identity

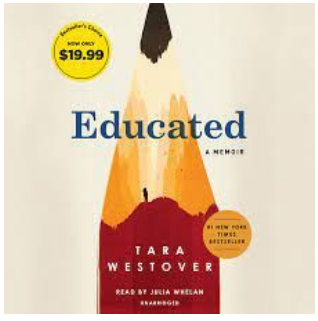
English Concepts: Voice, Style, Tone Audience, Personal narrative, Memoir, Memory, Personal truth
History Concepts: Citizenship, Democracy, Culture, Dominance/Weakness, Values/Ideals, Propaganda, Migration, Immigration, Push/Pull Factors, Idealism,
Reality

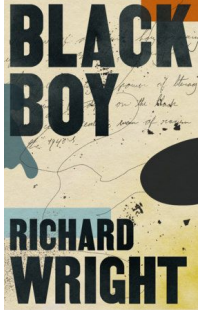
Core Learning Activities: Analyzing primary documents in regards to US development, influential people, and change
"New Colossus" Reading and Analysis
"New- New Colossus" poem writing
“I am from” poem, semi narrative poem
Close Reading Analysis ~ *Narrative of the Life of Frederick Douglass*
Multiple seminars (*Educated, Black Boy*)
Historical trends of the 1800s information exchange- interactive role play and presentations
"1800s Essay" preparation/practice/self-evaluation
Family Immigration Artifact Fair/ My Immigrant Past





What is an American? (Continued)

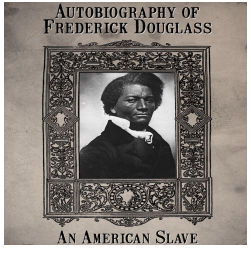




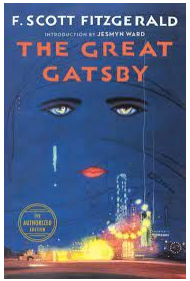
In Class Essay: *Black Boy* and *Educated*
Summative: Extended Essay
Consider *Black Boy*, *Educated,* your own and your classmates' family histories, our national immigration history, and "The Problem We All Live With," and answer the following question. **What is the value of using individual and personal stories to better understand our collective history?**

Memoir Assignment
Summative: Narrative Writing Assignment
Use language (literary devices and purposeful diction) to relay a time in your life. Remember, a memoir is not necessarily about the "big" moments in your life.

Hands on Learning
Using hands on learning and creating lessons and projects that are interesting to students help engage students to think about what it means to be an American and what it took to get America to where it is today. Also discussing comparisons from our lives today to what people of the past had to deal with or go through.

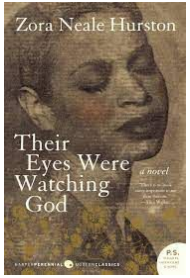


What is the Price of Progress?

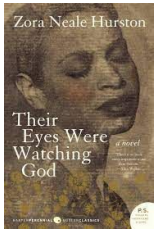


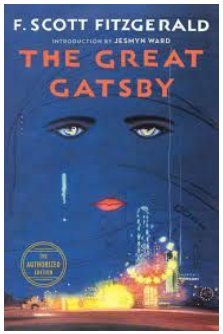
Lenses: Opportunity, Conflict, Role of Government
English concepts: rhetorical devices, connotation, tone, syntax, primary sources, secondary sources, argument, audience, claim/argument, persuasive writing
History concepts: Reform, Agitation, Resistance, Fear, Resentment, Discontent, Political Pressure, Growth, Depression, Change, Anxiety, Economic Hardships, Helplessness, Loss, Resistance

Core Learning Activities:
1920s Culture Collage
Automobile Spinoffs Handout
1920s Slang- Students create a story using 20's slang/situations OR we do a discussion about the terms and
Immigration project, slideshow, and Ellis Island simulation
The Century Videos "Boom to Bust" and "Stormy Weather"- understanding of the ‘20s and ‘30s
New Deal discussion and slideshow
1917 analysis, how did progress lead to WW1?
Pre-reading activities (*The Great Gatsby, Their Eyes Were Watching God)*
Study guides (*The Great Gatsby)*
Close Reading activities (*The Great Gatsby*, *Their Eyes Were Watching God*)
Text Based Seminars (*The Great Gatsby*, *Their Eyes Were Watching God*)
Excerpts from Kristin Hannah’s *The Four Winds*
Dust Bowl - slideshow, imagery activity - create a story of the people you see



What is the Price of Progress? (Continued)

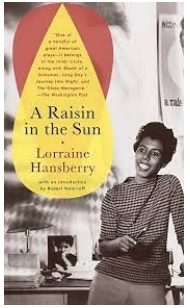




***Their Eyes Were Watching God*/Black Panther Essay**
Summative: Extended Essay
What do the novel and the film suggest about the possibility of sustaining a utopian society?

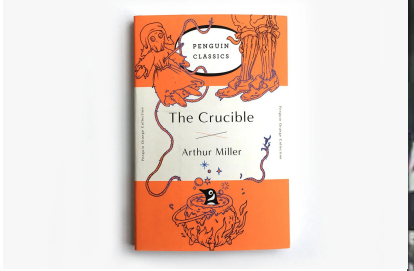
***The Great Gatsby* Essay**
Summative: Extended Essay
Your job is to decide which aspect of the novel is most worthy of discussion. First, establish what you think is a prominent theme in the text. Then, you should think about the best way to examine that theme. For example, you might think that Fitzgerald wants to examine the death of the American Dream or, at least, its inevitable collapse. You then decide that the best way to approach the conversation of that theme is through an in depth examination of the symbols in the text, particularly those that represent vision or blindness. You then craft a thesis based on that idea.

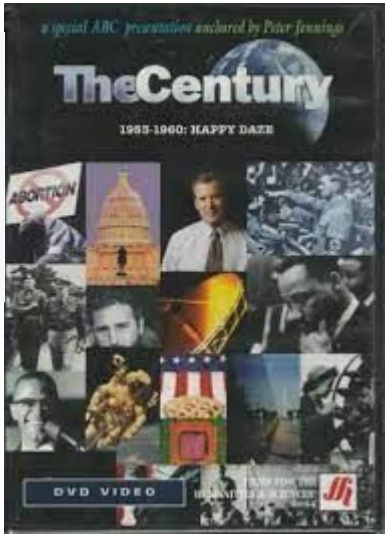
Who is included in “We the People?”



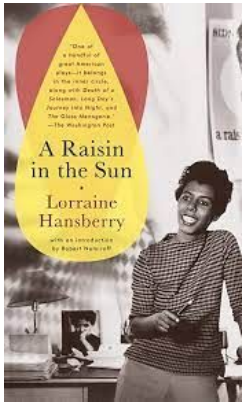
Lenses: Agency, Justice
English concepts: Motif, audience, structure, critical lens, voice, theme, context, injustice, social justice
History concepts: Power, Superiority, Dominance, Tension, Nations, Conflict, Opportunity, Inequality/Equality, Reform, Resistance, Fear, Resentment, Injustice, Success, Tactics, Uprisings, Oppression, Change

Core Learning Activities:
1950s Life Hyperdocs which include various sources on gender, fear, rebellion, culture
Real Story of the Cold War- events of the Cold War
“We Didn't Start the Fire” Lyrical References & lyrical rewrite
The Century Series Videos- "Best Years" and "Happy Daze"
African American Experience Thematic timeline
Civil Rights Primary documents
Evaluating sources- Art as an Argument
The Crucible- Pre-reading, close reading, seminars
Raisin in the Sun- Pre-reading, close reading, seminars, readers theater
"Plan your Protest" activity
Eyes on the Prize- Civil Rights Movement Documentary, School Edition





Who is included in “We the People?” (Continued)



Art as an Argument
Summative: Personal Project
Visual Arts Project, Technology Project, Other written assessments
We will explore how different media are used to convey arguments.

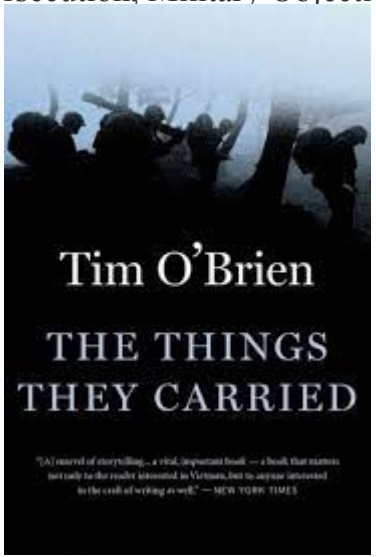
The African-American Experience Thematic Timeline
Summative: Other written assessments
Students will investigate different eras and themes of race relations over the span of US History to determine progress and/or lack of progress

Civil Rights Recruitment Fair
Summative: Other oral assessments
The students will create an oral presentation and a display to recruit others to a Civil Rights cause.

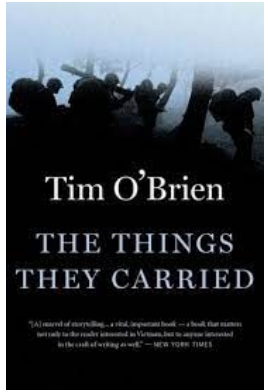
What Should We Fight For?

Lenses: Inquiry, Identity, Conflict
English concepts: primary research, secondary research, speaker, audience, audience engagement, purpose, citations, organization, presentation, genre, form, discussion, fiction. storytelling, rhetorical strategies
History concepts: Uncertainty, Desperation, Authoritarianism, Propaganda, Modern Warfare, Morality, Fear Culture, Adaptation, Homefront Support, Campaign, World Affairs, Truth, Citizenship, Subjugation, Persecution, Military Objectives, Victory and Defeat

Core Learning Activities:
Causes of WWII, "From One War to Another"
WWII Chronology
WWII homefront reading (includes women roles)
“Unbroken” viewing and analyze
Vietnam/Counterculture discussion, images, slideshow, hippie culture and women in battle
The Things They Carry- Pre-read, reflections, close reading, discussions, quote analysis
Proteus Preparation (research, writing, portfolio presentation, conferencing);
Excerpts from Kristin Hannah’s *The Women*



What Should We Fight For? (Continued)



Proteus Presentation

Summative: Other oral assessments
Final exam presentation.

Proteus Project (Includes 8-10 pg. Research paper)
Summative: Other written assessments
Final exam project. Select a topic. Conduct research on the topic. Maintain a list of works cited and consulted.(NoodleTools is the best way to maintain this). Write a sequence of pieces that present the issue from a variety of perspectives and that illustrates appropriate historical context.

Curriculum Writing Self-Reflection Part 1

Please answer the following questions regarding revisions to the curriculum and your experience with curriculum writing:

1. How has the curriculum improved from the original version to the this newly revised version?

   Added new hands on activities such as the Immigration Experience at Ellis Island Simulation, removed Immigration Act of 1924 DBQ. Added a SOAPS activity where students analyze multiple primary sources that center around African Americans during this time period. Added a Becoming A Muckraker (research and presentation assignment). Removed the Political Cartoon creation. Removed New Deal Matrix. Added the Prohibition Recall Relay. Added showing and analyzing the film 1917. Reading about the New Deal. Added the most updated version of We Didn't Start the Fire and then have students create their own version. Removed the Civil Rights DBQ, and adjust the midterm so it was more of a combination of critical thinking and fact recall. Overall we have tried to create a curriculum that is more hands on and student centered so students can get the most from the class as they can. Current curriculum is robust and rigorous, and has become much more hands-on and collaborative for students. We removed "America for Americans" by Teddy Roosevelt (did not fit fluidly into Unit 1 and students struggled, overall. Removed "This American Life" podcast creation to ensure content / texts addressed thoroughly and deeply.

Curriculum Writing Self-Reflection Part 2

1. Reflecting back on the process, what improvements to the curriculum do you look forward to implementing the most?

   Enjoyed adding supplemental excerpts to deepen understanding of 1930s Dust Bowl and women's roles in Vietnam. We have worked hard to make modifications to assignments/assessments so the curriculum is accessible to more students. As a team, we continue to ensure that curriculum represents and honors a myriad of voices and stories from American history, and we look forward to continuing to craft a curriculum that is rich and impactful.

Newtown Public Schools

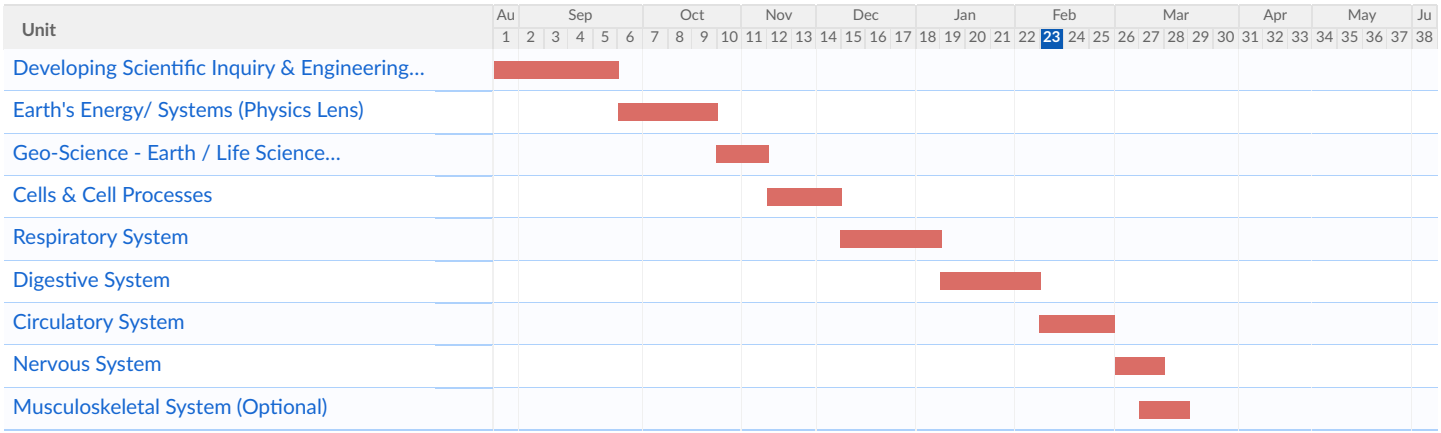
Atlas

Science Grade 7 (Under Review/Revision)

Newtown Middle School / Grade 7 / Science

4 Curriculum Developers | Last Updated: Sunday, Feb 8, 2026 by Musco, Susan

Unit Calendar by Year



9 Units found

Unit Plan

Developing Scientific Inquiry & Engineering Skills

Newtown Middle School / Grade 7 / Science

Week 1 - Week 5 | 4 Curriculum Developers | Last Updated: Jan 26, 2026 by Musco, Susan

Concept-Based Curriculum Unit Template

Purpose of the Unit

The overarching goal(s) of the unit.

- To understand how scientific knowledge is created and communicated.

Conceptual Lens/Concepts

Concepts are the "big ideas" of the unit. The conceptual lens is a particular concept that focuses the thinking of the unit.

Lens:

- Communication

Concepts:

- data collection
- analysis
- evidence
- reasoning
- variables
- observations
- inferences
- predictions
- scientific questions.

Generalizations

Critical conceptual relationships that students are expected to ***UNDERSTAND*** *at the end of the unit.*

<u>Topic Generalizations</u>

1. Scientific inquiry drives the development of knowledge through observation and investigation
2. Scientific inquiry relies on qualitative and quantitative observations by using them to make inferences and/or predictions which facilitates problem solving.
3. Formulating measurable and observable relationships among factors supports the systematic investigation needed to generate explanations and address scientific inquiries.
4. The scientific method allows for collection and organization of data into appropriately constructed tables and graphs in order to evaluate, interpret and communicate results.
5. The examination and interpretation of information enable the recognition of patterns and the formation of meaningful insights, which support effective problem-solving

Guiding Questions

A combination of Factual (F), Conceptual (C) and Provocative/Debatable (P) questions that lead to the generalizations. Label each question (F), (C) or (P).

1. Scientific inquiry drives the development of knowledge through observation and investigation

- What tools are used to make scientific measurements? (F)
- What are observations? (F)
- What procedures are used to conduct controlled investigations? (F)
- How is measurement used to make observations? (C)
- How are specific scientific questions answered using observations in controlled investigations? (C)

2. Scientific inquiry relies on qualitative and quantitative observations by using them to make inferences and/or predictions which facilitates problem solving.

- What is an inference? (F)
- What is a quantitative observation? (F)
- How are qualitative and quantitative observations used to make inferences and/or predictions in order to solve problems? (C)
- How do observations lead to inferences? (C)

- How are qualitative and quantitative observations different? (C)
- What is the difference between an inference and a prediction? (C)

3. Formulating measurable and observable relationships among factors supports the systematic investigation needed to generate explanations and address scientific inquiries.

- What is the dependent variable? (F)
- What is the independent variable? (F)
- How are constants defined? (F)
- How does a prediction become a hypothesis? (C)
- How do scientists identify variables and constants in order to develop a testable hypothesis to find solutions to scientific questions? (C)
- How do scientists write a testable hypothesis? (C)

4. A systematic investigative process supports the structured gathering and representation of information, enabling meaningful evaluation, interpretation, and communication of findings.

