DELAWARE VALLEY SCHOOL DISTRICT

PLANNED INSTRUCTION

A PLANNED COURSE FOR:

_____The Citizen Scientist_____

Grade Level: 11/12

Date of Board Approval: _____2017_____

DELAWARE VALLEY SCHOOL DISTRICT

Planned Instruction

Title of Planned Instruction: The Citizen Scientist

Subject Area: Science **Grade(s): 11/12**

Course Description:

The Citizen Scientist is an interdisciplinary science course that focuses on current events relating to scientific issues and the events that occur within the biome of the temperate deciduous forest, especially in Northeastern Pennsylvania. Relevant current events will be examined throughout the course on a on a local, state, national, and global level to foster science literacy in society. The biodiversity of the temperate deciduous forest will be studied to understand cycles in nature and energy as they relate to current scientific issues. Students will examine 13 key units, including: Ethics, Worldview, Values, Risk, and Statistics; Your Biome in Autumn; Food Issues; Consumerism and Human Population Issues; Your Biome in Winter; Citizen Science Projects Exploration; Climate Change; Human Health, Evolution, and Reproductive Technology; Your Biome in Spring; Water Issues; Your Biome in Summer; Humans, Issues, and Science; and Citizen Science in the World—Capstone Project. This course is designed to prepare students to be more scientific literate for issues with science and society.

Time/Credit for the Course: One full year (180 days), meeting daily for 46 minutes/ 1.0 Credits

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DELAWARE VALLEY SCHOOL DISTRICT

Curriculum Map

1. **Marking Period One -Overview based on 45 days:**

UNIT 1—Ethics, Worldviews, and Values; Risk and Statistics
UNIT 2—Your Biome and Autumn
UNIT 3—Food Issues

Marking Period One -Goals:
Understanding of:

- Ongoing exploration of relevant current events on a local, state, national, and global level as they become available to foster science literacy in society.
- Ethics, Worldviews, and Values; Risk and Statistics
    - Topics may include but are not limited to the following:
        - Conservation, Preservation, Sustainability
        - Cause and effects
        - Issues facing the planet and its people
        - Triple bottom line
        - What can be asked scientifically?
        - Risk assessment
        - Risk management
        - How data can be manipulated
        - Graphs and interpretation
        - Peer review process
        - Credible sources and science
- Your Biome and Autumn
    - Topics may include but are not limited to the following:
        - Delaware River
        - Temperate Deciduous Forest and Tree Identification
        - Migrations—Raptors, Mammals, Birds, and other animals
        - Biodiversity Topics in Autumn
        - Cycles in Nature and Energy
            - Hurricanes
            - Seasons
            - Cycles of the Moon
- Food
    - Topics may include but are not limited to the following:
        - Challenges to feed over 7 Billion people
        - Food Security
        - GMOs
        - CAFOs
        - Green Revolution in Agriculture—fertilizers, pesticides, irrigation, etc.
        - Biotech, Biocontrol, and Food
        - Organic vs. Intensive vs. Slash and Burn vs. Sustainable

- Soil Conservation
- Gleaming

2. Marking Period Two -Overview based on 45 days:

UNIT 4: Consumerism and Human Population Issues
UNIT 5: Your Biome in Winter
UNIT 6: Citizen Science in the World-Part 1

Marking Period Two -Goals:
Understanding of:

- Ongoing exploration of relevant current events on a local, state, national, and global level as they become available to foster science literacy in society.
- Consumerism and Human Population Issues
  - Topics may include but are not limited to the following:
    - Issues with growing Human Population
    - Developed vs. Developing Counties
    - "Cradle to grave" manufacturing
    - Fair Trade and EarthWise Consumerism
    - "Throw-away Society"
    - Waste generation and management
    - Water Issues
    - Who owns your water?
    - Who owns your food?
    - The rise of the monopolies
    - Energy issues
    - Mining Issues
    - FF use and extraction issues
    - Renewable vs nonrenewable energy
    - Developed vs. Developing
    - Pollution issues
    - Air, Water, Soil, Noise Pollution
    - Acid Rain
    - Ozone layer and Issues
- Your Biome and Winter
  - Topics may include but are not limited to the following:
    - Hibernations
    - Biodiversity Topics for Winter
    - Cycles in Nature and Energy
- Citizen Science in the World
  - Participate in or research a way to get involved in Citizen Science projects.

