Unit 3 Land Use and Food Production (Earth and Space Science, Engineering Design)

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Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

AP Environmental Science, 10-12

Unit 3: Land Use and Food Production

Belleville Board of Education

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Unit Overview

- Dynamic processes move matter within the earth and on its surface and can cause volcanic eruptions, tsunamis, and earthquakes.
- The three major types of rock found in the earth's crust are recycled very slowly by physical and chemical processes.
- Some minerals in the earth's crust can be made into useful products, but extracting and using these resources can disturb the land, erode soils, produce large amounts of solid waste, and pollute the air, water, and soil.
- Raising the price of a scarce mineral resource can lead to an increase in its supply, but there are environmental limits to this effect.
- We can try to find substitutes for scarce resources, reduce resource waste, and recycle and reuse minerals.
- Many of the poor have health problems from not getting enough food, while many people in affluent countries suffer health problems from eating too much.
- The greatest obstacles to providing enough food for everyone are poverty, political upheaval, corruption, war, and the harmful environmental effects of food production.
- The transfer of matter and energy between the biosphere, geosphere, atmosphere, and hydrosphere often takes place in soils.
- The unconsolidated mineral or organic material on the immediate surface of the Earth that serves as a natural medium for the growth of land plants.
- The four major systems of Earth are the geosphere, hydrosphere, atmosphere, and biosphere. The geosphere includes a metallic core, solid and molten rock, soil, and sediments. The atmosphere is the

envelope of gas surrounding Earth. The hydrosphere includes the ice, water vapor, and liquid water in the atmosphere, the ocean, lakes, streams, soils, and groundwater. The biosphere includes Earth's life, which can be found in many parts of the geosphere, hydrosphere, and atmosphere. Humans are part of the biosphere, and human activities have important impacts on all four spheres.

- More sustainable food production involves reducing overgrazing and overfishing, irrigating more efficiently, using integrated pest management, promoting agrobiodiversity, and providing government subsidies only for more sustainable agriculture, fishing, and aquaculture.
- We can improve food security by creating programs to reduce poverty and chronic malnutrition, relying more on locally grown food, and cutting waste.
- Future food production may be limited by soil erosion and degradation, desertification, water and air pollution, climate change from greenhouse gas emissions, and loss of biodiversity.
- We have used high-input industrialized agriculture and lower-input traditional methods to greatly increase supplies of food.
- The greatest obstacles to providing enough food for everyone are poverty, political upheaval, corruption, war, and the harmful environmental effects of food production.
- Many of the poor have health problems from not getting enough food, while many people in affluent countries suffer health problems from eating too much.

Enduring Understanding

- Dynamic forces that move matter within the earth and on its surface recycle the earth's rocks, form deposits of mineral resources, and cause volcanic eruptions, earthquakes, and tsunamis.
- The available supply of a mineral resource depends on how much of it is in the earth's crust, how fast we use it, mining technology, market prices, and the harmful environmental effects of removing and using it.
- We can use mineral resources more sustainably by trying to find substitutes for scarce resources, reducing resource waste, and reusing and recycling nonrenewable minerals.
- About 925 million people have health problems because they do not get enough to eat and 1.6 billion people face health problems from eating too much.
- Modern industrialized agriculture has a greater harmful impact on the environment than any other human activity.
- More sustainable forms of food production will greatly reduce the harmful environmental impacts of current systems while increasing food security and national security for all countries.
- More sustainable food production involves reducing overgrazing and overfishing, irrigating more efficiently, using integrated pest management, promoting agrobiodiversity, and providing government subsidies only for more sustainable agriculture, fishing, and aquaculture.
- We can sharply cut pesticide use without decreasing crop yields by using a mix of cultivation techniques, biological pest controls, and small amounts of selected chemical pesticides as a last resort (integrated pest management).
- Future food production may be limited by soil erosion and degradation, desertification, water and air pollution, climate change from greenhouse gas emissions, and loss of biodiversity.
- We have used high-input industrialized agriculture and lower-input traditional methods to greatly

increase supplies of food.
- The greatest obstacles to providing enough food for everyone are poverty, political upheaval, corruption, war, and the harmful environmental effects of food production.
- Many of the poor have health problems from not getting enough food, while many people in affluent countries suffer health problems from eating too much.