- What precise methods are used to collect and organize data into appropriately constructed tables and graphs for the purpose of evaluating and interpreting and communicating results? (F)
- What are the X and Y axis on a graph? (F)
- Which variable goes on each axis? (F)
- What are the rules for making a graph? (F)
- How do scientists create a data table? (C)
- How do graphs reveal trends and help to make sense of data? (C)
- How can variables be identified and manipulated? (C)
- How do scientists communicate results? (C)
- How do scientists avoid bias in their communication? (C)

5. The examination and interpretation of information enable the recognition of patterns and the formation of meaningful insights, which support effective problem-solving

- What is a claim? (F)
- What evidence best supports scientific data? (C)
- How is data analyzed to identify trends, draw conclusions in order to solve problems and develop additional testable questions? (C)
- How is a claim supported with data? (C)
- How do scientists decide what evidence best supports scientific data? (C)
- How is a new variable identified based on data analysis? (C)
- How do scientists evaluate data to draw conclusions? (C)
- How can the results of experimentation be used to make informed decisions? (C)
- Is data all definitive? (Is it true that numbers never lie?) (P)

Content Knowledge

Critical facts and information that students are expected to KNOW *at the end of the unit.*

Observation skills in scientific inquiry,
Formulating clear and focused scientific questions
Identifying independent and dependent variables
Creating graphs and data tables

Understanding relationships between variables
Writing claims about scientific evidence
Clarifying scientific models and phenomena
Evaluating evidence in scientific arguments (CER)
Refining scientific explanations (reasoning)
Gathering empirical evidence
Analyzing empirical data
Using models to explain scientific concepts
Distinguishing between qualitative and quantitative data
Constructing logical scientific arguments
Communicating scientific findings effectively

Standards

The content standards that are taught and/or assessed in this unit.

NGSS: Science and Engineering Practices

NGSS: 6-8

Practice 1. Asking questions (for science) and defining problems (for engineering)

Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.

- [x] Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions.
- [x] Ask questions that challenge the premise(s) of an argument or the interpretation of a data set.
- [x] Ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles.
- [x] Ask questions that require sufficient and appropriate empirical evidence to answer.
- [x] Ask questions to clarify and/or refine a model, an explanation, or an engineering problem.
- [x] Ask questions to determine relationships between independent and dependent variables and relationships in models.
- [x] Ask questions to identify and/or clarify evidence and/or the premise(s) of an argument.
- [x] Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.

Practice 3. Planning and carrying out investigations

Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions.

- [x] Collect data about the performance of a proposed object, tool, process or system under a range of conditions.
- [x] Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions.
- [x] Evaluate the accuracy of various methods for collecting data.
- [x] Conduct an investigation and/or evaluate and/or revise the experimental design to produce data to serve as the basis for evidence that meet the goals of the investigation.
- [x] Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.

Practice 4. Analyzing and interpreting data

Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

- [x] Analyze and interpret data to determine similarities and differences in findings.
- [x] Consider limitations of data analysis (e.g., measurement error), and/or seek to improve precision and accuracy of data with better technological tools and methods (e.g., multiple trials).
- [x] Apply concepts of statistics and probability (including mean, median, mode, and variability) to analyze and characterize data, using digital tools when feasible.
- [x] Analyze and interpret data to provide evidence for phenomena.
- [x] Use graphical displays (e.g., maps, charts, graphs, and/or tables) of large data sets to identify temporal and spatial relationships.
- [x] Construct, analyze, and/or interpret graphical displays of data and/or large data sets to identify linear and nonlinear relationships.

Practice 5. Using mathematics and computational thinking

Mathematical and computational thinking in 6–8 builds on K–5 experiences and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments.

- [x] Apply mathematical concepts and/or processes (e.g., ratio, rate, percent, basic operations, simple algebra) to scientific and engineering questions and problems.
- [x] Use mathematical representations to describe and/or support scientific conclusions and design solutions.
- [x] Use digital tools (e.g., computers) to analyze very large data sets for patterns and trends.

Practice 6. Constructing explanations (for science) and designing solutions (for engineering)

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

- [x] Apply scientific reasoning to show why the data or evidence is adequate for the explanation or conclusion.
- [x] Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.
- [x] Construct an explanation that includes qualitative or quantitative relationships between variables that predict(s) and/or describe(s) phenomena.

Practice 7. Engaging in argument from evidence

Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

- [x] Make an oral or written argument that supports or refutes the advertised performance of a device, process, or system based on empirical evidence concerning whether or not the technology meets relevant criteria and constraints.

Interactive version of NGSS
NGSS Resources

Core Learning Activities

The learning activities that support the acquisition of content knowledge, attainment of critical skills and lead to the generalizations of the unit. Activities should be clearly articulated, include teacher instructions and identify optional vs. assured experiences.

- Identifying Variables and Writing Hypotheses
- Qualitative / Quantitative Me Assignment
- Gro-Dino Scientific Method Lab
- Creating Data Tables and Graphs
- Writing Claim, Evidence and Reasoning Paragraphs

Rubicon Copy of Identifying Variables Slide Show
Rubicon Copy of How to Write a Hypothesis
Rubicon Copy of Data Tables and Graphing
Rubicon Copy of Data Tables and Graphing
Rubicon Copy of Gro-Dino Lab Report Outline

Portrait of the Newtown Graduate

Rubicon Copy of Data Table and Graph Checklist

Rubicon copy 7th CER paragraph rubric

Rubicon Copy of Identifying Variables and Writing Hypotheses

Vocabulary

Academic and content-specific vocabulary needed to support knowledge, understanding and/or skills.

Meter, liter, gram, metric system, pre-fixes, qualitative, quantitative, inference, independent variable, dependent variable, hypothesis , constant, control, triple-beam balance, graduated cylinder, axes, graph, data table, validity, data consistency, trend, average.

Resources

Teacher and student resources used to support the learning.

Teaching Science Process Skills
Good Apple Science Resource Book For Grades 6-8
Joyce E. Raming, M.Ed.
Jill Bailer, M.ED.
John M. Ramsey, Ph.D.

Inquiry Skills Activity Book I,II and III
Prentice Hall Science Explorer
Pearson Education Inc.
Pearson Prentice Hall

Assessments

The means by which students will demonstrate what they know (content knowledge), what they can do (critical skills), and what they understand (generalizations) as a result of their learning from the unit.

Qualitative Me/Quantitative Me | Summative | Exhibition

Personal Project

Assignment depicting student that includes descriptive qualitative observations of physical characteristics and quantitative metric measurements of student.

Rubicon Copy of Qualitative Me Task Directions

Rubicon Copy Qualitative Me Task Rubric

2 Standards Assessed

Rubicon Copy Qualitative Me Task Rubric

Rubicon Copy of Qualitative Me Task Directions

Differentiation

Core learning activities, resources and assessments that meet the needs of all learners.

Test Prep Connections

As appropriate, include activities that build skills for standardized testing, such as IABs.

Unit Plan

Earth's Energy/ Systems (Physics Lens)

Newtown Middle School / Grade 7 / Science

Week 6 - Week 9 | 4 Curriculum Developers | Last Updated: Jan 31, 2026 by Musco, Susan

Concept-Based Curriculum Unit Template

Purpose of the Unit

The overarching goal(s) of the unit.

Purpose of the Unit

Understand how Earth's energy systems and geological processes shape our planet.

Conceptual Lens/Concepts

Concepts are the "big ideas" of the unit. The conceptual lens is a particular concept that focuses the thinking of the unit.

Lens: energy transfer & energy transformations.

Concepts

- Scale, Proportion & Quantity
- Patterns
- Stability & Change
- Geoscience processes
- energy transfer
- energy transformation
- thermal energy
- internal/external forces

Generalizations

Critical conceptual relationships that students are expected to ***UNDERSTAND*** *at the end of the unit.*

1. A structured temporal framework categorizes Earth's past into distinct intervals derived from identifiable patterns and changes over time.
2. The flow of energy influences system balance and drives transformations within Earth's surface processes over time.
3. Changes in energy within Earth systems reveal patterns that reflect the movement of tectonic plates over time.
4. External and internal energy sources power the continuous movement and transformation of materials within Earth's systems.

Guiding Questions

A combination of Factual (F), Conceptual (C) and Provocative/Debatable (P) questions that lead to the generalizations. Label each question (F), (C) or (P).

1. A structured temporal framework categorizes Earth's past into distinct intervals derived from identifiable patterns and changes over time.

- How are rock strata created?(F)
- What is relative dating? (F)
- What is carbon dating? (F)
- What is a geologic column? (F)
- What evidence do rock layers provide about Earth's history? (F)
- What are fossils? (F)
- What can we learn about the Earth's past by studying fossils? (C)
- How has Earth changed over billions of years? (C)

2. The flow of energy influences system balance and drives transformations within Earth's surface processes over time.

- What are geoscience processes? (F)
- What is weathering? (F)
- What is deposition? (F)
- What is erosion? (F)
- What is sediment? (F)
- What is chemical weathering? (F)
- What is mechanical weathering? (F)
- What processes contribute to the formation of mountains, valleys, and other landforms? (C)
- How have geoscience processes such as erosion, volcanic eruptions, and plate tectonics have shaped Earth's surface over time? (C)

3. Changes in energy within Earth systems reveal patterns that reflect the movement of tectonic plates over time.

- What is thermal energy? (F)
- What are the four main layers of the Earth? (F)
- What are each of the layers composed of? (F)
-
- What is the theory of continental drift? (F)
- What is the evidence for continental drift? (F)
- What are mid-ocean ridges? (F)
- What is sea-floor spreading? (F)
- What is the theory of plate tectonics? (F)
- How do convergent plate boundaries move? (F)
- How do divergent plate boundaries move? (F)
- How do transform plate boundaries move? (F)
- How does the temperature change as you get deeper into the Earth? (C)
- How is thermal energy transferred through the layers of the Earth? (C)
- How does seafloor spreading support the theory of continental drift? (C)
- How did the discovery of sea-floor spreading lead to the theory of plate tectonics? (C)
- How does the distribution of fossils, rock formations, and seafloor structures provide evidence of past plate movements? (C)

4. External and internal energy sources power the continuous movement and transformation of materials within Earth's systems.

- How are igneous rocks formed? (F)
- How are metamorphic rocks formed? (F)
- How are sedimentary rocks formed? (F)
- What is the rock cycle? (F)
- How is the cycling of Earth's materials, including the rock cycle, driven by energy from the sun and Earth's interior? (C)

Content Knowledge

Critical facts and information that students are expected to KNOW at the end of the unit.

Continental Drift Theory, Sea-Floor Spreading, Theory of Plate Tectonics, geoscience processes, force, energy, gravity, energy transfer, energy transformation, matter, convection currents, conduction, radiation, convection, thermal energy, internal forces, weathering, erosion, deposition, natural resources.

Standards

The content standards that are taught and/or assessed in this unit.

NGSS: Science Performance Expectations

NGSS: MS Physical Science

MS.Structure and Properties of Matter

Performance Expectations Show Details

- [x] MS-PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. Show Details

MS.Energy

Performance Expectations Show Details

- [x] MS-PS3-3. Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.* Show Details
- [x] MS-PS3-4. Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. Show Details

NGSS: MS Earth & Space Science

MS.History of Earth

Performance Expectations Show Details

- [x] MS-ESS1-4. Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history. Show Details
- [x] MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. Show Details
- [x] MS-ESS2-3. Analyze and interpret data on the distribution of fossils and rocks, contintental shapes, and seafloor structures to provide evidence of the past plate motions. Show Details

MS.Earth's Systems

Performance Expectations Show Details

- [x] MS-ESS2-1. Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. Show Details
- [x] MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. Show Details

MS.Human Impacts

Performance Expectations Show Details

- [x] MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capital consumption of natural resources impact Earth's systems. Show Details

Interactive version of NGSS
NGSS Resources

Core Learning Activities

The learning activities that support the acquisition of content knowledge, attainment of critical skills and lead to the generalizations of the unit. Activities should be clearly articulated, include teacher instructions and identify optional vs. assured experiences.

- Far Flung Fossils
- Relative Dating
- Geological timescale
- Informational reading strategies
- Interactive Rock Cycle
- Weathering and Erosion Study Guide
- Plate Tectonics Study Guide

Portrait of the Newtown Graduate

Far Flung Fossils packet.pdf

Rubicon Copy of Relative Dating Cards

Rubicon Copy Relative Dating

Rubicon Copy of Relative Dating

Rubicon Copy Check for Understanding - Convection Currents

Interactive Rock Cycle

Rubicon Copy of Weathering and Erosion Study Guide

Rubicon Copy of Plate Tectonic Study Guide

Vocabulary

Academic and content-specific vocabulary needed to support knowledge, understanding and/or skills.

Rock strata, geological timescale, fossils, Era, Period, inner core, outer core, mantle, asthenosphere, lithosphere, crust, plate boundary, transform, convergent, divergent, convection, density, subduction, deep ocean trench, mid-ocean ridge, rift valley ,recycling, mountain, volcano, earthquake, sedimentary, metamorphic, igneous, weathering (mechanical vs chemical), melting, crystallization, deformation, sedimentation, rock cycle, erosion , deposition, constructive, destructive, renewable, non-renewable, mineral, ground-water, & energy.

Resources

Teacher and student resources used to support the learning.

Prentice Hall Science Explorer - Inside Earth

History of earth in one year
https://www.youtube.com/watch?v=ICZjAEMw2Wk

http://www.middleschoolchemist...

https://clever.discoveryeducation.com/learn/techbook/courses/49191d45-2e31-4e93-8e73-b9160cc2128d

Assessments

The means by which students will demonstrate what they know (content knowledge), what they can do (critical skills), and what they understand (generalizations) as a result of their learning from the unit.

Chemical Weathering Lab | Summative | Lab Assignment

Students chemically weather three unknown rock samples, collect & analyze data including % change in mass (both wet & dry masses) and compare results from the experiment with conducted multi-media research. The assessment requires the synthesis of data with research to draw conclusions and make recommendations for uses of each rock type.

Rubicon Copy of Chemical Weathering Lab

23 Standards Assessed

Plate Tectonics Test | Summative | Standardized Test

Department generated common assessment that covers material learned while investigating plate tectonics.

Rubicon Copy of Plate Tectonic Test

3 Standards Assessed

Weathering and Erosion Test | Summative | Standardized Test

Department created assessment based on material learned about weathering and erosion.

Rubicon Copy of Weathering and Erosin Test Reg/Mod

No Standards Assessed

Energy Transfer: Conduction | Summative | Lab Assignment

Lab experience investigating the effect of chemical weathering on different rock types.

Rubicon Copy of Energy Transfer: Conduction

No Standards Assessed

Rubicon Copy of Chemical/Mechanical Weathering Lab
Rubicon Copy of Weathering and Erosin Test Reg/Mod
Rubicon Copy of Energy Transfer: Conduction
Rubicon Copy of Plate Tectonic Test

Differentiation

Core learning activities, resources and assessments that meet the needs of all learners.

Differentiation may include the following, based on learning styles:

- varied texts
- sentence starters
- focus questions
- skeleton notes
- flexible seating for prescribed activities
- organizational activities/ tools (binder checks, binder quiz, etc)

Test Prep Connections

As appropriate, include activities that build skills for standardized testing, such as IABs.

- NGSS interim data
- NGSS lesson/ review
- warm ups
- exit tickets
- study guides
- notecards

Unit Plan

Geo-Science - Earth / Life Science Connection

Newtown Middle School / Grade 7 / Science

Week 10 - Week 11 | 4 Curriculum Developers | Last Updated: Feb 8, 2026 by Musco, Susan

Concept-Based Curriculum Unit Template

Purpose of the Unit

The overarching goal(s) of the unit.

Develop an understanding that humans rely on natural resources for survival.

Conceptual Lens/Concepts

Concepts are the "big ideas" of the unit. The conceptual lens is a particular concept that focuses the thinking of the unit.

Lens:

- Stability and change

Concepts:

- Natural Resources
- Sustainability
- Distribution
- Availability
- geoscience processes
- consumption

Generalizations

Critical conceptual relationships that students are expected to ***UNDERSTAND*** *at the end of the unit.*

1. Earth's natural resources ensure the existence of life.
2. Geoscience processes over time create natural resources.
3. Resource availability and distribution impact human societies and ecosystems.
4. Management of Earth's resources is crucial for sustainability.
5. The increased consumption of natural resources significantly impacts the stability of Earth's systems.

Guiding Questions

A combination of Factual (F), Conceptual (C) and Provocative/Debatable (P) questions that lead to the generalizations. Label each question (F), (C) or (P).