3. Marking Period Three -Overview based on 45 days:

UNIT 7—Climate Change
UNIT 8—Human Health, Evolution, and Reproductive Technology
UNIT 9—Your Biome in Spring

Marking Period Three –Goals:
Understanding of:

- Ongoing exploration of relevant current events on a local, state, national, and global level as they become available to foster science literacy in society.
- Climate Change
    - Topics may include but are not limited to the following:
        - Data
        - Issues
        - Impacts on the world
- Human Health, Evolution, and Reproductive Technology
    - Topics may include but are not limited to the following:
        - Developed vs. Developing Countries
        - Emerging and reemerging diseases
        - Endocrine system disrupters and the human impact
        - Vaccines—Fact vs. fiction
        - Equity in sanitation and health
        - Sanitation
        - Water Quality and Availability
        - Antibiotic resistance and evolution
        - Stem cells
        - Cloning
        - Gene Modification
        - Gene Therapy
        - Genetic Testing
- Your Biome in Spring
    - Topics may include but are not limited to the following:
        - Invasive species
        - The timing of nature
        - Bird songs
        - Pollinators
        - Maple syrup in Pennsylvania
        - Amphibians and water issues
        - Mating and Migration
        - Biodiversity topics in Spring
        - Cycles in Nature and Energy

4. Marking Period Four –Overview based on 45 days:

UNIT 10—Water Issues
UNIT 11—Your Biome in Summer
UNIT 12—Humans and Issues—Humans and Science
UNIT 13—Citizen Science in the World—Part 2

Marking Period Four -Goals:
Understanding of:

- Ongoing exploration of relevant current events on a local, state, national, and global level as they become available to foster science literacy in society.
- Water Issues
    - Topics may include but are not limited to the following:
        - Ocean Issues
        - Fishing Issues
        - Overfishing
        - Acidification
        - Coral Reefs
        - Plastic Pollution
        - Who owns the groundwater
        - Water use in industry, agriculture, domestic
        - Other Ocean Issues
- Your Biome in Summer
    - Topics may include but are not limited to the following:
        - Pollinators and Issues
        - Earth Day
        - Spring wildflowers
        - Invasive species
    - Biodiversity Topics in Summer
    - Cycles in Nature and Energy
- Humans and Issues--Humans and Science
    - Topics may include but are not limited to the following:
        - Equity
        - Human Rights
        - Personal Choice and Worldviews
        - Capstone Projects
- Citizen Science in the World
    - Participate in or research a way to get involved in Citizen Science projects.

Marking Period One -Overview based on 45 days:

UNIT 1—Ethics, Worldviews, and Values; Risk and Statistics
UNIT 2—Your Biome and Autumn
UNIT 3—Food Issues

Marking Period One -Goals:
Understanding of:

- Ongoing exploration of relevant current events on a local, state, national, and global level as they become available to foster science literacy in society.
- Ethics, Worldviews, and Values; Risk and Statistics
    - Topics may include but are not limited to the following:
        - Conservation, Preservation, Sustainability
        - Cause and effects
        - Issues facing the planet and its people
        - Triple bottom line
        - What can be asked scientifically?
        - Risk assessment
        - Risk management
        - How data can be manipulated
        - Graphs and interpretation
        - Peer review process
        - Credible sources and science
- Your Biome and Autumn
    - Topics may include but are not limited to the following:
        - Delaware River
        - Temperate Deciduous Forest and Tree Identification
        - Migrations—Raptors, Mammals, Birds, and other animals
        - Biodiversity Topics in Autumn
        - Cycles in Nature and Energy
            - Hurricanes
            - Seasons
            - Cycles of the Moon
- Food
    - Topics may include but are not limited to the following:
        - Challenges to feed over 7 Billion people
        - Food Security
        - GMOs
        - CAFOs
        - Green Revolution in Agriculture—fertilizers, pesticides, irrigation, etc.
        - Biotech, Biocontrol, and Food
        - Organic vs. Intensive vs. Slash and Burn vs. Sustainable
        - Soil Conservation
        - Gleaming

UNIT 1: Introduction to the Citizen Scientist

Big Idea #1: Sustainable use of natural resources is essential to provide for the needs and wants of all living things now and in the future.