Essential Questions

- How Can We Use Mineral Resources More Sustainably?
- How Long Will Supplies of Nonrenewable Mineral Resources Last?
- What Are Mineral Resources and What Are the Environmental Effects of Using Them?
- How Are Earth's Rocks Recycled?
- What Are the Earth's Major Geological Processes and Hazards?
- How Is Food Produced?
- What Is Food Security and Why Is It So Difficult to Attain?
- How Can We Produce Food More Sustainably?
- How Can We Improve Food Security?
- What Environmental Problems Arise from Food Production?
- How Can We Protect Crops from Pests More Sustainably?
- What Is Food Security and Why Is It So Difficult to Attain?

Exit Skills

- *Analyze a problem, developing hypothesis, and design a scientific experiment to test those hypothesis*
- Use statistical analysis of data collected to make an argument based on purely scientific evidence
- Develop a vernacular of scientific terms and current environmental problems
- Data mine from scientific journals and articles evaluating their scientific methodology for validity

New Jersey Student Learning Standards (NJSLS-S)

NextGen Science Standards

HS-ETS1-1	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
HS-ETS1-4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
HS-ESS2-2	Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
HS-ESS2-3	Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.
HS-ESS2-5	Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.
HS-ESS2-6	Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.
HS-ESS2-7	Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.
HS-ESS3-1	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
HS-ESS3-2	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
HS-ESS3-5	Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth's systems.
HS-ESS3-6	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
9-12.HS-ESS3-1.2.1	students understand that empirical evidence is required to differentiate between cause and correlation and to make claims about specific causes and effects. They suggest cause and effect relationships to explain and predict behaviors in complex natural and designed systems. They also propose causal relationships by examining what is known about smaller scale mechanisms within the system. They recognize changes in systems may have various causes that may not have equal effects.
9-12.HS-ESS2-6.2.1	Develop a model based on evidence to illustrate the relationships between systems or between components of a system.
9-12.HS-ESS2-3.2.1	Develop a model based on evidence to illustrate the relationships between systems or between components of a system.

9-12.HS-ESS2-5.3.1	Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.
9-12.HS-ESS3-6.4.1	When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models.
9-12.HS-ESS3-5.4.1	Analyze data using computational models in order to make valid and reliable scientific claims.
9-12.HS-ESS2-2.4.1	Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.
9-12.HS-ESS3-6.5.1	Use a computational representation of phenomena or design solutions to describe and/or support claims and/or explanations.
9-12.HS-ESS2-6.5.1	students learn that the total amount of energy and matter in closed systems is conserved. They can describe changes of energy and matter in a system in terms of energy and matter flows into, out of, and within that system. They also learn that energy cannot be created or destroyed. It only moves between one place and another place, between objects and/or fields, or between systems. Energy drives the cycling of matter within and between systems. In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved.
9-12.HS-ESS2-3.5.1	Energy drives the cycling of matter within and between systems.
9-12.HS-ESS2-5.6.1	The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials.
9-12.HS-ESS3-1.6.1	Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) 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.
9-12.HS-ESS2-2.7.1	Feedback (negative or positive) can stabilize or destabilize a system.
9-12.HS-ESS2-7.7.1	Construct an oral and written argument or counterarguments based on data and evidence.
9-12.HS-ESS3-2.7.1	Evaluate competing design solutions to a real-world problem based on scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (e.g. economic, societal, environmental, ethical considerations).
9-12.HS-ESS2-7.7.1	students understand much of science deals with constructing explanations of how things change and how they remain stable. They quantify and model changes in systems over very short or very long periods of time. They see some changes are irreversible, and negative feedback can stabilize a system, while positive feedback can destabilize it. They recognize systems can be designed for greater or lesser stability.
9-12.HS-ESS3-5.7.1	Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible.
9-12.HS-ESS2-3.ESS2.A.1	Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface and its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, a solid mantle and crust. Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from Earth's interior and gravitational movement of denser materials toward the interior.
9-12.HS-ESS2-2.ESS2.A.1	Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes.