1. Earth's natural resources ensure the existence of life
   - What elements are humans composed of? (F)
   - What do human, as living things, need from the planet to survive? (C)
   - How do humans acquire the elements necessary for survival? (C)
   - How is access to resources acquired? (C)
   - What are the physiological consequences of lack of resources? (C)

2. Geological processes over time create natural resources.
   - How are these resources created? (F)
   - What processes create natural resources? (F)
   - Can we make more of these resources? (F)
   - What conditions are needed? (F)
   - How long does it take? (F)
   - What are renewable resources? (F)
   - What are non-renewable resources? (F)

- How are non-renewable resources used? (F)
- What is coal? (F)
- How is coal formed? (F)
- Where is coal formed? (F)
- What is petroleum? (F)
- How is petroleum formed? (F)
- Where is petroleum formed? (F)
- How are minerals formed? (F)
- Where are minerals found? (F)
- How have past and ongoing geoscience processes determined the distribution of Earth's resources? (C)

3. Resource availability and distribution impact human societies and ecosystems.

- Where are the resources we need located? (F)
- Why are resources located where they are? (F)
- Why are they not evenly distributed? (F)
- How do we acquire resources that are not nearby?(C)
- How does the distribution of natural resources impact human populations? (C)
- Does the distribution of natural resources contribute to unfair economic disparity among populations?(P)

4. Sustainable management of Earth's resources is crucial for stability.

- What impact do our needs have on the planet? (F)
- What factors contribute to the limited availability of natural resources? (F)
- How can non-renewable resources be conserved? (F)
- Can non-renewable resources be created? (F)

5. The increased consumption of natural resources significantly impacts the stability of Earth's systems.

- What impact does human population growth and increased consumption of natural resources have on Earth's systems? (C)

Content Knowledge

Critical facts and information that students are expected to KNOW at the end of the unit.

Humans rely on Earth's natural resources.
Minerals, fresh water, and biosphere resources are limited.
Many resources are not renewable within human lifetimes.
Resource distribution is uneven due to geologic processes.
Earth's land, ocean, atmosphere, and biosphere provide essential resources.
Past geologic processes influence current resource locations.
Resource availability impacts human society and ecosystems.
Sustainable resource management is crucial for future generations.
Human activity affects the availability of natural resources.
Understanding geologic history helps locate valuable resources.
Renewable resources can be replenished naturally over time.
Non-renewable resources are finite and deplete over use.
Conservation efforts help manage limited natural resources.

Standards

The content standards that are taught and/or assessed in this unit.

NGSS: Science and Engineering Practices

NGSS: 6-8

Practice 7. Engaging in argument from evidence

Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

- [x] Construct, use, and/or present an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.

NGSS: Disciplinary Core Ideas

NGSS: 6-8

ESS3: Earth and Human Activity

ESS3.A: Natural Resources

- [x] Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. (MS-ESS3-1)

Interactive version of NGSS
NGSS Resources

Core Learning Activities

The learning activities that support the acquisition of content knowledge, attainment of critical skills and lead to the generalizations of the unit. Activities should be clearly articulated, include teacher instructions and identify optional vs. assured experiences.

Research using multiple sources, primarily Discovery Education (see resources for link), to compile information to execute the summative project at the end of the unit.

- Written responses and map creation that shows locations of natural resources.
- Description of geoscience processes that create the resources.
- Draw conclusions about the relationship between population and resource availability.

Rubicon Copy of Earth's Natural Resources Research

Portrait of the Newtown Graduate

Vocabulary

Academic and content-specific vocabulary needed to support knowledge, understanding and/or skills.

Abiotic
Biotic
Geosphere
Biosphere
Hydrosphere
Geologic processes
Renewable resources
Non-renewable resources
Fossil fuels
Petroleum
Coal

Resources

Teacher and student resources used to support the learning.

Amazing Nature: Plants Dancing in Time Lapse

Nature Speaking: Reese Witherspoon Home

Discovery Education Techbook

Earth's Natural Resources Studio Board

Natural Resources Background Builder

Natural gas
Mineral ore
Soil
Sediment
Water
Forests
Conservation
Sustainability

Assessments

The means by which students will demonstrate what they know (content knowledge), what they can do (critical skills), and what they understand (generalizations) as a result of their learning from the unit.

Natural Resources Project | Summative | Exhibition

Technology Project | Personal Project

Describes how natural resources are formed through geoscience process, mapping the location of the resources and using the knowlege of geoscience processes that created them. Looks at the use and conservation of renewable and non renewable resources and the effects of human population on these resources.

Rubicon Copy of Earth's Natural Resources Project Rubric | Rubicon Copy of Natural Resources Maps

No Standards Assessed

Rubicon Copy of Natural Resources Maps | Rubicon Copy of Earth's Natural Resources Project Rubric

Differentiation

Core learning activities, resources and assessments that meet the needs of all learners.

Test Prep Connections

As appropriate, include activities that build skills for standardized testing, such as IABs.

Unit Plan

Cells & Cell Processes

Newtown Middle School / Grade 7 / Science

Week 12 - Week 14 | 4 Curriculum Developers | Last Updated: Jan 31, 2026 by Musco, Susan

Concept-Based Curriculum Unit Template

Purpose of the Unit

The overarching goal(s) of the unit.

The overarching goals of this unit are:

- Explore how cells are the basic unit of life, with special structures responsible for specific functions, that utilize energy for survival.
- Explore the transfer of energy through the matter on earth and how it supports life.

Conceptual Lens/Concepts

Concepts are the "big ideas" of the unit. The conceptual lens is a particular concept that focuses the thinking of the unit.

Lens:

- Energy Transformation
- Homeostasis

Concepts:

- Structure
- Function
- Systems
- Interactions
- Interdependence
- Cells
- Organisms

Generalizations

Critical conceptual relationships that students are expected to ***UNDERSTAND*** *at the end of the unit.*

1. Cells create the structure of all organisms.
2. Specialized structures in cells perform different functions that support homeostasis.
3. Energy transformations convert energy from one form to another so it can be used for life processes.
4. Cells can be organized into larger structures and organ systems that interact to maintain homeostasis.
5. Organisms depend on energy transformation creating an interdependence among all life on earth.

Guiding Questions

A combination of Factual (F), Conceptual (C) and Provocative/Debatable (P) questions that lead to the generalizations. Label each question (F), (C) or (P).

1. Cells create the structure of all organisms.
   - What is the basic unit of structure and function of all living things? (F)
   - What characteristics define living things? (F)
   - What are cells? (F)
   -
   - What are the two types of cells? (F)
   - How are prokaryotic cells organized? (F)
   - How are eukaryotic cells organized? (F)
   - Why are cells important to all living things? (C)
   - Why do some organisms consist of a single cell while others have many cells? (C)
   - In what ways are prokaryotic cells essential for the health, growth, or survival of eukaryotic organisms? (P)

2. Specialized structures in cells perform different functions that support homeostasis.

- What are the organelles and specialized structures in cells?(F)
- What are the parts of a cell? (F)
- What are the functions of those parts? (F)
- What are the building blocks of proteins? (F)
- How do these cells parts work together to synthesize proteins? (C)
- How do proteins perform life processes? (C)

3. Energy transformations convert energy from one form to another so it can be used for life processes.

- How does photosynthesis transform sunlight energy into chemical energy?
- What are the reactants and products of photosynthesis? (F)
- What is the energy transformation that occurs during photosynthesis? (F)
- What organelle is involved in photosynthesis? (F)
- What is the process of cellular respiration in eukaryotic cells? (F)
- What are the reactants and products of cellular respiration? (F)
- What is the energy transformation that occurs during cellular respiration? (F)
- What organelle is involved in cellular respiration? (F)
- Why does cellular respiration need to take place in both plant and animal cells? (C
- How do the structures in plant cells enable photosynthesis, and why are these structures absent in animal cells?(C)

4. Cells can be organized into larger structures that interact to maintain homeostasis.

- How are cells organized in multicellular organisms? (F)
- What is homeostasis? (F)
- How do cells maintain homeostasis? (C)
- How do the different types of cells in multicellular organisms work together? (C)

5. Organisms depend on energy transformation creating an interdependence among all life on earth.

- Why are plants called producers? (C)
- Why are animals called consumers? (C)
- How are photosynthesis and cellular respiration interdependent on each other? (C)
- What would life on Earth look like if photosynthesis suddenly stopped—how would it affect air, food, and ecosystems? (P)
- In what ways does the ability of plants to convert sunlight into energy determine the survival of all living things?(P)

Content Knowledge

*Critical facts and information that students are expected to **KNOW** at the end of the unit.*

Cell theory principles
Types of cells and their structure and functions
Structure and function of cell organelles
Cell membrane function and structure
Photosynthesis process and function
Role of chloroplasts in photosynthesis
Cellular respiration process and function
Energy transformation in cells
Interdependence of cellular systems
Interdependence of photosynthesis and cellular respiration

Standards

The content standards that are taught and/or assessed in this unit.

NGSS: Science and Engineering Practices

NGSS: 6-8

Practice 2. Developing and using models

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- [x] Develop a model to describe unobservable mechanisms.

Practice 3. Planning and carrying out investigations

Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions.

- [x] Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.
- [x] Conduct an investigation and/or evaluate and/or revise the experimental design to produce data to serve as the basis for evidence that meet the goals of the investigation.
- [x] Evaluate the accuracy of various methods for collecting data.
- [x] Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions.
- [x] Collect data about the performance of a proposed object, tool, process or system under a range of conditions.

NGSS: Crosscutting Concepts

NGSS: 6-8

Crosscutting Statements

4. Systems and System Models – A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

- [x] Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems.
- [x] Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems.
- [x] Models are limited in that they only represent certain aspects of the system under study.

6. Structure and Function – The way an object is shaped or structured determines many of its properties and functions.

- [x] Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts; therefore, complex natural and designed structures/systems can be analyzed to determine how they function.

NGSS: Disciplinary Core Ideas

NGSS: 6-8

LS1: From Molecules to Organisms: Structures and Processes

LS1.A: Structure and Function

- [x] All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1)
- [x] Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (MS-LS1-2)

LS1.C: Organization for Matter and Energy Flow in Organisms

- [x] Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. (MS-LS1-6)
- [x] Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (MS-LS1-7)

Interactive version of NGSS
NGSS Resources

Core Learning Activities

The learning activities that support the acquisition of content knowledge, attainment of critical skills and lead to the generalizations of the unit. Activities should be clearly articulated, include teacher instructions and identify optional vs. assured experiences.

Types of Cells - slide show and Venn diagram
Cells, What do they do - Slide show and guided note taking.
Inside a cell - Video (see resources for link) and guided note taking.
Anatomy of The Cell
How A Cell Operates
Cell Analogy Project
Cell Test Study Guide

Rubicon Copy Cell Test Study Guide
Types of Cells Venn Diagram.pdf
Inside a Cell - Cell Parts and Functions.pdf
Rubicon Copy Inside a Cell - Cell Parts and Functions
Rubicon Copy of Cells, What Do They Do?
Rubicon Copy of Types of cells
The Anatomy of the Cell.pdf
How a Cell Operates.pdf
Rubicon Copy of Cells, What do they do?

Portrait of the Newtown Graduate

Vocabulary

Academic and content-specific vocabulary needed to support knowledge, understanding and/or skills.

cell, unicellular, multicellular, prokaryotic, eukaryotic, cell membrane, nucleus, cytoplasm, organelle, mitochondria, ribosome, chloroplast, photosynthesis, cellular respiration, homeostasis, tissue, organ, organ system

Resources

Teacher and student resources used to support the learning.

Phenomenon:
https://www.youtube.com/watch?v=wRloCHpU4MQ&feature=youtu.be
Pond water video and / or
Check cells, dialysis tubing

Microorganisms
By Barbara and Pat Ward
Mark Twain/Carson-Dellosa Publishing Company, Inc.

Learning About Cells
By Debbie Routh
Mark Twain Media, Inc. Publisher

Human Biology Activities Kit
By John R. Roland
Published by Jossey-Bass

Discovery Education Techbook

Inside a Cell Video

Assessments

The means by which students will demonstrate what they know (content knowledge), what they can do (critical skills), and what they understand (generalizations) as a result of their learning from the unit.

Characteristics of Living Things Content Reading | Summative | Narrative Writing Assignment

Reading text and using the information in the text to decide whether it is living or non living based on criteria learned.

Rubicon Copy of Characteristics of Living Things Content Reading

No Standards Assessed

Cell Analogy Project | Summative | Exhibition

Personal Project

To make an analogy between eukaryotic cells **(plant and animal)** and something (system or activity) you are familiar with in order to understand how eukaryotic cells work.

Rubicon Copy of Cell Analogy Rubric | Rubicon Copy Cell Analogy Project Explanation | Rubicon Copy Cell Analogy Project Key

No Standards Assessed

Rubicon Copy of Cell Analogy Rubric
Rubicon Copy Cell Analogy Project Explanation
Rubicon Copy Cell Analogy Project Key
Rubicon Copy of Cell Types & Processes Test
Rubicon Copy of Characteristics of Living Things Content Reading 2

Differentiation

Core learning activities, resources and assessments that meet the needs of all learners.

Rubicon Copy of Modified Cell Types & Processes Test

Test Prep Connections

As appropriate, include activities that build skills for standardized testing, such as IABs.

Unit Plan

Respiratory System

Newtown Middle School / Grade 7 / Science

Week 15 - Week 18 | 4 Curriculum Developers | Last Updated: Jan 31, 2026 by Musco, Susan

Concept-Based Curriculum Unit Template

Purpose of the Unit

The overarching goal(s) of the unit.

Explore how the respiratory system interacts with other systems to provide energy and maintain homeostasis.

Conceptual Lens/Concepts

Concepts are the "big ideas" of the unit. The conceptual lens is a particular concept that focuses the thinking of the unit.

Lens:

- Energy Transformation
- Homeostasis

Concepts:

- Structure
- Function
- Systems
- Interactions
- Interdependence
- Respiratory System
- Energy Transformation
- Homeossasis.

Generalizations

*Critical conceptual relationships that students are expected to **UNDERSTAND** at the end of the unit.*

1. Structures of the respiratory systems determine function and efficiency.
2. Functions of the respiratory system contribute to energy transformations in the human body.
3. The respiratory system provides essential materials for energy production and transformation.
4. The respiratory system optimizes homeostasis.
5. The interdependence of organ systems promotes energy transformation and maintains homeostasis.

Guiding Questions

A combination of Factual (F), Conceptual (C) and Provocative/Debatable (P) questions that lead to the generalizations. Label each question (F), (C) or (P).

1. Structures of the respiratory systems determine function and efficiency.
   - What are the parts of the respiratory system? (F)
   - What are the functions of each of the parts of the respiratory system (F)
   - What is the process of breathing? (C)
   - What is the role of air pressure in the process of breathing? (C)
   - How do different activities affect our breathing rate? (C)

2. Functions of the respiratory system contribute to energy transformations in the human body.
   - Where does cellular respiration take place? (F)
   - What are the reactants of cellular respiration? (F)
   - What are the products of cellular respiration? (F)
   - What is the process of cellular respiration? (C)
   - How are breathing and respiration different? (C)

- Why does the breathing rate change during different activities? (C)

3. The respiratory system provides essential materials for energy production and transformation?
   - What gases are exchanged during gas exchange? (F)
   - How does gas exchange occur in the alveoli of the lungs? (C)
   - What is the role of diffusion in gas exchange (C)
   - How is oxygen used by the human body? (C)
   - Why is it not necessary to store oxygen in the human body? (C)
   - What is the impact of reduced oxygen intake on the human body? (C)

4. The respiratory system optimizes homeostasis.
   - What waste gases are removed during exhalation? (F)
   - How does the removal of waste products maintain homeostasis? (C)
   - What would the impact of not removing waste products be on the body? (C)
   - How does the energy produced by the transformation process of cellular respiration support homeostasis? (C)

5. The interdependence of organ systems promotes energy transformation and maintains homeostasis.
   - What is the sequence of respiration? (F)
   - How does the respiratory system interact with the circulatory and digestive systems? (C)
   - How do environmental factors impact the respiratory system? (C)
   - How does lifestyle choice impact the function of the respiratory system? (C)
   - What are the best lifestyle choices for maintaining optimum respiratory functions? (P)

Content Knowledge

Critical facts and information that students are expected to KNOW at the end of the unit.

Respiratory system structure and function
Gas exchange in lungs
Role of alveoli in gas exchange
Diaphragm and breathing mechanism
Models to represent respiratory processes
Respiratory system interaction with circulatory system
Cellular respiration and energy production
Sequence of respiration
Removal of waste gasses
Effects of exercise on respiration

Standards

The content standards that are taught and/or assessed in this unit.

NGSS: Science Performance Expectations

NGSS: MS Life Science

MS.Structure, Function, and Information Processing

Performance Expectations Show Details

- [x] MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. Show Details

MS.Matter and Energy in Organisms and Ecosystems

Performance Expectations Show Details

- [x] MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. Show Details

NGSS: Crosscutting Concepts

NGSS: 6-8

Crosscutting Statements

2. Cause and Effect: Mechanism and Prediction – Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.

- [x] Cause and effect relationships may be used to predict phenomena in natural or designed systems.

4. Systems and System Models – A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

- [x] Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems.
- [x] Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems.
- [x] Models are limited in that they only represent certain aspects of the system under study.

6. Structure and Function – The way an object is shaped or structured determines many of its properties and functions.

- [x] Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts; therefore, complex natural and designed structures/systems can be analyzed to determine how they function.

7. Stability and Change – For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

- [x] Small changes in one part of a system might cause large changes in another part.

NGSS: Disciplinary Core Ideas

NGSS: 6-8

LS1: From Molecules to Organisms: Structures and Processes

LS1.A: Structure and Function

- [x] In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (MS-LS1-3)

Interactive version of NGSS
NGSS Resources

Core Learning Activities

The learning activities that support the acquisition of content knowledge, attainment of critical skills and lead to the generalizations of the unit. Activities should be clearly articulated, include teacher instructions and identify optional vs. assured experiences.