Essential Questions:

- How are the needs and wants of all living things (including humans) directly connected to successful management of natural resources?

Concepts:

- Humans can cause changes directly and indirectly to ecosystems over time.
- New technologies affect the use and management of our natural resources.

Competencies:

- Describe in detail how sustainability balances the needs of humans and society with the needs of a natural system.
- Discuss how the availability of our natural resources in dependent on climatic occurrences, available technologies and consumer wants and desires.

Big Idea #2: People acting individually and/or as groups influence the environment.

Essential Questions:

- How do humans influence the environment?

Concepts:

- Human actions affect ecosystems.
- Human practices can lead to water, air, soil, and indoor pollution.

Competencies:

- Describe how human actions affect the balance within an ecosystem.
- Compare and contrast how human practices affect the health of the environment.

Big Idea #3: Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.

Essential Questions:

- How and why do organisms interact with their environment and what are the effects of these interactions?

Concepts:

- Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support.
- Matter is transferred though organisms in an ecosystem; some is stored, most is lost.
- Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy of life processes.

Competencies:

- Evaluate data to explain resources availability and other environmental factors that affect carrying capacity of ecosystems.
- Use data to develop mathematical models to describe the flow of matter and energy between organism and the ecosystem.
- Use data to develop mathematical models to describe the flow of matter and energy between organism and the ecosystem.

Science Long Term Transfer Goals:

1. Approach science as a reliable and tentative way of knowing and explaining the natural world.
2. Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
3. Make and use observations to analyze relationships and patterns in order to explain phenomena, develop models, and make predictions.
4. Evaluate Systems, in order to connect how form determines function and how any change in one component affects the entire system.
5. Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.

Unifying Themes Big Ideas and Essential Questions:

- The flow of energy and matter into, out of, and within systems can be tracked to understand the systems' possibilities and limitations.
    - How does the flow of energy contribute to the functioning of a system?
- Data must be presented in a form that can reveal any patterns and relationships that allows results to be communicated to others.
    - In what ways are data analyzed, interpreted, and communicated?

Inquiry and Design Big Ideas and Essential Questions:

- Data must be presented in a form that can reveal any patters and relationships and that allows results to be communicated to others.
    - In what ways are data analyzed, interpreted, and communicated?

Unit 1: **Ethics, Worldview, Risk, and Statistics**
Time Range in Days: 10-14 days

Standard(s):
Biology; Environment and Ecology; Technology

3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry

4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6

3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchor(s):
BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5,
Unifying Themes: 3.3.12.A

Overview:
The Citizen Science is an interdisciplinary science course that focuses on current events relating to scientific issues and the events that occur within the biome of the temperate deciduous forest, especially Northeastern Pennsylvania. Current events will take a precedent throughout the course and will be incorporated freely throughout each unit. Students will identify ethical philosophies, worldviews, and values as well as the concepts of sustainability and sustainable development. The scientific method and processes relating to the current issues in science will be examined in addition to local, state, national, and global issues. Students will then examine risk and risk management in relation to current issues and begin to explore why science literacy is important for decision making. Students will also examine statistics and false claims in science along with the peer review process.

Focus Question(s):

- What are the key science related issues in your life or in your community?
- What is your worldview?
- How do ethics, worldview, and values play a role in science literacy and scientific issues?
- How does the human population influence environmental and scientific issues?

- What is sustainability?
- What role do statistics and graphical analysis play in science literacy?
- How can data be manipulated?

Goals:
Students will be able to independently use their learning to:

- Approach science as a reliable and tentative way of knowing and explaining the natural world.
- Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
- Make and use observations to analyze relationships and patterns in order to explain phenomena, develop models, and make predictions.
- Evaluate systems, in order to connect how form determines function and how any change to one component affects the entire system.
- Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.
- To introduce students to science current events that apply to the course.
- To define ethics, worldview, values, and sustainability.
- To examine the interdisciplinary nature of science and all the corresponding components involved in science research and decision making.
- To examine risk and risk management.
- To examine issues relating to human population on science issues.
- To investigate statistics and statistical interpretation in regards to data analysis and interpretation.