9-12.HS-ESS2-3.ESS2.B.1	The radioactive decay of unstable isotopes continually generates new energy within Earth's crust and mantle, providing the primary source of the heat that drives mantle convection. Plate tectonics can be viewed as the surface expression of mantle convection.
9-12.HS-ESS2-5.ESS2.C.1	The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks.
9-12.HS-ESS2-2.ESS2.D.1	The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space.
9-12.HS-ESS3-6.ESS2.D.1	Current models predict that, although future regional climate changes will be complex and varied, average global temperatures will continue to rise. The outcomes predicted by global climate models strongly depend on the amounts of human-generated greenhouse gases added to the atmosphere each year and by the ways in which these gases are absorbed by the ocean and biosphere.
9-12.HS-ESS2-6.ESS2.D.1	Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen.
9-12.HS-ESS2-7.ESS2.D.1	Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen.
9-12.HS-ESS2-6.ESS2.D.2	Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate.
9-12.HS-ESS2-7.ESS2.E.1	The many dynamic and delicate feedbacks between the biosphere and other Earth systems cause a continual co-evolution of Earth's surface and the life that exists on it.
9-12.HS-ESS3-2.ESS3.A.1	All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors.
9-12.HS-ESS3-1.ESS3.A.1	Resource availability has guided the development of human society.
9-12.HS-ESS3-1.ESS3.B.1	Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations.
9-12.HS-ESS3-6.ESS3.D.1	Through computer simulations and other studies, important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in response to human activities.
9-12.HS-ESS3-5.ESS3.D.1	Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts.
9-12.HS-ESS3-2.ETS1.B.1	When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts.
9-12.HS-ETS1-1.1.1	Analyze complex real-world problems by specifying criteria and constraints for successful solutions.
9-12.HS-ETS1-4.4.1	Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions— including energy, matter, and information flows— within and between systems at different scales.
9-12.HS-ETS1-4.5.1	Use mathematical models and/or computer simulations to predict the effects of a design solution on systems and/or the interactions between systems.
9-12.HS-ETS1-2.6.1	Design a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.
9-12.HS-ETS1-3.6.1	Evaluate a solution to a complex real-world problem, based on scientific knowledge,

	student-generated sources of evidence, prioritized criteria, and tradeoff considerations.
9-12.HS-ETS1-1.ETS1.A.1	Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them.
9-12.HS-ETS1-1.ETS1.A.2	Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.
9-12.HS-ETS1-4.ETS1.B.1	Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs.
9-12.HS-ETS1-3.ETS1.B.1	When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts.
9-12.HS-ETS1-2.ETS1.C.1	Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed.

Interdisciplinary Connections

LA.RH.11-12.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of primary and secondary sources, connecting insights gained from specific details to develop an understanding of the text as a whole.
LA.RH.11-12.9	Integrate information from diverse sources, both primary and secondary, into a coherent understanding of an idea or event, noting discrepancies among sources.
LA.RST.11-12.1	Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.
LA.RST.11-12.2	Determine the central ideas, themes, or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
LA.RST.11-12.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
LA.RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
LA.RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
LA.WHST.11-12.1.A	Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.