The Breathing Process slide show and guided note taking
The anatomy of the Respiratory System Project and Poster.
Sequence for Respiration slide show and guided notes/worksheet

Portrait of the Newtown Graduate

Gas Exchange in the Alveoli packet.
The Adventures of an Oxygen Molecule constructed writing response.

The Anatomy of the Respiratory System Project.pdf
The Anatomy of the Respiratory System Poster.pdf
Breathing Process
Gas Exchange in the Alveoli.pdf
Sequence of Respiration
Sequence for Respiration.pdf
Rubicon Copy of The Adventures of Oxygen Molecules

Vocabulary

Academic and content-specific vocabulary needed to support knowledge, understanding and/or skills.

lungs, alveoli, surface area, thoracic cavity, nasal cavity, pharynx, larynx, trachea, bronchi, bronchioles, diaphragm, diffusion, concentration, molecules, oxygen, carbon dioxide, inhalation, exhalation, air pressure, breathing rate, cellular respiration

Resources

Teacher and student resources used to support the learning.

Human Biology Activities Kit
By John R. Roland
Published by Jossey-Bass

Your Body and How It Works
By Pat and Barb Ward
Mark Twain Media/Carson-Dellosa Publishing Company, Inc.

Human Biology and Health Student Textbook and All in One Teaching Resources
Prentice Hall Science Explorer
Published by Pearson/Prentice Hall

Discovery Education Techbook

Assessments

The means by which students will demonstrate what they know (content knowledge), what they can do (critical skills), and what they understand (generalizations) as a result of their learning from the unit.

Respiratory System Test | Summative | Standardized Test

Department created assessment based on content learned about the respiratory system.

Rubicon Copy of Respiratory Test

No Standards Assessed

Rubicon Copy of Respiratory Test

Differentiation

Core learning activities, resources and assessments that meet the needs of all learners.

Rubicon Copy of Modified Respiratory Test

Test Prep Connections

As appropriate, include activities that build skills for standardized testing, such as IABs.

Unit Plan

Digestive System

Newtown Middle School / Grade 7 / Science

Week 19 - Week 22 | 4 Curriculum Developers | Last Updated: Jan 31, 2026 by Musco, Susan

Concept-Based Curriculum Unit Template

Purpose of the Unit

The overarching goal(s) of the unit.

Purpose of the Unit: Digestive System

Explore how the digestive system interacts with other body systems to provide energy and maintain homeostasis.

Conceptual Lens/Concepts

Concepts are the "big ideas" of the unit. The conceptual lens is a particular concept that focuses the thinking of the unit.

Lens:

- Homeostasis
- Energy transformation

Concepts:

- Interdependence
- Structure
- Function
- Systems
- Interactions
- Digestion
- Digestive System
- Efficiency
- Energy Transformation

Generalizations

Critical conceptual relationships that students are expected to ***UNDERSTAND*** *at the end of the unit.*

1. Structures of digestive system determine function and efficiency.
2. Functions of the digestive system contribute to energy transformations in the human body.
3. The digestive system provides essential materials for energy production and transformation.
4. The digestive system optimizes homeostasis.
5. The interdependence of organ systems promotes energy transformation and maintains homeostasis.

Guiding Questions

A combination of Factual (F), Conceptual (C) and Provocative/Debatable (P) questions that lead to the generalizations. Label each question (F), (C) or (P).

1. Structures of digestive system determine function and efficiency.
   - What structures of the mouth assist in mechanically and chemically breaking down food? (F)
   - What is the esophagus? (F)
   - What structures of the stomach assist in mechanically and chemically breaking down food? (F)
   - What accessory organs assist the stomach in breaking down food by contributing chemicals to the digestive process? (F)
   - What structures in the small instestine assist in nutrient absorption? (F)

- How do structures in the digestive system determine function and efficiency? (C)

2. Functions of the digestive system contribute to energy transformations in the human body.

- How is food in the mouth broken down to increase surface area? (C)
- How does food mechanically break down in the mouth? (C)
- How does food chemically break down in the mouth? (C)
- How does food mechanically break down in the stomach? (C)
- How does food chemically break down in the stomach? (C)
- How are nutrients absorbed in the small intestine? (C)
- What do enzymes do and how do they assist in chemical digestion? (C)
- How does the esophagus move food from the mouth to the stomach? (C)
- What is the function of the stomach? (C))
- How do the digestive system organs interact? (C)
- How is food moved through the body? (C)
- What is the relationship between digestion, absorption, and elimination? (C)
- How is the function of each organ determined by its shape and structure? (C)

3. The digestive system provides essential materials for energy production and transformation.

- What is the role of glucose in cellular respiration? (C)
- What is the role of the digestive system in cellular respiration, energy production, and energy transformations? (C)
- Where does the glucose that the body uses for energy come from? (F)
- What are the essential nutrients found in food needed for survival? (F)
- What are the functions of nutrients brought into the body? (F)
- What are enzymes and what do they do? (F)
- What is chyme? (F)

4. The digestive system optimizes homeostasis.

- What is the function of the large intestine and what major process occurs here, aiding in maintaining homeostasis? (F)
- How is solid waste prepared for removal? (F)

5. The interdependence of organ systems promotes energy transformation and maintains homeostasis.

- What other body systems aid the digestive system in its function? (F)
- How would dysfunction of the digestive systems nutrient absorption processes threaten the health and survival of an organism? (C)
- How would dysfunction of the digestive system's ability to eliminate waste threaten the health and survival of an organism? (C)
- How could humans use their knowledge and understanding of the digestive system to make healthier choices? (P)

Content Knowledge

*Critical facts and information that students are expected to **KNOW** at the end of the unit.*

Types of digestive processes (digestion molecular absorption, elimination/ excretion)
Digestive structure and functions
Structure and function of digestive organs
Function of enzymes
Cellular respiration process and function
Energy transformations (matter to energy; energy for growth and repair)
Role of digestive processes in homeostasis
Interdependence of body systems
Making observations
Identifying variables
Presenting data
Scientific communication

Standards

The content standards that are taught and/or assessed in this unit.

NGSS: Disciplinary Core Ideas
NGSS: 6-8
LS1: From Molecules to Organisms: Structures and Processes

LS1.A: Structure and Function

- [x] In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (MS-LS1-3)

LS1.C: Organization for Matter and Energy Flow in Organisms

- [x] Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (MS-LS1-7)

Interactive version of NGSS
NGSS Resources

Core Learning Activities

The learning activities that support the acquisition of content knowledge, attainment of critical skills and lead to the generalizations of the unit. Activities should be clearly articulated, include teacher instructions and identify optional vs. assured experiences.

A brief tour through the human digestive system, this video will address major structures and functions including the esophagus, stomach, small intestine, and large intestine. This video also mentions chemical and mechanical digestion as well as some digestive vocabulary.

Anatomy of the Digestive System Packet
Digestive System - Structure and Function slide show and graphic organizer.
Digestive System Study Guide

https://youtu.be/1UvuBYUbFk0?si=-WmzURfgIHTs66_n

Portrait of the Newtown Graduate

Digestive System Study Guide
https://docs.google.com/document/d/1YVb6-hPYDHRPho_hUPkeskn4h5kcr2xU4boX9HJR_qU/edit?usp=sharing

9-2 The Anatomy of the Human Digestive System_BLANK.pdf

https://clever.discoveryeducation.com/learn/videos/7fee6fec-b561-43bd-a288-b82632427440

Rubicon Copy of Digestive System -Structure and Function

Rubicon Copy of Digestive System Graphic Organizer

Rubicon Copy of Digestive Study Guide

Vocabulary

Academic and content-specific vocabulary needed to support knowledge, understanding and/or skills.

digestion, absorption, elimination, organs, systems, mechanical digestion, chemical digestion, nutrients, molecules, enzymes (amylase, pepsin), surface area, homeostasis, function, efficiency, mouth, teeth, tongue, salivary glands, saliva, esophagus, peristalsis, stomach, (hydrochloric) acid, liver, gallbladder, bile, pancreas, small intestine, (micro)villi, large intestine, rectum, anus,

Resources

Teacher and student resources used to support the learning.

Human Biology Activities Kit
By John R. Roland
Published by Jossey-Bass

Your Body and How It Works
By Pat and Barb Ward
Mark Twain Media/Carson-Dellosa Publishing Company, Inc.

Human Biology and Health Student Textbook and All in One Teaching Resources
Prentice Hall Science Explorer
Published by Pearson/Prentice Hall

Discovery Education Techbook

Assessments

The means by which students will demonstrate what they know (content knowledge), what they can do (critical skills), and what they understand (generalizations) as a result of their learning from the unit.

OPTIONAL Digestive System Board Game | Summative | Exhibition

Group Project

Optional assessment where students create a board game that teaches about the digestive system.

3 Standards Assessed

Digestive System Test | Summative | Standardized Test

Department created assessment covering content learned about the digestive system.

Rubicon Copy of Digestive System Test NGSS Reg/Mod

Rubicon Copy of Digestive System Test Reg/Mod

No Standards Assessed

Rubicon Copy of Digestive System Test Reg/Mod

Rubicon Copy of Digestive System Test NGSS Reg/Mod

Differentiation

Core learning activities, resources and assessments that meet the needs of all learners.

Test Prep Connections

As appropriate, include activities that build skills for standardized testing, such as IABs.

Unit Plan

Circulatory System

Newtown Middle School / Grade 7 / Science

Week 23 - Week 25 | 4 Curriculum Developers | Last Updated: Jan 31, 2026 by Musco, Susan

Concept-Based Curriculum Unit Template

Purpose of the Unit

The overarching goal(s) of the unit.

Circulatory System

Explore how the circulatory system interacts with other body systems to provide energy and maintain homeostasis.

Conceptual Lens/Concepts

Concepts are the "big ideas" of the unit. The conceptual lens is a particular concept that focuses the thinking of the unit.

Lens:

- Energy transformation
- Homeostasis

Concepts:

- Interdependence
- Structure
- Function
- Systems
- Interactions
- Circulation

Generalizations

*Critical conceptual relationships that students are expected to **UNDERSTAND** at the end of the unit.*

1. Structures of the circulatory system determine function and efficiency.
2. Functions of the circulatory system contribute to energy transformations in the human body.
3. The circulatory system provides essential materials for energy production and transformation.
4. The circulatory system optimizes homeostasis.
5. The interdependence of organ systems promotes energy transformation and maintains homeostasis.

Guiding Questions

A combination of Factual (F), Conceptual (C) and Provocative/Debatable (P) questions that lead to the generalizations. Label each question (F), (C) or (P).

1. Circulatory system structures determine function and efficiency.
   - What are the structures of the heart? (atria, ventricles)? (F)
   - What are valves? (F)
   - What is the septum? (F)
   - What are the four components of blood? (F)
   - What are the three major types of blood vessels? (F)
   - How does the circulatory system structures determine function and efficiency? (C)

2. Functions of the circulatory system contribute to energy transformations in the human body.
   - What is the function of the heart? (F)
   - What is the function of atria? (F)
   - What is the function of ventricles? (F)
   - What is the function of the septic? (F)
   - What is the function of valves? (F)
   - What is the function of veins? (F)

- What is the function of arteries? (F)
- What is the function of capillaries? (F)
- What are the functions of red blood cells, white blood cells, platelets, and plasma?(F)
- How do the functions of the circulatory system contribute to energy transformations in the human body? (C)

3. The circulatory system provides essential materials for energy production and transformation.

- How does oxygen get to red blood cells? (F)
- What is gas exchange? (C)
- What is diffusion? (C)
- What are the two loops of circulation? (F)
- How does oxygen bind to red blood cells? (C)
- How does the glucose from food get to body cells? (C)
- What is pulmonary circulation? (F)

4. The circulatory system optimizes homeostasis.

- How do healthy choices (regular exercise, diet, stress management, avoidance of drugs and alcohol, getting enough sleep) promote cardiovascular health and, therefore, overall health? (C)
- Is exposure to toxins and stress, etc avoidable? (P)
- What is the connection between regular exercise, cellular respiration, and cardiovascular health? (C)
- How does carbon dioxide leave the circulatory system? (F) (C?)
- What would happen if there was a hole in the septum of the heart? (C)

5. The interdependence of organ systems promotes energy transformation and maintains homeostasis.\

- What are the best lifestyle choices for maintaining optimum circulatory functions? (F)
- How do all organ systems contribute to cellular respiration to meet the human body's energy demands? (C)
- How does the circulatory system specifically contribute to cellular respiration to meet the human body's energy demands? (C)
- How would dysfunction of the circulatory system and it's components contribute to deterioration of the body's health? (C)
- Which has a greater impact on the health of the body--lifestyle or environment? (P)

Content Knowledge

Critical facts and information that students are expected to ***KNOW*** *at the end of the unit.*

Types of circulatory processes (diffusion, gas exchange, oxygenation, clotting)
Circulatory structure and functions
Structure and function of circulatory organs
Function of antibodies/ antigens
Cellular respiration process and function
Energy transformations
Role of circulatory and pulmonary processes in homeostasis
Interdependence of body systems
Making observations
Data collection/ data analysis

Scientific communication

Standards

The content standards that are taught and/or assessed in this unit.

NGSS: Disciplinary Core Ideas
NGSS: 6-8
LS1: From Molecules to Organisms: Structures and Processes
LS1.A: Structure and Function

- [x] In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (MS-LS1-3)

Interactive version of NGSS
NGSS Resources

Core Learning Activities

The learning activities that support the acquisition of content knowledge, attainment of critical skills and lead to the generalizations of the unit. Activities should be clearly articulated, include teacher instructions and identify optional vs. assured experiences.

Getting to Know the Circulatory System
Discovery Education- this is a reading and questions giving a general overview of the human circulatory system. Skills use include reading comprehension with purpose and is in support of the generalization that the circulatory system works with all systems to maintain homeostasis.
Reading: https://google.discoveryeducation.com/learn/player/158a8660-bf06-4626-b4ca-7fd6184aa3c2

Human Circulatory System
This investigation reviews what we know about the circulatory system so far and then delves into exploring the components of the circulatory system. The circulatory system, also known as the cardiovascular system, includes the heart, blood vessels, and blood. It transports necessary substances through the body and removes waste products. This supports the generalization that structures of the circulatory system determine function and efficiency.
https://google.discoveryeducation.com/learn/videos/f8f9a1cb-e36e-4584-92de-4042f9074afd/

The Internal and External Anatomy of the Human Heart
Heart Internal and External
Anatomy worksheets (6-4 & 6-5)
These assignments go into detail about the structure of the human heart and support the generalization that structures of the circulatory system determine function and efficiency.
https://drive.google.com/file/d/15fFKUAKKrdW_mmqYqfwyyEyryu4N4VH1/view?usp=sharing

The Beat Goes On/ Labeling the Heart
Discovery Education
This interactive game demonstrates how blood flows throughout your body and delivers the oxygen your cells need to survive. Your heart keeps the blood moving, sending it back and forth to your lungs

Portrait of the Newtown Graduate

to keep it fresh with oxygen. Explore the parts of your heart and see it in action. This supports the generalization that circulation moves essential materials and removes waste products to promote interdependence of body systems and facilitate energy transformation.
https://clever.discoveryeducation.com/learn/player/4b848c65-499e-4add-b52f-336d2b236d9d

Once students have finished The Beat Goes On and reviewed their notes/ classwork up to this point, they should use the slideshow to practice labeling the parts of the heart.
https://docs.google.com/presentation/d/11CZQhGy7cvol8Hv9fC0o5PmamtQni6b14-d37QgahC0/edit?usp=sharing

Blood Flow Through the Heart Slideshow and Video for Review Check for Understanding
This slideshow and video review the functions and structure of the heart and structures within the heart. It also reviews pulmonary circulation (that is, circulation between the heart and lungs, which facilitates the oxygenation of blood). This supports the generalization that circulatory interactions contribute to the life processes of human body systems.
https://docs.google.com/presentation/d/1V3AABAAoYLoz9IxDXbz8FihKutUx9rEzFjtVY4P1SMA/edit?usp=sharing

Video demonstrating the pathway of blood through the human heart.
https://youtu.be/jBt5jZSWhMI?si=-Yt8d4MMXbHIXHru

Three Types of Blood Vessels Slideshow
https://docs.google.com/presentation/d/1TBzClwf7tBP0fKPC_D47ucw5CwRqnKcnsfp9_MyOirE/edit?usp=sharing

Blood Composition Slide
https://docs.google.com/document/d/1UkIw8YIVlvzYLDL37eKP1y8acQa96fKnC82Qhwhg-d4/edit?usp=sharing

Blood Types and Transfusions

https://drive.google.com/file/d/1SKdv2z5MHKK0Awfxo0v8x8Fpaoz1V3Fn/view?usp=sharing

Independent Heart Rate Lab Proposal and Checklist (Lab Safety Contract, attached)

https://docs.google.com/document/d/1ZI_VSwECFGsfNhFDtQYtyjlkU_qGb7O-ULN3ch7ywCU/edit?usp=sharing

CER Grading Rubric for Grade Seven
https://docs.google.com/document/d/1R4dsXLh7ZZaafpbR9n_mJjaUW_eMasiejytMRkhIsh4/edit?usp=sharing

Circulatory System Study Guide

https://docs.google.com/document/d/1vTX-
https://youtu.be/Ai2X4GZyYYo-
fBhLSceaLvTUzoxeTsFYFrTpwzIs35qc/edit?usp=sharing

Vocabulary

Academic and content-specific vocabulary needed to support knowledge, understanding and/or skills.

heart, blood, blood vessels, oxygen, carbon dioxide, atrium/ atria, ventricles, oxygenated, deoxygenated, septum, valves, vein, arteries, capillaries, plasma, red blood cells, white blood cells, platelets, fibrin, hemoglobin, antigen, antibody, blood pressure, density, diffusion, circulation, cardiovascular health, pulmonary circulation, organ, system, gas exchange, cellular respiration, density, gravity

Resources

Teacher and student resources used to support the learning.