Objectives:

- Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
- Examine and discuss ethics, worldview, values, and sustainability in relation to scientific issues. (DOK 3)
- Diagnose and discuss some of the major scientific dilemmas of today. (DOK 3)
- Identify conservation, preservation, and sustainability. (DOK 1)
- Investigate what can be asked scientifically. (DOK 3)
- Investigate risk and risk management. (DOK 3)
- Examine graphs, statistics, interpretation and analysis. (DOK 3)
- Explore the process of peer review and credible sources within science. (DOK 3)

Core Activities and Corresponding Instructional Methods:

Do to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.

1. Students will take notes via Smart Notebook and other presentation software and use guided outlines and graphic organizers.
2. Students will participate in class discussions and group work regarding materials in Unit 1.
3. Students will conduct research through media, text, or other resources on issues facing the planet today and prepare discussion questions.
4. Students will research current events and participate in class discussion and current event assignments.
5. Students will read case studies to answer content questions, write summary paragraphs, or create materials for debate, discussion, or presentation.
6. Students will utilize relevant video resources to introduce, enforce, or foster questions regarding issues in the science community.
7. Students will read and analyze science articles.
8. Students will complete note sheets, worksheets, vocabulary evaluations, and content evaluations to demonstrate understanding of the concepts within the unit.

Assessments:

Diagnostic:

- Informal questioning
- Pre-tests or pre-surveys based on topic
- Exploration and examination of local issues to demonstrate prior knowledge of topics

Formative:

- Observations
- Assorted worksheets
- Vocabulary practice
- Diagrams if applicable
- Study guides
- Video guides
- Current event logs/journals
- Structured class discussion

Summative:

- Case studies and questions
- Video summaries
- Essays, debates, presentations, and other class projects
- Vocabulary quizzes

- Content Exams

Extensions:

- Teacher demonstrations
- Extended reading
- Current event articles and videos
- Online Resources and activities
- Science Applied readings
- Science Behind the Stories readings
- Other readings from a variety of applicable sources
- Nature walks or local ecosystem exploration

Correctives:

- Reviewing objectives
- Testing your comprehension handouts for each unit/topic
- Guided reading with guides as needed

Materials and Resources:

1. Current Events—news articles, videos, media resources.
2. Documentaries that apply to the topic (tentative potential list in Appendix)
3. Short videos for each topic—utilizing available video resources and other resources (Discovery, PBS, TED, news websites, YouTube, NPR, etc)
4. ChromeBooks
5. Science magazines
6. Case Studies
7. Teacher generated worksheets
8. "The Science Behind the Stories" reading segments (textbook)
9. "Applied Science" reading segments (textbook)
10. Environmental Science textbook resources from other courses and a variety of textbooks

11. —initial list is included in the appendix.

UNIT 2: Your Biome in Autumn—Biodiversity and Cycles in Nature

Big Idea #1: Sustainable use of natural resources is essential to provide for the needs and wants of all living things now and in the future.

Essential Questions:

- How are the needs and wants of all living things (including humans) directly connected to successful management of natural resources?

Concepts:

- Humans can cause changes directly and indirectly to ecosystems over time.
- New technologies affect the use and management of our natural resources.

Competencies:

- Describe in detail how sustainability balances the needs of humans and society with the needs of a natural system.
- Discuss how the availability of our natural resources in dependent on climatic occurrences, available technologies and consumer wants and desires.

Big Idea #2: People acting individually and/or as groups influence the environment.

Essential Questions:

- How do humans influence the environment?

Concepts:

- Human actions affect ecosystems.
- Human practices can lead to water, air, soil, and indoor pollution.

Competencies:

- Describe how human actions affect the balance within an ecosystem.
- Compare and contrast how human practices affect the health of the environment.

Big Idea #3: Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.

Essential Questions:

- How and why do organisms interact with their environment and what are the effects of these interactions?

Concepts:

- Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support.
- Matter is transferred though organisms in an ecosystem; some is stored, most is lost.

- Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy of life processes.

Competencies:

- Evaluate data to explain resources availability and other environmental factors that affect carrying capacity of ecosystems.
- Use data to develop mathematical models to describe the flow of matter and energy between organism and the ecosystem.
- Use data to develop mathematical models to describe the flow of matter and energy between organism and the ecosystem.

Big Idea #4: The Health of all living things is directly related to the quality of the environment.

Essential Questions:

- How does the quality of the environment affect the health of all living things within it?

Concepts:

- Human health is affected by pollution.
- Environmental health and biological diversity are affected by human practices.