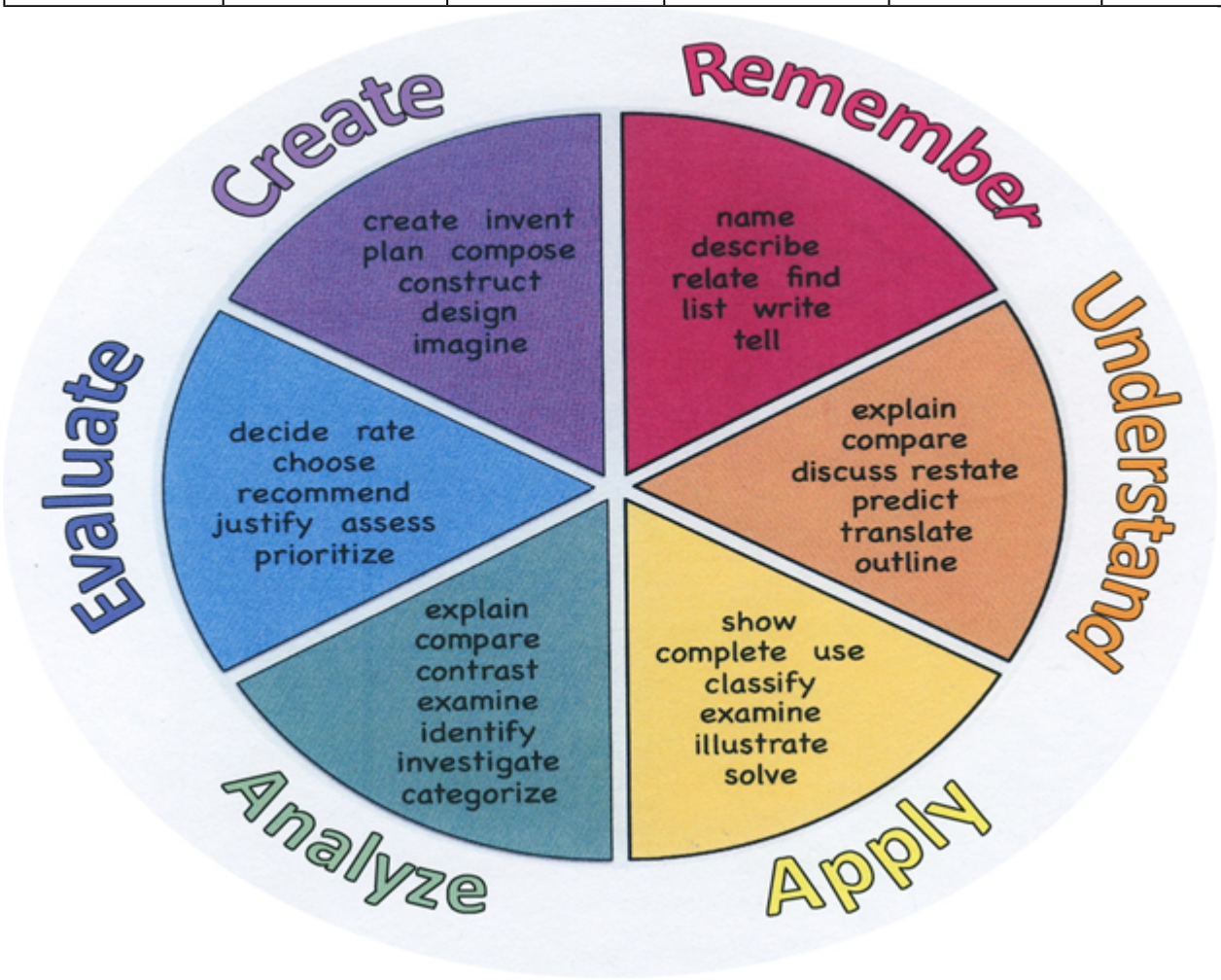
Learning Objectives

- Describe the geologic processes that build and erode the Earth’s surface
- List the physical, chemical, and biological factors involved in soil formation
- Explain the importance of humus to soil fertility
- Differentiate between soil texture and soil structure
- Explain how texture and structure influence soil atmosphere and soil water
- Explain the role of living organisms in soil formation and fertility
- Describe the various layers in a soil profile
- Describe the processes of soil erosion by water and wind
- Explain how contour farming strip mining, terracing, waterways, windbreaks, and tillage to reduce soil erosion
- Explain how land not suited for cultivated may still be productively used for other purposes
- Explain how mechanization encouraged monoculture farming
- List the advantages and disadvantages of monoculture farming
- Explain why chemical fertilizers are used
- Understand how fertilizers alter soil characteristics
- Explain why modern agriculture makes extensive use of pesticides
- Differentiate between persistent pesticides and non-persistent pesticides
- List four problems associated with pesticide use
- Define bio magnification and organic farming
- Explain why integrated pest management depends on a complete
- Knowledge of the pests life history
- Recognize that genetically modified crops are created by using biotechnical techniques to insert genes from one species into another
- Describe the rock cycle and discuss its importance in environmental science
- Explain how soil forms and describe its characteristics
- Explain how elements and minerals are extracted for human use.
- Describe approaches and policies that promote sustainable land use
- Describe human nutritional needs and the challenges of overcoming hunger and malnutrition
- Explain the development of modern industrial agriculture, the role played by inputs such as irrigation water, fertilizers, and pesticides, and the environmental consequences of modern farming methods.
- Identify the benefits and costs of using genetically modified organisms in agriculture
- Describe alternatives to industrial farming methods
- Explain the environmental impacts of various approaches to raising and harvesting meat and fish.