Human Biology Activities Kit
By John R. Roland
Published by Jossey-Bass

Your Body and How It Works
By Pat and Barb Ward
Mark Twain Media/Carson-Dellosa Publishing Company, Inc.

Human Biology and Health Student Textbook and All in One Teaching Resources
Prentice Hall Science Explorer
Published by Pearson/Prentice Hall

Discovery Education Techbook

Assessments

The means by which students will demonstrate what they know (content knowledge), what they can do (critical skills), and what they understand (generalizations) as a result of their learning from the unit.

Journey of a Red Blood Cell | Summative | Exhibition

Personal Project

Students will use a comic strip/graphic novel format to describe the journey of a red blood cell throughout the body and all of the “experiences” it has.

Rubicon Copy of The Journey of a Red Blood Cell 2022

No Standards Assessed

Circulatory System Test | Summative | Standardized Test

Department created assessment based on the content learned about the circulatory system .

Rubicon Copy of Circulatory System Test

No Standards Assessed

Rubicon Copy of The Journey of a Red Blood Cell 2022 Rubicon Copy of Circulatory System Test 2023

Differentiation

Core learning activities, resources and assessments that meet the needs of all learners.

Test Prep Connections

As appropriate, include activities that build skills for standardized testing, such as IABs.

Unit Plan

Nervous System

Newtown Middle School / Grade 7 / Science

Week 26 - Week 27 | 4 Curriculum Developers | Last Updated: Jan 31, 2026 by Musco, Susan

Concept-Based Curriculum Unit Template

Purpose of the Unit

The overarching goal(s) of the unit.

Explore how the nervous systems interacts with other body systems to utilize energy and maintain homeostasis.

Conceptual Lens/Concepts

Concepts are the "big ideas" of the unit. The conceptual lens is a particular concept that focuses the thinking of the unit.

Lens:

- Energy Transfer
- Homeostasis

Concepts:

- Structure & Function
- Systems and Interactions
- Interdependence
- Communication
- Environment
- Memory

Generalizations

Critical conceptual relationships that students are expected to ***UNDERSTAND*** *at the end of the unit.*

1. Structures of the nervous system function to respond to stimulus.
2. Energy transformations at sensory receptors—such as mechanical pressure, chemical interactions, or light—enable the conversion of external stimuli into electrical signals.
3. The central nervous system (CNS) and peripheral nervous system (PNS) interact to detect changes in the environment and produce an appropriate response.
4. Memories formed through past experiences influence learned behaviors, and in what ways do these behaviors help the nervous and endocrine systems work together to maintain homeostasis in changing internal and external conditions.
5. Communication through the nervous system coordinate the activities of multiple body systems, and the interdependence of these systems is essential for maintaining homeostasis when the body encounters internal or external changes.

Guiding Questions

A combination of Factual (F), Conceptual (C) and Provocative/Debatable (P) questions that lead to the generalizations. Label each question (F), (C) or (P).

1. Structures of the nervous system function to respond to stimulus.
    - What are the regions of the brain? (F)
    - What is the main function of the cerebrum? (F)
    - What is the main function of the cerebellum? (F)
    - What is the main function of the brain stem? (F)
    - What are the three types of neurons? (F)
    - What is the function of sensory neurons? (F)
    - What is the function of the interneurons? (F)
    - What is the function of the motor neurons? (F)
    - What is a nerve impulse? (F)
    - What is a stimulus? (F)
    - How do structures of the nervous system work together to respond to the internal and external environment? (C)
2. Energy transformations at sensory receptors—such as mechanical pressure, chemical interactions, or light—enable the conversion of external stimuli into electrical signals.
    - What is a response? (F)
    - What is a stimulus? (F)

- What are the five senses? (F)
- What type of energy travels through a neuron? (F)
- Where is information analyzed? (F)
- What is a reflex? (F)
- How does the nervous system collect internal and external information? (C)

3. The central nervous system (CNS) and peripheral nervous system (PNS) interact to detect changes in the environment and produce an appropriate responses.
   - What are the divisions of the nervous system? (F)
   - What is the function of the central nervous system? (F)
   - What is the function of the peripheral nervous system (F)
   - How are nerve impulses generated? (C)
   - How do nerve impulses cross the synapse? (C)
4. Memories formed through past experiences influence learned behaviors, and in what ways do these behaviors help the nervous and endocrine systems work together to maintain homeostasis in changing internal and external conditions?
   - How are memories created? (C)
   - How do nervous system responses become learned behavior? (C)
   - How do learned behaviors aid in survival? (C)
   - How is the memory of a stimulus created? (C)
   - Are behaviors learned through experience always advantageous? (P)
5. Communication through the nervous system coordinate the activities of multiple body systems, and the interdependence of these systems is essential for maintaining homeostasis when the body encounters internal or external changes.
   - How does the muscular system work with the nervous system in a reflex? (F)
   - How does the endocrine system work with the nervous system in a reflex? (F)
   - What interactions of the nervous system and other body systems contribute to the health and survival of the organism? (C)
   - How do reflex arcs aid in survival? (C)
   - How do the sense organs work with the nervous system to promote the health of the organism? (C)
   - How do the sense organs work with the nervous system to aid in survival? (C)

Content Knowledge

Critical facts and information that students are expected to KNOW at the end of the unit.

Sensory receptors detect external stimuli.
Neurons transmit electrical signals.
Synapses allow neuron communication.
Brain processes and interprets information.
Spinal cord transmits signals to and from brain.
Reflex actions are rapid, involuntary responses.
Central nervous system consists of brain and spinal cord.
Peripheral nervous system connects the CNS to limbs and organs.
Autonomic nervous system controls involuntary actions.
Neurotransmitters facilitate signal transmission between neurons.
Homeostasis regulated by the nervous system.

Nervous system interacts with other body systems.
Neuron structure supports its function.
Nervous system models show information flow.

Standards

The content standards that are taught and/or assessed in this unit.

NGSS: Science Performance Expectations

NGSS: MS Life Science

MS.Structure, Function, and Information Processing

Performance Expectations Show Details

- [x] MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. Show Details
- [x] 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. Show Details

NGSS: Crosscutting Concepts

NGSS: 6-8

Crosscutting Statements

2. Cause and Effect: Mechanism and Prediction – Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.

- [x] Cause and effect relationships may be used to predict phenomena in natural or designed systems.

4. Systems and System Models – A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

- [x] Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems.
- [x] Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems.

6. Structure and Function – The way an object is shaped or structured determines many of its properties and functions.

- [x] Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts; therefore, complex natural and designed structures/systems can be analyzed to determine how they function.

7. Stability and Change – For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

- [x] Small changes in one part of a system might cause large changes in another part.
- [x] Systems in dynamic equilibrium are stable due to a balance of feedback mechanisms.

Interactive version of NGSS
NGSS Resources

Core Learning Activities

The learning activities that support the acquisition of content knowledge, attainment of critical skills and lead to the generalizations of the unit. Activities should be clearly articulated, include teacher instructions and identify optional vs. assured experiences.

Nervous System slide show and guided notes
Nervous System Study Guide
Discover Education - The Central Nervous System Studio Board (worksheet Lobes of the Brain)

Portrait of the Newtown Graduate

Rubicon Copy of The Nervous System

Rubicon Copy of Notes on Nervous system

Rubicon Copy of Nervous System Study Guide

Rubicon Copy of Unit 6: Nervous System

Rubicon Copy of Lobes of the Brain DE

Vocabulary

Academic and content-specific vocabulary needed to support knowledge, understanding and/or skills.

Neuron
Dendrite
Axon
Synapse:
Central Nervous System (CNS)
Peripheral Nervous System (PNS)
Brain
Spinal Cord
Sensory Neurons
Motor Neurons
Interneurons:
Reflex
Homeostasis
Stimulus
Response
Nerve Impulse
Neurotransmitter
Cerebrum
Cerebellum
Brainstem

Resources

Teacher and student resources used to support the learning.

Human Biology Activities Kit
By John R. Roland
Published by Jossey-Bass

Your Body and How It Works
By Pat and Barb Ward
Mark Twain Media/Carson-Dellosa Publishing Company, Inc.

Human Biology and Health Student Textbook and All in One Teaching Resources
Prentice Hall Science Explorer
Published by Pearson/Prentice Hall

Discovery Education Techbook

Rubicon Copy of Lobes of the Brain DE

Assessments

The means by which students will demonstrate what they know (content knowledge), what they can do (critical skills), and what they understand (generalizations) as a result of their learning from the unit.

The 5 Senses Tab Bookle | Summative | Personal Project

Research and organize information on each of the five senses and how they take in information.

Rubicon CopyTHE 5 SENSES Tab Booklet

No Standards Assessed

Reflex Arc Model | Summative | Personal Project

Write a short (paragraph) story where information is inputted into the brain, processed and then acted upon.
Draw and label a reflex arc that represents your story.
Describe everything that occurs during the event.

Rubicon Copy of Reflex Arc Rubric

No Standards Assessed

Grade 7 Science Final Exam | Summative | Standardized Test

Department created assessment of important concepts learned throughout the year.

Rubicon Copy of Science Final

No Standards Assessed

Rubicon CopyTHE 5 SENSES Tab Booklet

Rubicon Copy of Reflex Arc Rubric

Differentiation

Core learning activities, resources and assessments that meet the needs of all learners.

Test Prep Connections

As appropriate, include activities that build skills for standardized testing, such as IABs.

Unit Plan

Musculoskeletal System (Optional)

Newtown Middle School / Grade 7 / Science

Week 27 - Week 28 | 4 Curriculum Developers | Last Updated: Jan 26, 2026 by Musco, Susan

Concept-Based Curriculum Unit Template

Purpose of the Unit

The overarching goal(s) of the unit.

An **OPTIONAL** unit that explores how the skeletal and muscular systems interacts with other body systems to utilize energy and maintain homeostasis.
This unit is optional because it is not included in the NGSS standards but, if time permits, is valuable to the students understanding of how the human body works as an interdependent collection of systems.
As this is an **OPTIONAL** unit there are no assessments and the material is not covered on the final exam.

Conceptual Lens/Concepts

Concepts are the "big ideas" of the unit. The conceptual lens is a particular concept that focuses the thinking of the unit.

Lens:

- Movement, support and protection

Concepts

- Structure & Function
- Systems and Interactions
- Interdependence

Generalizations

*Critical conceptual relationships that students are expected to **UNDERSTAND** at the end of the unit.*

1. Movement results from coordinated interactions among interdependent body systems
2. Interdependent body systems interact to protect vital organs and maintain structural support.
3. The musculoskeletal system relies on the interaction of various tissues and organs to support, protect and facilitate movement.
4. The musculoskeletal system coordinates muscles, bones, and connective tissues to adjust strength, endurance, and flexibility, allowing the body to meet different physical demands and energy needs.

Guiding Questions

A combination of Factual (F), Conceptual (C) and Provocative/Debatable (P) questions that lead to the generalizations. Label each question (F), (C) or (P).

1. Movement results from coordinated interactions among interdependent body systems.
    - What are the three types of muscle? (F)
    - What are tendons?(F)
    - What are ligaments?(F)
    - What is bone made of?(F)
    - How do muscles and bones work together to facilitate movement? (C)
    - How do muscles work? (C)
2. Interdependent body systems interact to protect vital organs and maintain structural support.
    - How do bones and muscles work together to protect vital organs? (F)
    - Which muscles help protect internal organs?(F)
    - How do fixed joints aid in protection?(F)
    - How do flat bones protect organs? (F)
    - What are the layers of bone?(F)
    - How would damage to one body system affect the body's ability to protect vital organs and maintain structure? (C)

3. The musculoskeletal system depends on the coordinated interaction of bones, muscles, and connective tissues to provide support, protect organs, and enable movement.
    - What are joints? (F)
    - What is connective tissue? (F)
    - What is cartilage?(F)
    - How does the coordinated interaction of bones, muscles, and connective tissues enable the musculoskeletal system to provide support, protect organs, and facilitate movement?(C)
4. The musculoskeletal system coordinates muscles, bones, and connective tissues to adjust strength, endurance, and flexibility, allowing the body to meet different physical demands and energy needs.
    - How do muscles grow? (F)
    - How do you increase bone density? (F)
    - In what ways do muscles and bones change when the body is exposed to different types of physical activity? (C)

Content Knowledge

*Critical facts and information that students are expected to **KNOW** at the end of the unit.*

Functions of bones
Functions of muscles
Types of joints
Bone structure and composition
Interaction between bones and muscles
Role of tendons and ligaments
Importance of the skeletal system
Importance of the muscular system
Muscle contraction process
Common musculoskeletal disorders

Standards

The content standards that are taught and/or assessed in this unit.

NGSS: Science Performance Expectations
NGSS: MS Life Science
MS.Structure, Function, and Information Processing
Performance Expectations Show Details

- [x] MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. Show Details

NGSS: Science and Engineering Practices
NGSS: 6-8
Practice 1. Asking questions (for science) and defining problems (for engineering)
Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.

- [x] Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.
- [x] Ask questions to identify and/or clarify evidence and/or the premise(s) of an argument.

Practice 2. Developing and using models
Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- [x] Develop and/or use a model to predict and/or describe phenomena.
- [x] Develop a model to describe unobservable mechanisms.

Practice 4. Analyzing and interpreting data

Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

- [x] Construct, analyze, and/or interpret graphical displays of data and/or large data sets to identify linear and nonlinear relationships.

Practice 6. Constructing explanations (for science) and designing solutions (for engineering)

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

- [x] Construct an explanation using models or representations.

Practice 8. Obtaining, evaluating, and communicating information

Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods.

- [x] Communicate scientific and/or technical information (e.g. about a proposed object, tool, process, system) in writing and/or through oral presentations.

NGSS: Disciplinary Core Ideas

NGSS: 6-8

LS1: From Molecules to Organisms: Structures and Processes

LS1.A: Structure and Function

- [x] In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (MS-LS1-3)

Interactive version of NGSS
NGSS Resources

Core Learning Activities

The learning activities that support the acquisition of content knowledge, attainment of critical skills and lead to the generalizations of the unit. Activities should be clearly articulated, include teacher instructions and identify optional vs. assured experiences.

Muscle Types slide show and graphic organizer for guided notes
Bones, Four parts of Human Bone slideshows and Bones, Joints and Ligaments guided notes.
Muscle/Skeleton Review

- Rubicon Copy of Type of Muscle Graphic Organizer
- Rubicon Copy of Bones, Joints and Ligaments
- Rubicon Copy of Muscle Skeleton Review
- Rubicon Copy of Muscle Types
- Rubicon Copy The Four Parts (Layers) of Human Bone Google Slides Presentation
- Rubicon Copy of Bones

Portrait of the Newtown Graduate

Vocabulary

Academic and content-specific vocabulary needed to support knowledge, understanding and/or skills.

Muscle, bone, cardiac muscle, smooth muscle, striated muscle, flat bone, long bone, irregular bone, short bone, cartilage, ligament, tendon, contract, relax, bone marrow (red and yellow), compact

Resources

Teacher and student resources used to support the learning.

Human Biology Activities Kit
By John R. Roland
Published by Jossey-Bass

bone, pivot joint, hinge joint, ball and socket joint, movable joint, spongy bone, gliding joint fixed joint.

Your Body and How It Works
By Pat and Barb Ward
Mark Twain Media/Carson-Dellosa Publishing Company, Inc.

Human Biology and Health Student Textbook and All in One Teaching Resources
Prentice Hall Science Explorer
Published by Pearson/Prentice Hall

Discovery Education Techbook

Assessments

The means by which students will demonstrate what they know (content knowledge), what they can do (critical skills), and what they understand (generalizations) as a result of their learning from the unit.

Differentiation

Core learning activities, resources and assessments that meet the needs of all learners.

Test Prep Connections

As appropriate, include activities that build skills for standardized testing, such as IABs.