Competencies:

- Analyze the effect of air, water, soil, noise, and indoor pollution on society.
- Analyze the effects of human activities on the health of organisms in an ecosystem.

Science Long Term Transfer Goals:

1. Approach science as a reliable and tentative way of knowing and explaining the natural world.
2. Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
3. Make and use observations to analyze relationships and patterns in order to explain phenomena, develop models, and make predictions.
4. Evaluate Systems, in order to connect how form determines function and how any change in one component affects the entire system.
5. Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.

Unifying Themes Big Ideas and Essential Questions:

- The flow of energy and matter into, out of, and within systems can be tracked to understand the systems' possibilities and limitations.
    - How does the flow of energy contribute to the functioning of a system?

- Data must be presented in a form that can reveal any patterns and relationships that allows results to be communicated to others.
    - In what ways are data analyzed, interpreted, and communicated?

Inquiry and Design Big Ideas and Essential Questions:

- Data must be presented in a form that can reveal any patters and relationships and that allows results to be communicated to others.
    - In what ways are data analyzed, interpreted, and communicated?

Curriculum Plan

Unit 2: Your Biome in Autumn—Biodiversity and Cycles in Nature

Time Range in Days: 18-22 days

Standard(s):
Biology; Environment and Ecology; Technology

3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry

4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6

3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchor(s):
BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5,
Unifying Themes: 3.3.12.A

Overview:
The Citizen Science is an interdisciplinary science course that focuses on current events relating to scientific issues and the events that occur within the biome of the temperate deciduous forest, especially Northeastern Pennsylvania. Current events will take a precedent throughout the course and will be incorporated freely throughout each unit. Students will identify biodiversity and cycles in nature in relation to the temperate deciduous forest. The topics include, but are not limited to: the Delaware River, Migrations patterns, Tree Identification and other biodiversity surveys on campus and in the community, Weather and Hurricane patterns, and other topics dealing with the ecology of Pennsylvania. Students will be encouraged to examine what is happening in

their community and to examine any current events or science issues that their biome faces in the autumn in an attempt to build science literacy and understanding on the local, state, national, and global level.

Focus Question(s):

- What are the key science related issues currently occurring in your life or in your community?
- What is the biodiversity of your biome and what issues are the local ecological communities facing?
- How does weather influence your ecological community?
- What are the cycles of nature in your ecological community and how does it change during this season?
- How does weather influence your biome?

Goals:

Students will be able to independently use their learning to:

- Approach science as a reliable and tentative way of knowing and explaining the natural world.
- Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
- Make and use observations to analyze relationships and patterns in order to explain phenomena, develop models, and make predictions.
- Evaluate systems, in order to connect how form determines function and how any change to one component affects the entire system.
- Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.
- To introduce students to science current events that apply to the course.
- To examine the biodiversity of the temperate deciduous forest in autumn; including topics of species identification, migration, seasonal change, and the Delaware River.
- To examine cycles in nature and energy in the community as well as the impact of weather on cycles.

Objectives:

- Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
- Examine and discuss biodiversity issues within the temperate deciduous forest in relation to scientific issues. (DOK 3)
- Explore and evaluate the changing biological communities surround us. (DOK 2)
- Examine and discuss cycles in nature and energy in the community as well as the impact of weather on cycles in nature. (DOK 3)
- Diagnose and discuss some of the major scientific dilemmas of today. (DOK 3)
- Examine graphs, statistics, interpretation and analysis. (DOK 3)
- Explore the process of peer review and credible sources within science. (DOK 3)

- Students will read and analyze science articles.
- Students will complete note sheets, worksheets, vocabulary evaluations, and content evaluations to demonstrate understanding of the concepts within the unit.
- Research and possibly participate in a citizen science project. (DOK 3)

Core Activities and Corresponding Instructional Methods:

Do to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.

1. Students will take notes via Smart Notebook and other presentation software and use guided outlines and graphic organizers.
2. Students will participate in class discussions and group work regarding materials in Unit 2.
3. Students will research through media, text, or other resources issues facing the planet today and prepare discussion questions.
4. Students will research current events and participate in class discussion.
5. Students will read case studies to answer content questions, write summary paragraphs, or create materials for debate, discussion, or presentation.
6. Students will utilize relevant video resources to introduce, enforce, or foster questions regarding issues in the science community.
7. Students will read and analyze science articles in relation to biodiversity and cycles in nature and energy.
8. Students will complete note sheets, worksheets, vocabulary evaluations, and content evaluations to demonstrate understanding of the concepts within the unit.
9. Students will explore their community and the biodiversity on campus in an effort to look up, look out, and see what is happening in the ecological community that surrounds them.