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

Remember	Understand	Apply	Analyze	Evaluate	Create
Choose	Classify	Choose	Categorize	Appraise	Combine
Describe	Defend	Dramatize	Classify	Judge	Compose
Define	Demonstrate	Explain	Compare	Criticize	Construct
Label	Distinguish	Generalize	Differentiate	Defend	Design
List	Explain	Judge	Distinguish	Compare	Develop
Locate	Express	Organize	Identify	Assess	Formulate
Match	Extend	Paint	Infer	Conclude	Hypothesize
Memorize	Give Examples	Prepare	Point out	Contrast	Invent
Name	Illustrate	Produce	Select	Critique	Make
Omit	Indicate	Select	Subdivide	Determine	Originate
Recite	Interrelate	Show	Survey	Grade	Organize
Select	Interpret	Sketch	Arrange	Justify	Plan
State	Infer	Solve	Breakdown	Measure	Produce
Count	Match	Use	Combine	Rank	Role Play

Draw Outline Point Quote Recall Recognize Repeat Reproduce	Paraphrase Represent Restate Rewrite Select Show Summarize Tell Translate Associate Compute Convert Discuss Estimate Extrapolate Generalize Predict	Add Calculate Change Classify Complete Compute Discover Divide Examine Graph Interpolate Manipulate Modify Operate Subtract	Detect Diagram Discriminate Illustrate Outline Point out Separate	Rate Support Test	Drive Devise Generate Integrate Prescribe Propose Reconstruct Revise Rewrite Transform



Suggested Activities & Best Practices

Assessment Evidence - Checking for Understanding (CFU)

Assessments Generated using ExamView Test Generator and Test Bank from Toward a Sustainable Future 12e; Pearson Wright 7 Boorse 2014 (Summative)

Common, Department Quarterly Benchmarks (Benchmark)

Oncourse Assessment Tools (Formative)

Unit Test/Quiz (Summative)

"Do Now/Exit Ticket" Activity (Formative)

- Admit Tickets
- Anticipation Guide
- Common Benchmarks
- Compare & Contrast
- Create a Multimedia Poster
- DBQ's
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Fist- to-Five or Thumb-Ometer
- Illustration
- Journals
- KWL Chart
- Learning Center Activities
- Multimedia Reports
- Newspaper Headline
- Outline
- Question Stems
- Quickwrite
- Quizzes
- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide

- Surveys
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Top 10 List
- Unit review/Test prep
- Unit tests
- Web-Based Assessments
- Written Reports

Primary Resources & Materials

Environmental Science – Toward a Sustainable Future 12e; Pearson Wright & Boorse 2014

Principles of Environmental Engineering and Science; McGraw Hill Davis & Masten 2014

Ancillary Resources

Abbey, E. *Desert Solitaire.* (1985). New York: Random House Publishers, Inc.

Bormann, H. and Kellert, S. (1991). *Ecology, Economics, and Ethics: The Broken Circle.* CT: Yale University Press.