Newtown Public Schools

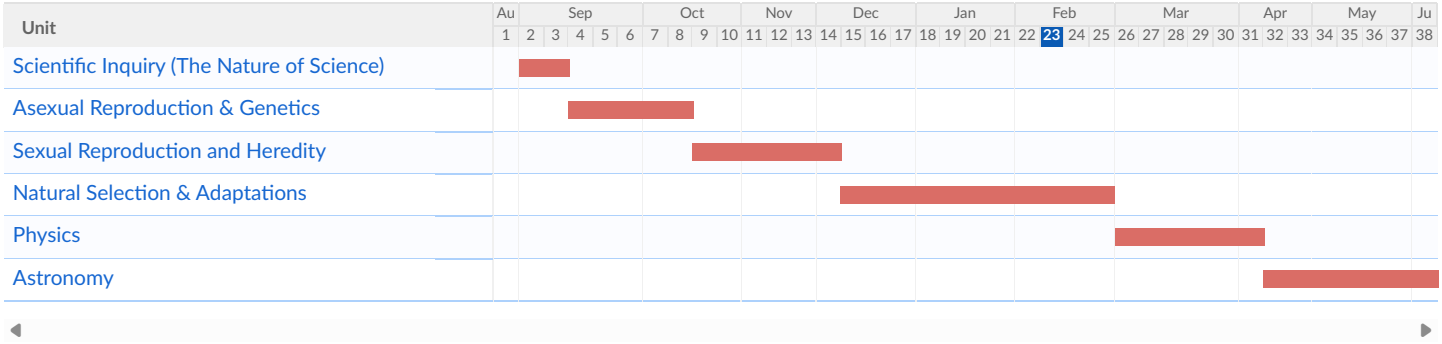
Atlas

Science Grade 8 (Under Review/Revision)

Newtown Middle School / Grade 8 / Science

5 Curriculum Developers | Last Updated: Saturday, Feb 7, 2026 by Betesh, Jennifer

Unit Calendar by Year



6 Units found

Unit Plan

Scientific Inquiry (The Nature of Science)

Newtown Middle School / Grade 8 / Science

Week 2 - Week 3 | 5 Curriculum Developers | Last Updated: Dec 19, 2025 by Betesh, Jennifer

Concept-Based Curriculum Unit Template

Purpose of the Unit

The overarching goal(s) of the unit.

To understand how scientific knowledge is created and communicated.

Conceptual Lens/Concepts

Concepts are the "big ideas" of the unit. The conceptual lens is a particular concept that focuses the thinking of the unit.

Lens: Communication, data collection and analysis, evidence, reasoning, fair tests, variables, independent and dependent variables, controlled variables, observations, inferences and predictions

Generalizations

*Critical conceptual relationships that students are expected to **UNDERSTAND** at the end of the unit.*

Topic Generalizations

1. Scientists identify variables and constants in order to develop a testable hypothesis to find solutions to scientific questions.

2. Scientists present data in data table and graphs to help visualize information more clearly and identify trends.

3. The ability to control variables, identify sources of error and conduct multiple trials creates a fair and valid test.

Guiding Questions

A combination of Factual (F), Conceptual (C) and Provocative/Debatable (P) questions that lead to the generalizations. Label each question (F), (C) or (P).

Topic Generalizations

1. Scientists identify variable and constants to design valid investigations that reveal cause and effect relationships.
   a. What are variables? (F)
   b. What is an independent variable? (F)
   c. What is a dependent variable? (F)
   d. What are constants/controlled variables? (F)
   e. What is an observation? (F)
   f. What is a prediction? (F)
   g. What is an inference? (F)
   h. How do repeated trials improve the reliability of data? (C)
   i. Why must we have a common language of units when sharing our data with other scientists? (C)
   j. Which is more dangerous in science: a poorly chosen independent variable or a forgotten constant? How could each one mislead the world? (P)
   k. If two variables change at the same time, who (or what) gets the credit for causing the outcome? (P)

2. Scientists present data in data table and graphs to help visualize information more clearly and identify trends.
   a. When and how are bar and line graphs used? (F)
   b. How is a data table accurately constructed? (F)
   c. How is a graph accurately constructed? (F)
   d. How can we use graphs to visually display our data/findings? (C)
   e. If a trend exists but you can't see it in your graph, does it still matter? Does the graph fail, or does the scientist? (P)

3. The ability to control variables, identify sources of error and conduct multiple trials creates a fair and valid test.
    a. How is this scientific process used in everyday life? (C)
    b. What is the relationship between the use of constants in an experiment and the validity of that experiment? (C)
    c. Why is the ability to accurately analyze data critical in experimentation? (C)
    d. Could an experiment with **no** controlled variables ever be considered fair? What would "fair" even mean in that case? (P)

Content Knowledge

*Critical facts and information that students are expected to **KNOW** at the end of the unit.*

- The independent variable is the manipulated variable in an experiment.
- The dependent variable is the measured variable in an experiment.
- Constants or controlled variables are the variables in a lab that must be kept the same throughout.
- The control is the part of the lab used for comparison.
- Three trials and an average should be done in an experiment to ensure a fair test.
- Bar graphs are used to show comparisons between unrelated variables and line graphs are used to show trends over time.
- The IV goes on the left column of a data table and the DV goes on the right column.
- On a graph, the Y-axis is where the dependent variable is plotted and the X-axis is where the independent variable is plotted.
- Graphing and data table set up rules need to be followed when creating each.

Standards

The content standards that are taught and/or assessed in this unit.

NGSS: Science and Engineering Practices

NGSS: 6-8

Practice 1. Asking questions (for science) and defining problems (for engineering)

Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.

- [x] Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.
- [x] Ask questions to identify and/or clarify evidence and/or the premise(s) of an argument.
- [x] Ask questions to determine relationships between independent and dependent variables and relationships in models.
- [x] Ask questions to clarify and/or refine a model, an explanation, or an engineering problem.
- [x] Ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles.

Interactive version of NGSS
NGSS Resources

Core Learning Activities

The learning activities that support the acquisition of content knowledge, attainment of critical skills and lead to the generalizations of the unit. Activities should be clearly articulated, include teacher instructions and identify optional vs. assured experiences.

Portrait of the Newtown Graduate

Practice identifying variables in experiments using Spongebob worksheets, Simpsons Worksheets,
Create data table and graphs for various data collected or given
Claim, Evidence and Reasoning Paragraph

Vocabulary

Academic and content-specific vocabulary needed to support knowledge, understanding and/or skills.

variable, independent variable, dependent variable, constant, controlled variable, hypothesis, data table, graph, observation, inference, prediction, bar graph, line graph, X-axis and Y-axis, phenomenon, model, relationship

Resources

Teacher and student resources used to support the learning.

Variety of handouts and practice sheets for identifying variables and making data tables and graphs.

Edpuzzle: Nature of Science
Edpuzzle: Scientific Variables

Assessments

The means by which students will demonstrate what they know (content knowledge), what they can do (critical skills), and what they understand (generalizations) as a result of their learning from the unit.

Copy of Low Heart Rate Lab 2023 Copy of Water Bottle Flip Lab

Differentiation

Core learning activities, resources and assessments that meet the needs of all learners.

Test Prep Connections

As appropriate, include activities that build skills for standardized testing, such as IABs.

Unit Plan

Asexual Reproduction & Genetics

Newtown Middle School / Grade 8 / Science

Week 4 - Week 8 | 5 Curriculum Developers | Last Updated: Feb 5, 2026 by Betesh, Jennifer

Concept-Based Curriculum Unit Template

Purpose of the Unit

The overarching goal(s) of the unit.

To explore the basics of genetics and understand that asexual reproduction results in genetically identical organisms.

Conceptual Lens/Concepts

Concepts are the "big ideas" of the unit. The conceptual lens is a particular concept that focuses the thinking of the unit.

Lens: Structure and function
Concepts: Cell division, reproductive strategies, genetic material, and characteristics

Generalizations

*Critical conceptual relationships that students are expected to **UNDERSTAND** at the end of the unit.*

Topic Generalizations:

1. Characteristic animal behaviors ensure the probability of successful reproduction.

2. Specialized plant structures ensure the probability of successful reproduction.

3. Asexual reproduction creates offspring with identical genetic information.

4. Genetic material is read and processed by a cell to fabricate proteins which are the building blocks of life.

5. Structures found in cells determine an organism's attributes.

6. Asexual reproductive processes have been adapted by multicellular organisms for other essential life functions.

Guiding Questions

A combination of Factual (F), Conceptual (C) and Provocative/Debatable (P) questions that lead to the generalizations. Label each question (F), (C) or (P).

1. Characteristic animal behaviors ensure the probability of successful reproduction.
   a. What are the different reproductive strategies used by animals to pass on traits & create offspring? (F)
   b. What happens to a species if organisms don't reproduce? (F)
   c. What is necessary for the continuation of a species? (F)
   d. How do specialized structures in plants contribute to their reproductive success? (C)
   e. If a behavior increases reproduction but decreases survival, is it still a “good” strategy? (P)

2. Specialized plant structures ensure the probability of successful reproduction.
   a. What are the different reproductive strategies used by plants to pass on traits & create offspring? (F)
   b. How do specialized structures in plants contribute to their reproductive success? (C)
   c. What happens to a species if organisms don't reproduce? (P)
   d. What is necessary for the continuation of a species? (P)

3. Asexual reproduction creates offspring with identical genetic information.

   a. What is asexual reproduction? (F)
   b. Why do offspring from asexual reproduction have identical genetic information? (F)
   c. What is the outcome of mitosis? (F)

d. What are the advantages/disadvantages of asexual reproduction? (C)
e. How does the type of reproduction affect the survival and adaptation of species over time? (C)
f. How does one cell develop into the trillions of cells in our body? (C)
g. Would live evolve if humans reproduced asexually? (P)

4. Genetic material is read and processed by a cell to fabricate proteins which are the building blocks of life.
a. What is a protein? (F)
b. Do plants have DNA? (F)
c. How does the structure of DNA allow it to perform its functions? (C)
d. What happens when you change the structure of DNA? (C)
e. What would happen if you could rewrite the protein-building instructions in your DNA? Would you still be "you"? (P)
f. If DNA contains all the instructions for life, why isn't DNA considered alive? (P)

5. Structures found in cells determine an organism's attributes.
a. What is the difference between genes, chromosomes, DNA and alleles? (F)
b. What is a gene? (F)
c. What is an allele? (F)
d. What is a chromosome? (F)
e. How are genes, chromosomes and DNA related to each other (C)?
f. What is a trait? (F)
g. How are genes expressed as traits? (C)
h. What causes humans to look so different? (C)
i. If two organisms have nearly identical cell structures, why can their traits be so different? What else might be influencing them? (P)
j. Which has more power over an organism's traits—the structures inside its cells, or the environment outside its body? (P)

6. Asexual reproductive processes have been adapted by multicellular organisms for other essential life functions.
a. What process do multicellular organisms (humans) use that is similar to asexual reproduction? (F)
b. What is mitosis used for in humans? (F)
c. How can models help us understand the processes of asexual reproduction? (C)
d. Which is more important for survival: the ability to reproduce or the ability to repair? What happens when an organism can do one but not the other? (P)

Content Knowledge

Critical facts and information that students are expected to ***KNOW*** *at the end of the unit.*

- Explore the process of cell division which results in identical cells/organisms (mitosis) and understand that this process results in somatic (body cells) that are identical to the parent cell and each other.
- Draw a model of how asexual organisms reproduce (mitosis) resulting in identical organisms (not necessary to know specific steps).
- Draw a model of DNA, chromosomes and genes to demonstrate how they are related to one another.
- DNA codes for proteins and proteins make traits.

- To understand that organisms who reproduce asexually do not have genetic diversity.
- Analyze and graph data about how both environmental and genetic factors affect plant growth.

Standards

The content standards that are taught and/or assessed in this unit.

NGSS: Science Performance Expectations

NGSS: MS Life Science

MS.Growth, Development, and Reproduction of Organisms

Performance Expectations Show Details

- [x] 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. Show Details
- [x] 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. Show Details

NGSS: Science and Engineering Practices

NGSS: 6-8

Practice 1. Asking questions (for science) and defining problems (for engineering)

Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.

- [x] Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.
- [x] Ask questions to clarify and/or refine a model, an explanation, or an engineering problem.

NGSS: Crosscutting Concepts

NGSS: 6-8

Crosscutting Statements

1. Patterns – Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

- [x] Graphs, charts, and images can be used to identify patterns in data.

6. Structure and Function – The way an object is shaped or structured determines many of its properties and functions.

- [x] Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts; therefore, complex natural and designed structures/systems can be analyzed to determine how they function.
- [x] Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.

Connections to the Nature of Science: Most Closely Associated with Crosscutting Concepts

Science is a Way of Knowing

- [x] Science knowledge is cumulative and many people, from many generations and nations, have contributed to science knowledge.

Science is a Human Endeavor

- [x] Men and women from different social, cultural, and ethnic backgrounds work as scientists and engineers.

NGSS: Disciplinary Core Ideas

NGSS: 6-8

LS1: From Molecules to Organisms: Structures and Processes

LS1.A: Structure and Function

- [x] All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1)
- [x] Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary to MSLS3-2)
- [x] Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (MS-LS1-2)

LS3: Heredity: Inheritance and Variation of Traits

LS3.A: Inheritance of Traits

- [x] Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. (MS-LS3-1)
- [x] Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS3-2)

Interactive version of NGSS
NGSS Resources

Core Learning Activities

The learning activities that support the acquisition of content knowledge, attainment of critical skills and lead to the generalizations of the unit. Activities should be clearly articulated, include teacher instructions and identify optional vs. assured experiences.

- Asexual summative assessment
- Reproductive strategies activity
- Tour of the Basics
- A Recipe for Traits (Dog DNA activity)
- Color a DNA molecule
- Strawberry DNA Extraction Lab

Unit 2: Asexual Reproduction & Genetics
Copy of A Recipe for Traits (Exploring Dog DNA) 2023
Copy of Tour of the Basics WebQuest (Updated)
Reproductive Strategies
Asexual_Reproduction_Student_Worksheet.pdf

Portrait of the Newtown Graduate

Vocabulary

Academic and content-specific vocabulary needed to support knowledge, understanding and/or skills.

Asexual reproduction, DNA, genes, chromosomes, protein, offspring mitosis, allele, chromatid, duplicated chromosome, traits, reproduction, genetic variation

Resources

Teacher and student resources used to support the learning.

- Discovery Education - Asexual Reproduction and Genetics Units
- Tour of the Basics
- Amoeba Sisters:
  - Mitosis
  - DNA, Chromosomes, Genes, & Traits: An Intro to Heredity

Assessments

The means by which students will demonstrate what they know (content knowledge), what they can do (critical skills), and what they understand (generalizations) as a result of their learning from the unit.

Asexual Reproduction Jigsaw Project | Summative | Group Project

Oral Report | Other Visual Assessments | Other written assessments

Located in Shared Drive.

No Standards Assessed

Asexual Reproduction Quiz | Summative | Other written assessments

Located in Shared Drive.

No Standards Assessed

Differentiation

Core learning activities, resources and assessments that meet the needs of all learners.

Test Prep Connections

As appropriate, include activities that build skills for standardized testing, such as IABs.

Unit Plan

Sexual Reproduction and Heredity

Newtown Middle School / Grade 8 / Science

Week 9 - Week 14 | 5 Curriculum Developers | Last Updated: Feb 5, 2026 by Betesh, Jennifer

Concept-Based Curriculum Unit Template

Purpose of the Unit

The overarching goal(s) of the unit.

To understand that reproduction is critical to the continuation of a species and that sexual reproduction allows for diversity in a species.

Conceptual Lens/Concepts

Concepts are the "big ideas" of the unit. The conceptual lens is a particular concept that focuses the thinking of the unit.

Lens: Stability and change
Concepts: sexual reproduction, diversity, mutations, animal behaviors and plant structures

Generalizations

*Critical conceptual relationships that students are expected to **UNDERSTAND** at the end of the unit.*

Topic generalizations:

1. Asexual reproduction results in offspring with identical genetic information compared to sexual reproduction which results in offspring with genetic variation.

2. Structural changes to genes (mutations) located on chromosomes may transform proteins and in turn, may result in harmful, beneficial, or neutral changes to the structure and function of the organism.

3. Characteristic animal behaviors ensure the probability of successful reproduction of animals.

4. Specialized plant structures ensure the probability of successful reproduction of plants.

5. Both environmental and genetic factors influence the growth of organisms.

Guiding Questions

A combination of Factual (F), Conceptual (C) and Provocative/Debatable (P) questions that lead to the generalizations. Label each question (F), (C) or (P).