Assessments:

Diagnostic:

- Informal questioning
- Pre-tests or pre-surveys based on topic
- Nature walks with discussion of prior knowledge of the ecological community

Formative:

- Observations
- Assorted worksheets
- Vocabulary practice
- Diagrams if applicable

- Study guides
- Video guides
- Current event logs/journals
- Structured class discussion

Summative:

- Case studies and questions
- Video summaries
- Biodiversity studies
- Essays, debates, presentations, and other class projects
- Vocabulary quizzes
- Content Exams

Extensions:

- Teacher demonstrations
- Extended reading
- Current event articles and videos
- Online Resources and activities
- Science Applied readings
- Science Behind the Stories readings
- Nature walks and biodiversity studies
- Other readings from a variety of applicable sources

Correctives:

- Reviewing objectives
- Testing your comprehension handouts for each unit/topic
- Guided reading with guides as needed

Materials and Resources:

1. Field guides and identification keys
2. Current Events—news articles, videos, media resources.
3. Documentaries that apply to the topic (tentative potential list in Appendix)
4. Short videos for each topic—utilizing available video resources and other resources (Discovery, PBS, TED, news websites, YouTube, NPR, etc)
5. ChromeBooks
6. Science magazines
7. Case Studies
8. Teacher generated worksheets

9. "The Science Behind the Stories" reading segments (textbook)
10. "Applied Science" reading segments (textbook)
11. Environmental Science textbook resources from other courses and a variety of textbooks

12. —initial list is included in the appendix.

UNIT 3: Food and Agriculture

Big Idea #1: Sustainable use of natural resources is essential to provide for the needs and wants of all living things now and in the future.

Essential Questions:

- How are the needs and wants of all living things (including humans) directly connected to successful management of natural resources?

Concepts:

- Humans can cause changes directly and indirectly to ecosystems over time.
- New technologies affect the use and management of our natural resources.

Competencies:

- Describe in detail how sustainability balances the needs of humans and society with the needs of a natural system.
- Discuss how the availability of our natural resources in dependent on climatic occurrences, available technologies and consumer wants and desires.

Big Idea #2: People acting individually and/or as groups influence the environment.

Essential Questions:

- How do humans influence the environment?

Concepts:

- Human actions affect ecosystems.
- Human practices can lead to water, air, soil, and indoor pollution.

Competencies:

- Describe how human actions affect the balance within an ecosystem.
- Compare and contrast how human practices affect the health of the environment.

Big Idea #3: The health of all living things is directly related to the quality of the environment.

Essential Questions:

- How does the quality of the environment affect the health of all living things within it?

Concepts:

- Human health is affected by pollution.
- Environmental health and biological diversity are affected by human practices.

Competencies:

- Analyze the effect of air, water, soil, noise, and indoor pollution on society.
- Analyze the effects of human activities on the health of organisms in an ecosystem.

Big Idea #4: Humans depend on the management and practices of agricultural systems.

Essential Questions:

- In what ways are human societies and cultures impacted by management and practices of agricultural systems?

Concepts:

- Agriculture has influenced culture, standard of living and foreign trade.
- Laws and regulations affect conservation and management of food and fiber production.
- Agricultural science influences farming practices, efficiency, and nutrition over time.
- Technological advancements increase efficiency in production and environmental impacts of agriculture.
- Integrated pest management (IPM) carries both benefits and risks when associated with agriculture.
- Society's needs and standard of living directly impact the sustainability of natural resources.
- Natural resource use and availability affect the sustainability of society.
- Technological advancements have changed society's standard of living and affect the sustainability of natural resources.
- Human activity affects ecosystems for better or worse.
- Human and societal supply and demand impact the environment in a variety of ways.