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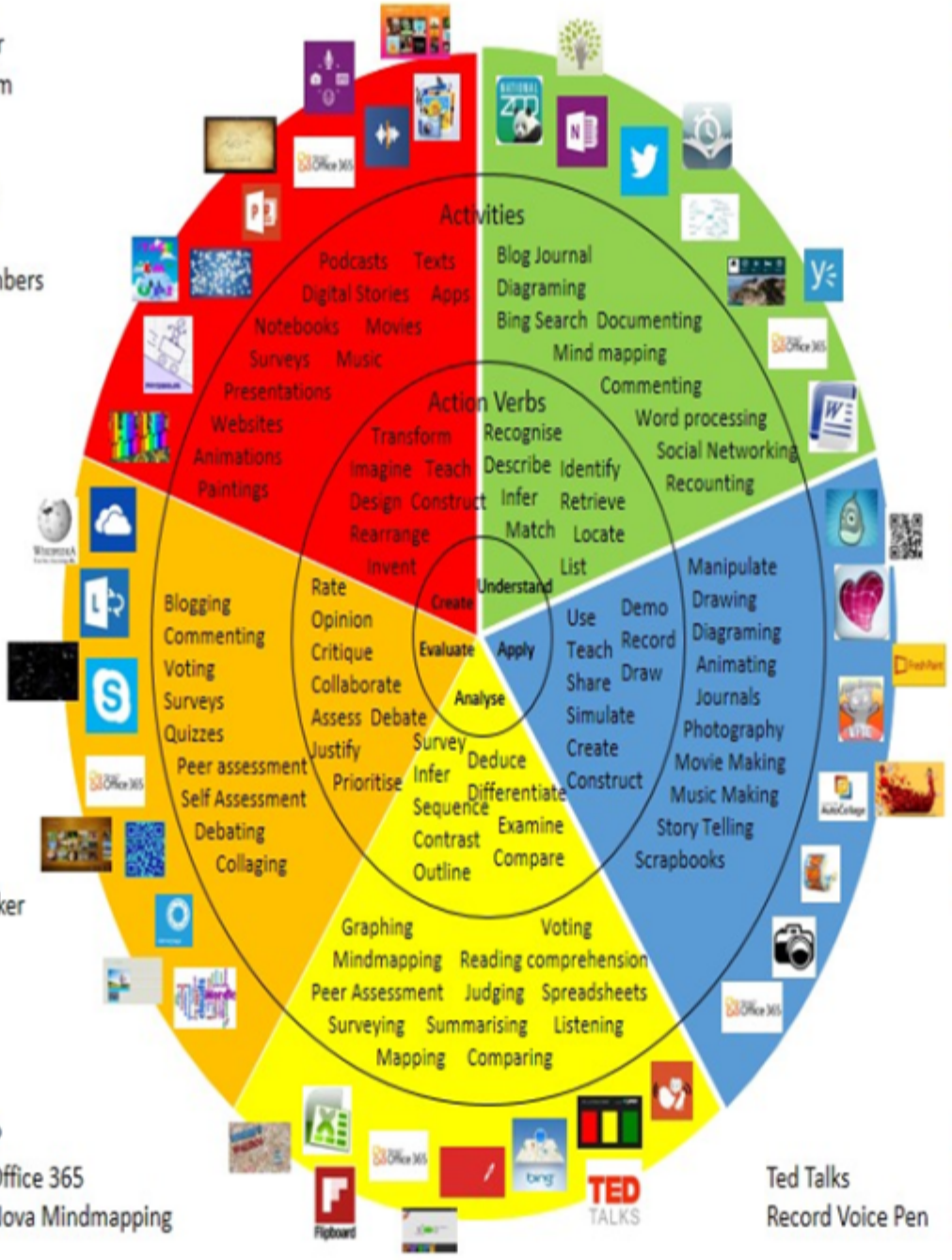
Wilson, E.O. (1999). *The Diversity of Life*. New York: W.W. Norton and Company, Inc.

Technology Infusion

Win 8.1 Apps/Tools Pedagogy Wheel

Podcasts
Photostory 3
Kid Story Builder
Music Maker Jam
Paint A Story
Office 365
MS PowerPoint
Stack 'Em Up
NqSquared Numbers
Physamajig
Xylophone 8

Wikipedia
Skydrive
Lync
SkyMap
Skype
Office 365
Puzzle Touch
Easy QR
Memorylage
Life Moments
Word Cloud Maker



Where's Waldo?
MS Excel Office 365
Flipboard Nova Mindmapping

Ted Talks
Record Voice Pen

Originally taken from http://www.coetail.com/vzimmer/files/2013/02/iPadagogy-Wheel.001.jpg
And adapted for Windows 8.1 devices by Charlotte Beckhurst @CharBeckhurst

Alignment to 21st Century Skills & Technology

- English Language Arts;
- Mathematics;
- Science and Scientific Inquiry (Next Generation);
- Social Studies, including American History, World History, Geography, Government and Civics, and Economics;
- World languages;
- Technology;
- Visual and Performing Arts.