1. Asexual reproduction results in offspring with identical genetic information compared to sexual reproduction which results in offspring with genetic variation.
   a. What are sex cells and how many chromosomes do they contain? (F)
   b. What is the result of meiosis? (F)
   c. What are the major differences between mitosis and meiosis? (F)
   d. How is gender determined? (F)
   e. What is a gamete? (F)
   f. What are the major differences between sexual and asexual reproduction? (F)
   g. How do gene combinations result in diversity? (C)
   h. What are the different reproductive strategies used by organisms to pass on traits & create offspring? (F)
   i. Should humans have the ability to choose gender and/or traits of their children? (P)
   j. Does genetic diversity always benefit a species? (P)

2. Structural changes to genes (mutations) located on chromosomes may transform proteins and in turn, may result in harmful, beneficial, or neutral changes to the structure and function of the organism.
   a. What are the three categories of mutations (harmful, beneficial and neutral)? (F)
   b. How can a mutation affect an organism? (C)
   c. If a mutation makes an organism stronger, does that mean the “error” was actually an improvement? (P)

d. If mutations shape every species that exists, why do we still think of them as mistakes? (P)

3. Characteristic animal behaviors ensure the probability of successful reproduction of animals.

a. How do certain animal behaviors help increase the chances of successful reproduction? (F)
b. How do behaviors like nest building, herding, or vocalizations in animals, play a role in attracting mates, protecting offspring, or reproducing? (F)
c. How does reproduction ensure the continuation of our species? (C)
d. What are advantages/disadvantages in asexual vs. sexual reproduction? (P)
e. If an animal changes its behavior due to the environment, is it adapting for survival, reproduction, or both? (P)

4. Specialized plant structures ensure the probability of successful reproduction of plants.

a. What are the major structures/functions of the reproductive parts and how do they help ensure successful reproduction of a species? (F)
b. What is pollination? (F)
c. How do pollinators help aid in the reproduction of plants? (C)
d. How do bright flowers or hard shell seeds in plants help aid in successful transfer of reproductive material? (C)
e. If a plant reproduces successfully without a specialized structure, does that make the structure unnecessary—or just extra insurance? (P)
f. Which is more important for a plant's future: attracting pollinators or protecting its seeds? (P)
g. If plants can't move, how do their structures "decide" the best way to reproduce? (P)

5. Both environmental and genetic factors influence the growth of organisms.

a. What is the definition and an example of an environmental factor? (F)
b. What is the definition and an example of a genetic factor? (F)
c. Given a data set, explain how both environmental and genetic factors influence the growth of a plant population. (C)
d. If two genetically identical organisms grow up in very different environments, will they end up the same—or completely different? (P)
d. Which matters more for an organism's growth: the blueprint inside its DNA or the conditions around it (Nature versus Nurture)? (P)
f. Can we really separate nature from nurture, or are they always working together in ways we can't see? (P)

Content Knowledge

Critical facts and information that students are expected to ***KNOW*** *at the end of the unit.*

- Explain the similarities and differences in cell division in somatic and germ cells (mitosis and meiosis).
- Use a Punnett square to determine the probability of traits being passed down from parent to offspring.
- Describe how genetic information is organized in genes on chromosomes, and explain sex determination in humans.
- Explain how animal behaviors can affect the successful reproduction of an organism.
- Explain how the reproductive structures of a plant can lead to successful reproduction.

Standards

The content standards that are taught and/or assessed in this unit.

NGSS: Science Performance Expectations

NGSS: MS Life Science

MS.Growth, Development, and Reproduction of Organisms

Performance Expectations Show Details

- [x] 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. Show Details
- [x] MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. Show Details
- [x] 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. Show Details
- [x] 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. Show Details

NGSS: Science and Engineering Practices

NGSS: 6-8

Practice 1. Asking questions (for science) and defining problems (for engineering)

Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.

- [x] Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.
- [x] Ask questions to determine relationships between independent and dependent variables and relationships in models.

Practice 2. Developing and using models

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- [x] Evaluate limitations of a model for a proposed object or tool.
- [x] Develop or modify a model—based on evidence – to match what happens if a variable or component of a system is changed.
- [x] Develop and/or revise a model to show the relationships among variables, including those that are not observable but predict observable phenomena.
- [x] Develop and/or use a model to predict and/or describe phenomena.
- [x] Develop a model to describe unobservable mechanisms.

Practice 3. Planning and carrying out investigations

Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions.

- [x] Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions.

Practice 4. Analyzing and interpreting data

Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

- [x] Construct, analyze, and/or interpret graphical displays of data and/or large data sets to identify linear and nonlinear relationships.
- [x] Use graphical displays (e.g., maps, charts, graphs, and/or tables) of large data sets to identify temporal and spatial relationships.

Practice 6. Constructing explanations (for science) and designing solutions (for engineering)

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

- [x] Construct an explanation using models or representations.
- [x] Apply scientific ideas, principles, and/or evidence to construct, revise and/or use an explanation for real-world phenomena, examples, or events.

Practice 8. Obtaining, evaluating, and communicating information

Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods.

- [x] Critically read scientific texts adapted for classroom use to determine the central ideas and/or obtain scientific and/or technical information to describe patterns in and/or evidence about the natural and designed world(s).

Connections to the Nature of Science: Most Closely Associated with Practices

Scientific Knowledge is Based on Empirical Evidence

- [x] Science knowledge is based upon logical and conceptual connections between evidence and explanations.

NGSS: Crosscutting Concepts

NGSS: 6-8

Crosscutting Statements

1. Patterns – Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

- [x] Macroscopic patterns are related to the nature of microscopic and atomic-level structure.
- [x] Patterns can be used to identify cause and effect relationships.
- [x] Graphs, charts, and images can be used to identify patterns in data.

6. Structure and Function – The way an object is shaped or structured determines many of its properties and functions.

- [x] Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts; therefore, complex natural and designed structures/systems can be analyzed to determine how they function.
- [x] Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.

Connections to the Nature of Science: Most Closely Associated with Crosscutting Concepts

Science is a Way of Knowing

- [x] Science knowledge is cumulative and many people, from many generations and nations, have contributed to science knowledge.

Science is a Human Endeavor

- [x] Men and women from different social, cultural, and ethnic backgrounds work as scientists and engineers.

NGSS: Disciplinary Core Ideas

NGSS: 6-8

LS1: From Molecules to Organisms: Structures and Processes

LS1.A: Structure and Function

- [x] All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1)
- [x] Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary to MSLS3-2)
- [x] Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (MS-LS1-2)
- [x] In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (MS-LS1-3)

LS1.B: Growth and Development of Organisms

- [x] Animals engage in characteristic behaviors that increase the odds of reproduction. (MS-LS1-4)
- [x] Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. (MS-LS1-4)
- [x] Genetic factors as well as local conditions affect the growth of the adult plant. (MS-LS1-5)

LS3: Heredity: Inheritance and Variation of Traits

LS3.A: Inheritance of Traits

- [x] Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. (MS-LS3-1)
- [x] Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS3-2)

LS3.B: Variation of Traits

- [x] In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. (MS-LS3-2)
- [x] In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. (MS-LS3-1)

Interactive version of NGSS
NGSS Resources

Core Learning Activities

The learning activities that support the acquisition of content knowledge, attainment of critical skills and lead to the generalizations of the unit. Activities should be clearly articulated, include teacher instructions and identify optional vs. assured experiences.

- QFT "Twins Phenomena"
- Reproductive Strategies Inquiry Activity
- Flower Dissection
- Design a Flower Model (optional)
- Heredity and the Environment
- Inventory of My Traits
- Punnett Squares
- Genetics with a Smile
- Monster Invasion

Unit 3: Sexual Reproduction & Heredity

Portrait of the Newtown Graduate

Vocabulary

Academic and content-specific vocabulary needed to support knowledge, understanding and/or skills.

meiosis, nucleus, DNA, chromosome, gene, sperm, egg, trait, gamete, punnett square, inherit, inheritance, trait, variation, allele, version, identical, genetic variation, genotype, phenotype, homozygous, heterozygous, dominant, recessive, purebred, hybrid, homologous, sexual reproduction

Resources

Teacher and student resources used to support the learning.

- YouTube: Twins Phenomenon Video
- Discovery Education - Modifying Organisms, Reproduction
- TED ED: How Mendel's Pea Plants Helped us Understand Genetics
- Amoeba Sisters: Asexual and Sexual Reproduction
- Amoeba Sisters: DNA, Chromosomes, Genes & Traits, An Introduction to Heredity: https://www.youtube.com/watch?v=8m6hHRlKwxY&vl=en

Assessments

The means by which students will demonstrate what they know (content knowledge), what they can do (critical skills), and what they understand (generalizations) as a result of their learning from the unit.

Reproduction Systems Quiz | Summative | Other written assessments

Located in Shared Drive

No Standards Assessed

Genetics Quiz | Summative | Other written assessments

Located in Shared Drive

No Standards Assessed

Design a flower assessment

Let's revisit the twins phenomena

Differentiation

Core learning activities, resources and assessments that meet the needs of all learners.

Test Prep Connections

As appropriate, include activities that build skills for standardized testing, such as IABs.

NGSS Interims

Unit Plan

Natural Selection & Adaptations

Newtown Middle School / Grade 8 / Science

Week 15 - Week 25 | 5 Curriculum Developers | Last Updated: Feb 7, 2026 by Betesh, Jennifer

Concept-Based Curriculum Unit Template

Purpose of the Unit

The overarching goal(s) of the unit.

To understand what is necessary for the continuation and survival of a species in its environment.

Conceptual Lens/Concepts

Concepts are the "big ideas" of the unit. The conceptual lens is a particular concept that focuses the thinking of the unit.

Lens: Change over time
Concepts:

- Structure & function
- Stability & change
- Mutations & adaptations
- Evidence for evolution
- Natural & artificial selection

Generalizations

Critical conceptual relationships that students are expected to ***UNDERSTAND*** *at the end of the unit.*

Topic Generalizations:

1. Patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth and provide evidence to show that species have changed over time.

2. Anatomical structures from different species, both current and past, provide evidence for evolutionary relationships (common ancestry).

3. Observations of embryological development across multiple different species provide evidence for evolutionary relationships (common ancestry).

4. Variations in genetic information from different species provide evidence for evolutionary relationships.

5. Genetic diversity within a species population esures the probability that some individuals will survive and reproduce in a specific environment.

6. Natural Selection may contribute to changes in the frequency of traits over time.

Guiding Questions

A combination of Factual (F), Conceptual (C) and Provocative/Debatable (P) questions that lead to the generalizations. Label each question (F), (C) or (P).

1. Patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth and provide evidence to show that species have changed over time.
    a. What is a fossil? (F)
    b. How have living things evolved over time? (C)
    c. How do scientists define and support the theory of evolution? (C)
    d. What are some examples of the evidence for evolution? (C)
    e. How and why do traits in a population change over time? (C)
    f. How does the fossil record provide evidence for evolution through common ancestry? (C)
    g. If humans left a fossil record 100 million years from now, what would it say about our species' diversity and impact? (P)
    h. If most species that ever lived are extinct, what does that say about the "success" of life on Earth? (P)

2. Anatomical structures from different species, both current and past, provide evidence for evolutionary relationships (common ancestry).
    a. What is a structural adaptation? What is a behavioral adaptation? (F)
    b. How do scientists define and support the theory of evolution? (C)

7. Humans use Artificial Selection to alter/design/change their environment to suit their needs.

c. How do analogous, homologous and vestigial structures provide evidence for evolution through common ancestry? (C)
d. If extinct species show structures we no longer see today, what does that say about the paths evolution didn't take? (P)
e. If a structure in one species is used for one purpose and in another species for a different purpose, what does that tell us about evolution's "creativity"? (P)

3. Observations of embryological development across multiple different species provide evidence for evolutionary relationships (common ancestry).

a. What is an embyro? (F)
b. How does comparing embryos at different stages of development from multiple species provide evidence for evolution through common ancestry? (C)
c. If embryos of vastly different animals are nearly identical at first, who—or what—is designing the differences that appear later? (P)

4. Variations in genetic information from different species provide evidence for evolutionary relationships.

a. How do scientists define and support the theory of evolution? (C)
b. What is the evidence for evolution? (C)
c. How do protein structures act as proxy information for DNA sequencing? (C)
d. How do comparing proteins/genetic information provide evidence for evolution through common ancestry? (C)

5. Genetic diversity within a species population ensures the probability that some individuals will thrive, survive and reproduce in a specific environment.

a. What is a mutation? (F)
b. Does only sexual, or does asexual, reproduction allow for genetic diversity? (C)
c. If all individuals in a population were genetically identical, could life survive major changes—or would diversity be the key to survival? (P)
d. Is genetic diversity more about survival of the species or survival of the individual? (P)

6. Natural Selection may contribute to changes in the frequency of traits over time.

a. How is natural selection defined? (F)
b. What is fitness? (F)
c. What is the definition of evolution? (F)
d. What does it mean to evolve? (C)
e. How do evolution and natural selection account for the variation of life on earth? (C)
f. How does natural selection affect the evolution of species on earth? (C)
g. How does the fitness of an organism affect it's ability to reproduce? (C)
h. How does the environment affect the fitness of organisms with specific structures? (C)
i. How/why do adaptations spread throughout a species? (C)
j. How will a species continue to evolve in the future? (P)
k. Should humans intervene to preserve species that cannot adapt? (P)

7. Humans use Artificial Selection to alter/design/change their environment to suit their needs.
   a. What is artificial selection? (F)
   b. What are some types of artificial selection? (F)
   c. How have humans interfered with the natural process of evolution? (P)
   d. Should humans alter DNA or should we leave "nature" alone? (P)

Content Knowledge

*Critical facts and information that students are expected to **KNOW** at the end of the unit.*

- There are three types of mutations - harmful, beneficial and neutral.
- Beneficial adaptations will increase an organism's survival chances and their fitness.
- Harmful adaptations can decrease an organism's chance of survival in an environment.
- Neutral adaptations do not help or hurt an organisms chance of survival.
- Evidence for evolution includes DNA evidence, fossil evidence, anatomical structures and embryological similarities.
- Artificial selection includes genetically modified organisms, cloning, designer babies and selective breeding of plants and animals, among other new technologies as well.

Standards

The content standards that are taught and/or assessed in this unit.

NGSS: Science Performance Expectations

NGSS: MS Life Science

MS.Growth, Development, and Reproduction of Organisms

Performance Expectations Show Details

- [x] MS-LS4-5. Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. Show Details

MS.Natural Selection and Adaptations

Performance Expectations Show Details

- [x] MS-LS4-1. Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. Show Details
- [x] MS-LS4-6. Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. Show Details
- [x] MS-LS4-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. Show Details
- [x] MS-LS4-3. Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy. Show Details
- [x] MS-LS4-2. Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. Show Details

NGSS: Science and Engineering Practices

NGSS: 6-8

Practice 1. Asking questions (for science) and defining problems (for engineering)

Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.

- [x] Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.
- [x] Ask questions to identify and/or clarify evidence and/or the premise(s) of an argument.
- [x] Ask questions to clarify and/or refine a model, an explanation, or an engineering problem.
- [x] Ask questions that require sufficient and appropriate empirical evidence to answer.

Practice 2. Developing and using models

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- ☑ Develop or modify a model—based on evidence – to match what happens if a variable or component of a system is changed.
- ☑ Develop a model to describe unobservable mechanisms.

Practice 4. Analyzing and interpreting data

Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

- ☑ Construct, analyze, and/or interpret graphical displays of data and/or large data sets to identify linear and nonlinear relationships.
- ☑ Use graphical displays (e.g., maps, charts, graphs, and/or tables) of large data sets to identify temporal and spatial relationships.
- ☑ Analyze and interpret data to provide evidence for phenomena.

Practice 6. Constructing explanations (for science) and designing solutions (for engineering)

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

- ☑ Construct an explanation that includes qualitative or quantitative relationships between variables that predict(s) and/or describe(s) phenomena.
- ☑ Construct an explanation using models or representations.

Practice 8. Obtaining, evaluating, and communicating information

Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods.

- ☑ Critically read scientific texts adapted for classroom use to determine the central ideas and/or obtain scientific and/or technical information to describe patterns in and/or evidence about the natural and designed world(s).

Connections to the Nature of Science: Most Closely Associated with Practices

Scientific Knowledge is Based on Empirical Evidence

- ☑ Science knowledge is based upon logical and conceptual connections between evidence and explanations.

Scientific Knowledge is Open to Revision in Light of New Evidence

- ☑ Scientific explanations are subject to revision and improvement in light of new evidence.
- ☑ Science findings are frequently revised and/or reinterpreted based on new evidence.

Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

- ☑ Theories are explanations for observable phenomena.
- ☑ Science theories are based on a body of evidence developed over time.
- ☑ The term "theory" as used in science is very different from the common use outside of science.
- ☑ A hypothesis is used by scientists as an idea that may contribute important new knowledge for the evaluation of a scientific theory.

NGSS: Crosscutting Concepts

NGSS: 6-8

Crosscutting Statements

1. Patterns – Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

- ☑ Macroscopic patterns are related to the nature of microscopic and atomic-level structure.
- ☑ Patterns can be used to identify cause and effect relationships.
- ☑ Graphs, charts, and images can be used to identify patterns in data.

2. Cause and Effect: Mechanism and Prediction – Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.

- ☑ Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.
- ☑ Cause and effect relationships may be used to predict phenomena in natural or designed systems.

3. Scale, Proportion, and Quantity – In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

- ☑ Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.
- ☑ Phenomena that can be observed at one scale may not be observable at another scale.

Connections to the Nature of Science: Most Closely Associated with Crosscutting Concepts

Science is a Way of Knowing

- [x] Science is both a body of knowledge and the processes and practices used to add to that body of knowledge.
- [x] Science knowledge is cumulative and many people, from many generations and nations, have contributed to science knowledge.
- [x] Science is a way of knowing used by many people, not just scientists.

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- [x] Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation.

Science is a Human Endeavor

- [x] Men and women from different social, cultural, and ethnic backgrounds work as scientists and engineers.
- [x] Advances in technology influence the progress of science and science has influenced advances in technology.

Science Addresses Questions About the Natural and Material World.

- [x] Scientific knowledge is constrained by human capacity, technology, and materials.
- [x] Science limits its explanations to systems that lend themselves to observation and empirical evidence.

NGSS: Disciplinary Core Ideas

NGSS: 6-8

LS4: Biological Evolution: Unity and Diversity

LS4.A: Evidence of Common Ancestry and Diversity

- [x] The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. (MS-LS4-1)
- [x] Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent. (MS-LS4-2)
- [x] Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy. (MS-LS4-3)

LS4.B: Natural Selection

- [x] Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4)

Interactive version of NGSS
NGSS Resources

Core Learning Activities

The learning activities that support the acquisition of content knowledge, attainment of critical skills and lead to the generalizations of the unit. Activities should be clearly articulated, include teacher instructions and identify optional vs. assured experiences.