CRP.K-12.CRP1.1	Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP5.1	Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.
CRP.K-12.CRP7.1	Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
CRP.K-12.CRP10.1	Career-ready individuals take personal ownership of their own education and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the

	pathways available to them and the time, effort, experience and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the education and experiential process, and they recognize that nearly all career paths require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals.
CRP.K-12.CRP12.1	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.
CAEP.9.2.12.C.2	Modify Personalized Student Learning Plans to support declared career goals.
TECH.8.1.12.A.4	Construct a spreadsheet workbook with multiple worksheets, rename tabs to reflect the data on the worksheet, and use mathematical or logical functions, charts and data from all worksheets to convey the results.
TECH.8.1.12.A.5	Create a report from a relational database consisting of at least two tables and describe the process, and explain the report results.
TECH.8.1.12.A.CS2	Select and use applications effectively and productively.
TECH.8.1.12.B.CS1	Apply existing knowledge to generate new ideas, products, or processes.
TECH.8.1.12.C.CS1	Interact, collaborate, and publish with peers, experts, or others by employing a variety of digital environments and media.
TECH.8.1.12.C.CS2	Communicate information and ideas to multiple audiences using a variety of media and formats.
TECH.8.1.12.E.CS1	Plan strategies to guide inquiry.
TECH.8.1.12.E.CS2	Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
TECH.8.1.12.E.CS3	Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.
TECH.8.1.12.E.CS4	Process data and report results.
TECH.8.1.12.F.CS3	Collect and analyze data to identify solutions and/or make informed decisions.
TECH.8.1.12.F.CS4	Use multiple processes and diverse perspectives to explore alternative solutions.
TECH.8.2.12.B.CS2	The effects of technology on the environment.

21st Century Skills/Interdisciplinary Themes

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

21st Century Skills

- Civic Literacy

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

Differentiation

Differentiations:

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

Hi-Prep Differentiations:

- Alternative formative and summative assessments
- Choice boards
- Games and tournaments
- Group investigations
- Guided Reading
- Independent research and projects
- Interest groups
- Learning contracts
- Leveled rubrics
- Literature circles
- Multiple intelligence options
- Multiple texts
- Personal agendas
- Project-based learning

- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products
- Varying organizers for instructions

Lo-Prep Differentiations

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

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

- printed copy of board work/notes provided
- additional time for skill mastery
- assistive technology
- behavior management plan
- Center-Based Instruction
- check work frequently for understanding
- computer or electronic device utilizes
- extended time on tests/ quizzes
- have student repeat directions to check for understanding
- highlighted text visual presentation
- modified assignment format
- modified test content
- modified test format
- modified test length
- multi-sensory presentation

- multiple test sessions
- preferential seating
- preview of content, concepts, and vocabulary
- Provide modifications as dictated in the student's IEP/504 plan
- reduced/shortened reading assignments
- Reduced/shortened written assignments
- secure attention before giving instruction/directions
- shortened assignments
- student working with an assigned partner
- teacher initiated weekly assignment sheet
- Use open book, study guides, test prototypes

English Language Learning (ELL)

- teaching key aspects of a topic. Eliminate nonessential information
- using videos, illustrations, pictures, and drawings to explain or clarif
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student’s learning;
- allowing students to correct errors (looking for understanding)
- allowing the use of note cards or open-book during testing
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher’s notes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using computer word processing spell check and grammar check features
- using true/false, matching, or fill in the blank tests in lieu of essay tests

At Risk

- allowing students to correct errors (looking for understanding)
- teaching key aspects of a topic. Eliminate nonessential information
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student’s learning
- allowing students to select from given choices

- allowing the use of note cards or open-book during testing
- collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test.
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using authentic assessments with real-life problem-solving
- using true/false, matching, or fill in the blank tests in lieu of essay tests
- using videos, illustrations, pictures, and drawings to explain or clarify

Talented and Gifted Learning (T&G)

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

Sample Lesson