- QFT for Birds of Paradise phenomenon
- Mutations card sort
- X-Men Activity
- Opposable thumbs activity
- Adaptations stations
- Create-A-Creature
- PHET - Natural Selection Bunny Lab
- Natural Selection Stick Worm Lab
- Woof to Wolf QFT
- Evidence for Evolution Stations
- Artificial Selection Jigsaw Project
- Natural Selection Game
- Peppered Moth Squares Lab (optional)
- Peppered Moth Graph and CER

Portrait of the Newtown Graduate

1. Mutations | 7. Reflection Paragraph | 6. Artificial Selection | 5. Evolution | 4. Natural Selection | 3. Create-A-Creature Project | 2. Adaptations

Vocabulary

Academic and content-specific vocabulary needed to support knowledge, understanding and/or skills.

Unit Vocabulary: adaptations, structural adaptations, behavioral adaptations, physiological adaptations, mutations, homologous structures, analogous structures, vestigial structures, embryo, natural selection, artificial selection, fitness, evolution, DNA evidence, fossil evidence, anatomical structures & embryological similarities, common ancestor

Resources

Teacher and student resources used to support the learning.

- Birds of Paradise video - BBC Planet Earth
- "When Fish First Walked" Reading and Questions
- Discovery Education
- Evolve: Shape from History channel
  - DVD
  - DailyMotion
  - Internet Archive
- Edpuzzle: Structural and Behavioral Adaptations, The Way Plants Defend Themselves
- Amoeba Sisters: Natural Selection
- Stated Clearly Videos
  - What is Evolution?
  - What is the Evidence for Evolution?
- NOVA: What Darwin Never Knew
  - DVD
  - YouTube
- Guess the Embryo PBS

Assessments

The means by which students will demonstrate what they know (content knowledge), what they can do (critical skills), and what they understand (generalizations) as a result of their learning from the unit.

Artificial Selection Jigsaw Project | Summative | Group Project

No Standards Assessed

Natural Selection & Evolution Quiz | Summative | Other written assessments

Located in Shared Drive

No Standards Assessed

Differentiation

Core learning activities, resources and assessments that meet the needs of all learners.

Test Prep Connections

As appropriate, include activities that build skills for standardized testing, such as IABs.

Interim Assessments:

- MS LS 4-4
- MS LS 4-6

CER Paragraphs

Unit Plan

Physics

Newtown Middle School / Grade 8 / Science

Week 26 - Week 31 | 5 Curriculum Developers | Last Updated: Feb 5, 2026 by Betesh, Jennifer

Concept-Based Curriculum Unit Template

Purpose of the Unit

The overarching goal(s) of the unit.

To explore and understand what makes objects move, stop moving or change directions.

To explore and understand what causes changes in motion and how potential and kinetic energy are related to an object's motion.

Conceptual Lens/Concepts

Concepts are the "big ideas" of the unit. The conceptual lens is a particular concept that focuses the thinking of the unit.

Lens: Cause and effect
Concepts:

- Newton's laws of motion
- Gravity
- Inertia
- Forces
- Potential and Kinetic Energy
- Energy transfer in a roller coaster

Generalizations

Critical conceptual relationships that students are expected to ***UNDERSTAND*** *at the end of the unit.*

1. Newton's laws of motion explain what keeps objects at rest and what keeps objects in motion.

2. Use models to demonstrate the concepts of force, acceleration, and potential & kinetic energy.

3. Altering an object's mass and/or speed causes changes to the energy of an object.

Guiding Questions

A combination of Factual (F), Conceptual (C) and Provocative/Debatable (P) questions that lead to the generalizations. Label each question (F), (C) or (P).

1. Newton's Laws of Motion explain the motion of everyday objects.
a. How do you calculate speed of an object? (F)
b. How can we use a distance versus time graph to show an objects motion? (C)
c. What is inertia? (F)
d. What is gravity? (F)
e. What are Newton's 3 Laws of Motion? (F)
f. What factors affect gravity? (F)
g. How do mass and distance affect gravity? (C)
h. How are Newton's Laws of Motion applied to your everyday life? (C)
I. If seatbelts didn't exist, how dangerous would everyday driving be, according to Newton's laws? (C)
j. Why is it harder to stop a skateboard going fast than one moving slowly, even if they are the same size? (C)
k. Would sports be at all possible if Newton's laws didn't exist? (C)
l. Is it possible to move without pushing or pulling something else? (P)

2. Use models to demonstrate the concepts of force, acceleration, and potential & kinetic energy.
   a. What is the definition of force? (F)
   b. What is the definition of acceleration? (F)
   c. What is the definition of potential energy? (F)
   d. What is the definition of kinetic energy? (F)
   e. How are force and acceleration related? (C)
   f. How can we use a graph to show an object's motion? (C)
   g. Why do some objects move faster than others? (C)
   h What causes an object to start moving, stop moving and change direction? (C)
   i. Where is the most/least potential energy and kinetic energy found on a roller coaster ride? (C)
   j. How does energy change form during a roller coaster ride? (C)
   k. Can you ever design the "perfect" roller coaster ride? (P)

3. Changing an object's energy changes its motion and interactions.
   a. What is the definition of mass? (F)
   b. What is the definition of speed? (F)
   c. Is there a relationship between an increase in an object's mass and it's speed? (C)
   d. If you could change an object's mass or speed at will, could you create unlimited energy—or are there limits to what's possible? (P)

Content Knowledge

*Critical facts and information that students are expected to **KNOW** at the end of the unit.*

- The interaction of gravity and inertia allows for predictable patterns of motion.
- Motion is dependent on the changing distance between an object and its reference point.
- Speed is a type of motion that can be calculated from word problems and/or graphs.
- A force is a push or a pull that can affect motion.
- Mass and speed effect kinetic energy in a predictable way.
- Newton's Laws of Motion are critical to the understanding of how force and motion are intertwined.
- Potential energy is the stored energy of an object and kinetic energy is the energy of motion.

Standards

The content standards that are taught and/or assessed in this unit.

NGSS: Science Performance Expectations
NGSS: MS Physical Science
MS.Forces and Interactions
Performance Expectations Show Details

- [x] MS-PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. Show Details

- [x] MS-PS2-1. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.* Show Details

MS.Energy
Performance Expectations Show Details

- [x] MS-PS3-1. Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. Show Details
- [x] MS-PS3-2. Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. Show Details
- [x] MS-PS3-5. Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. Show Details

NGSS: Science and Engineering Practices

NGSS: 6-8

Practice 1. Asking questions (for science) and defining problems (for engineering)

Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.

- [x] Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.
- [x] Ask questions to determine relationships between independent and dependent variables and relationships in models.

Practice 3. Planning and carrying out investigations

Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions.

- [x] Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.

Practice 4. Analyzing and interpreting data

Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

- [x] Construct, analyze, and/or interpret graphical displays of data and/or large data sets to identify linear and nonlinear relationships.
- [x] Use graphical displays (e.g., maps, charts, graphs, and/or tables) of large data sets to identify temporal and spatial relationships.

Practice 5. Using mathematics and computational thinking

Mathematical and computational thinking in 6–8 builds on K–5 experiences and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments.

- [x] Use digital tools (e.g., computers) to analyze very large data sets for patterns and trends.

Practice 6. Constructing explanations (for science) and designing solutions (for engineering)

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

- [x] Apply scientific ideas or principles to design, construct, and/or test a design of an object, tool, process or system.
- [x] Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.
- [x] Optimize performance of a design by prioritizing criteria, making tradeoffs, testing, revising, and re-testing.

Connections to the Nature of Science: Most Closely Associated with Practices

Scientific Investigations Use a Variety of Methods

- [x] Science investigations use a variety of methods and tools to make measurements and observations.
- [x] Science investigations are guided by a set of values to ensure accuracy of measurements, observations, and objectivity of findings.

Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

- [x] Laws are regularities or mathematical descriptions of natural phenomena.

NGSS: Crosscutting Concepts

NGSS: 6-8

Crosscutting Statements

3. Scale, Proportion, and Quantity – In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

- [x] Proportional relationships (e.g., speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes.
- [x] Scientific relationships can be represented through the use of algebraic expressions and equations.

NGSS: Disciplinary Core Ideas

NGSS: 6-8

PS2: Motion and Stability: Forces and Interactions

PS2.A: Forces and Motion

- [x] All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. (MSPS2-2)
- [x] The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. (MS-PS2-2)
- [x] For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law). (MS-PS2-1)

PS3: Energy

PS3.A: Definitions of Energy

- [x] Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. (MS-PS3-1)

Interactive version of NGSS
NGSS Resources

Core Learning Activities

The learning activities that support the acquisition of content knowledge, attainment of critical skills and lead to the generalizations of the unit. Activities should be clearly articulated, include teacher instructions and identify optional vs. assured experiences.

- Measuring speed/motion activities
- Tortoise and Hare Graphing Activity
- Kinetic Energy Graphing (mass and speed as independent variables)
- CPO Ramps for measuring speed activity
- PHET: Energy Skate Park
- Paper Roller Coaster Project (templates require individual teacher licenses)

Unit 5: Physics

Portrait of the Newtown Graduate

Vocabulary

Academic and content-specific vocabulary needed to support knowledge, understanding and/or skills.

motion, point of reference, speed, constant speed, average speed, position-time graph, slope, force, gravity, inertia, mass, acceleration, balanced/unbalanced forces, net force, kinetic energy, potential energy, friction, Newton's Laws of Motion, Newton's Law of Universal Gravitation, weight

Resources

Teacher and student resources used to support the learning.

- Phenomenon - IIHS Crash Tests with and without Safety Belts or Roller Coaster: Kingda-Ka Six Flags
- Roller Coaster Videos:
  - Base & Columns
  - Beams
  - Diagonal Supports
  - Straight Tracks
  - Shelf
  - Funnel
  - Turns
  - Loop
  - Half-Pipe
  - Paper Roller Coaster Instructions Playlist
  - Ideas 1
  - Ideas 2
- Energy in a coaster simulation
- Paper roller coaster templates (requires individual teacher licenses)
- PhET Lab: Energy Skate Park

Assessments

The means by which students will demonstrate what they know (content knowledge), what they can do (critical skills), and what they understand (generalizations) as a result of their learning from the unit.

Roller Coaster Challenge | Group Project

Students work in small groups to design and build a roller coaster which is both safe and fun. They have to demonstrate where the laws of physics (Newton's laws, potential and kinetic energy) are occurring on the coaster when finished. They present the coasters to their class mates and their teachers.

No Standards Assessed

Physics Quiz | Summative | Other written assessments

Located in Shared Drive

No Standards Assessed

Differentiation

Core learning activities, resources and assessments that meet the needs of all learners.

Test Prep Connections

As appropriate, include activities that build skills for standardized testing, such as IABs.

Unit Plan

Astronomy

Newtown Middle School / Grade 8 / Science

Week 32 - Week 38 | 5 Curriculum Developers | Last Updated: Feb 5, 2026 by Betesh, Jennifer

Concept-Based Curriculum Unit Template

Purpose of the Unit

The overarching goal(s) of the unit.

To understand the predictable patterns of motion relative to the Earth, Sun, and Moon and how these movements cause the phases of the moon, eclipses, and seasons.

Conceptual Lens/Concepts

Concepts are the "big ideas" of the unit. The conceptual lens is a particular concept that focuses the thinking of the unit.

Lens: Patterns and systems
Concepts: eclipses, seasons, phases of the moon, gravity and inertia, orbits

Generalizations

Critical conceptual relationships that students are expected to ***UNDERSTAND*** *at the end of the unit.*

1. The interaction/interplay between gravity and the inertia of an object creates the predictable motion of objects in the solar system.

2. The orbital pathways of the planets and moons and the position of the Sun lead to interactions that produce astronomical phenomena.

3. The relative positions of the Earth and the Sun produce climatic variability across the globe.

Guiding Questions

A combination of Factual (F), Conceptual (C) and Provocative/Debatable (P) questions that lead to the generalizations. Label each question (F), (C) or (P).

1. The interaction/interplay between gravity and the inertia of an object creates the predictable motion of objects in the solar system.
   a. What variables (gravity & inertia) act to keep the Earth moving around the Sun and the moon moving around the Earth? (F)
   b. What objects are in our solar system? (F)
   c. What is the effect of gravity on the orbital movements of planets in the solar system? (C)
   d. What would happen to our Earth's orbit around the sun if you took away inertia (or gravity)? (C)
   d. What would life be like if our orbit was closer or farther from the Sun? (P)

2. The orbital pathways of the planets and moons and the position of the Sun lead to interactions that produce astronomical phenomena.
   a. What causes day and night? (F)
   b. What causes solar and lunar eclipses? (F)
   c. What causes the phases of the moon? (F)
   d. Why do we always see the same side of the moon? (C)
   e. Can you travel the world so that you are always in daylight? (P)
   f. What would happen if the moon suddenly disappeared? How would that effect the solar system and life on earth? (P)

3. The relative positions of the Earth and the Sun produce climatic variability across the globe.

a. What causes seasons? (F)
b. How does the position and movement of Earth in the solar system affect conditions on our planet? (C)
c. How does the Earth's position in space affect life on Earth? (P)
d. Is life (as we know it) possible on other planets - what conditions need to be met to support life, based on our current understanding? (P)

Content Knowledge

Critical facts and information that students are expected to KNOW at the end of the unit.

- The seasons are caused by the tilt of earth's axis as it moves around the sun.
- Day and night are due to earth's rotation - the side of earth facing the sun is day and the side facing away is night.
- Half of the moon is always lit by the sun, but the changing position of the earth, moon and sun cause us to see the different phases of the moon.
- Solar and lunar eclipses are caused by the changing position of the earth, moon and sun.
- As the distance between objects increases, the strength of gravity decreases.
- As the mass of an object increases, the strength of gravity increases.
- Objects in our solar system are the planets and their moons, the sun, asteroids and meteors.
- The earth stays in orbit around the sun (and the moon stays in orbit around the earth) because of gravity and inertia.

Standards

The content standards that are taught and/or assessed in this unit.

NGSS: Science Performance Expectations

NGSS: MS Earth & Space Science

MS.Space Systems

Performance Expectations Show Details

- [x] MS-ESS1-1. Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons. Show Details
- [x] MS-ESS1-2. Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. Show Details
- [x] MS-ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system. Show Details

NGSS: Science and Engineering Practices

NGSS: 6-8

Practice 1. Asking questions (for science) and defining problems (for engineering)

Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.

- [x] Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.
- [x] Ask questions to determine relationships between independent and dependent variables and relationships in models.
- [x] Ask questions to clarify and/or refine a model, an explanation, or an engineering problem.

Practice 8. Obtaining, evaluating, and communicating information

Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods.

- [x] Critically read scientific texts adapted for classroom use to determine the central ideas and/or obtain scientific and/or technical information to describe patterns in and/or evidence about the natural and designed world(s).

NGSS: Crosscutting Concepts

NGSS: 6-8

Crosscutting Statements

1. Patterns – Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

- [x] Patterns can be used to identify cause and effect relationships.
- [x] Graphs, charts, and images can be used to identify patterns in data.

2. Cause and Effect: Mechanism and Prediction – Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.

- [x] Cause and effect relationships may be used to predict phenomena in natural or designed systems.

3. Scale, Proportion, and Quantity – In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

- [x] Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

NGSS: Disciplinary Core Ideas

NGSS: 6-8

ESS1: Earth's Place in the Universe

ESS1.A: The Universe and Its Stars

- [x] Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1)
- [x] Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS1-2)

ESS1.B: Earth and the Solar System

- [x] The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS1-2),(MSESS1-3)
- [x] This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. (MS-ESS1-1)
- [x] The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (MS-ESS1-2)

Interactive version of NGSS
NGSS Resources

Core Learning Activities

The learning activities that support the acquisition of content knowledge, attainment of critical skills and lead to the generalizations of the unit. Activities should be clearly articulated, include teacher instructions and identify optional vs. assured experiences.

- Astronomy Word Sort
- Astronomy Stations - Scale, Orbits and Gravity
- PhET Lab: Gravity & Orbits
- Reason for the Seasons Exploration
- Phases of the moon modeling & webquest
- Astronomy Model Summative Task

Unit 6: Astronomy

Portrait of the Newtown Graduate

Vocabulary

Academic and content-specific vocabulary needed to support knowledge, understanding and/or skills.

Gravity
Inertia
Orbits
Phase
Eclipse (Solar & Lunar)
Seasons
Solar System

Resources

Teacher and student resources used to support the learning.

- YouTube: Our Story in One Minute
- YouTube: Eyewitness Planets
- PhET Lab: Gravity & Orbits
- Movies
  - Apollo 13
  - Hidden Figures
  - October Sky
  - The Martian

Universe
Galaxy
Tilt
Revolution
Rotation
Axis
Galaxy
Scale Size

Assessments

The means by which students will demonstrate what they know (content knowledge), what they can do (critical skills), and what they understand (generalizations) as a result of their learning from the unit.

Astronomy Model | Personal Project
No Standards Assessed

Differentiation

Core learning activities, resources and assessments that meet the needs of all learners.

Test Prep Connections

As appropriate, include activities that build skills for standardized testing, such as IABs.

NGSS Interims