Competencies:

- Identify how agriculture is vitally important in meeting the needs of society and maintaining the economy.
- Recognize that agricultural sciences and technologies strive to increase efficiency while balancing the needs of society with the conservation of our natural resources.
- Describe how agricultural components and systems affect—and are affected by—social, pollical, environmental, and economic factors.
- Recognize that sustainability of natural resources fluctuates based on society's needs or wants and the technological advances used.
- Discuss and describe how human activities cause changes within ecosystems.—positively, negatively, or both.

Science Long Term Transfer Goals:

1. Approach science as a reliable and tentative way of knowing and explaining the natural world.
2. Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
3. Make and use observations to analyze relationships and patterns in order to explain phenomena, develop models, and make predictions.
4. Evaluate Systems, in order to connect how form determines function and how any change in one component affects the entire system.
5. Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.

Unifying Themes Big Ideas and Essential Questions:

- The flow of energy and matter into, out of, and within systems can be tracked to understand the systems' possibilities and limitations.
  - How does the flow of energy contribute to the functioning of a system?
- Data must be presented in a form that can reveal any patterns and relationships that allows results to be communicated to others.
  - In what ways are data analyzed, interpreted, and communicated?

Curriculum Plan

Unit 3: **Food and Agriculture**
Time Range in Days: **10-12 days**

Standard(s):
Biology; Environment and Ecology; Technology

3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry

4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6

3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchor(s):
BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5,
Unifying Themes: 3.3.12.A

Overview:

The Citizen Science is an interdisciplinary science course that focuses on current events relating to scientific issues and the events that occur within the biome of the temperate deciduous forest, especially Northeastern Pennsylvania. Current events will take a precedent throughout the course and will be incorporated freely throughout each unit. In this unit, students will explore issues and topics related to the challenges of feeding over 7 billion people on the planet and the role that biotechnology is impacting modern agriculture in the post-green revolution era of agriculture. Topics may include by are not limited to: food security and malnutrition, GMOs, CAFOs, Green Revolution and its technological advancements of fertilizers, pesticides, irrigation, GMOs, etc; Biotechnology, Biocontrol, various types of farming (organic, subsistence, intensive, slash and burn), soil conservation, and any current events dealing with food and agriculture. Students will also examine the challenges of farming in the temperate deciduous forest, food waste, and the concept of eating locally or sustainably.

Focus Question(s):

- What are the key science related issues in your life or in your community?
- How are we going to feed a growing human population?
- What are the risks and rewards of using various biotechnology and green revolution advancements in agriculture?
- What are the ways to conserve soil?
- Is food security a human right?
- How should we deal with food waste?
- What are the various types of farming techniques and practices?
- What role do statistics and graphical analysis play in science literacy?
- How can data be manipulated?

Goals:

Students will be able to independently use their learning to:

- Approach science as a reliable and tentative way of knowing and explaining the natural world.
- Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
- Make and use observations to analyze relationships and patterns in order to explain phenomena, develop models, and make predictions.
- Evaluate systems, in order to connect how form determines function and how any change to one component affects the entire system.
- Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.
- To introduce students to science current events that apply to the course.

- To define and identify issues and challenges in relation to providing adequate, nutritious food to over 7 billion people on the planet.
- To discuss the impacts of biotechnology and green revolution advancements on the planet.
- To examine the various farming techniques: organic, intensive, subsistence, sustainable, slash/burn, etc.
- To examine the need for soil conservation.
- To examine malnutrition, food waste, food security, and how to feed the world.
- To investigate statistics and statistical interpretation in regards to data analysis and interpretation.
- To research and possibly participate in a citizen science project.

Objectives:

- Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
- Diagnose and discuss some of the major scientific dilemmas of today. (DOK 3)
- Explain the principals of soil conservation. (DOK 1)
- Describe human nutritional requirements. (DOK 2)
- Explain why nutritional requirements are not being met in various parts of the world. (DOK 3)
- Analyze alternatives to conventional farming methods. (DOK 4)
- Identify and analyze the impacts of biotechnology and the green revolution on the environment. (DOK 4)
- Describe the science behind genetically modified food. (DOK 1)
- Evaluate controversies and the debate over genetically modified food. (DOK 4)
- Assess feedlot agriculture for livestock and poultry. (DOK 4)
- Evaluate sustainable agriculture, including organic, as well as non-sustainable agriculture. (DOK 4)
- Examine graphs, statistics, interpretation and analysis. (DOK 3)
- Explore the process of peer review and credible sources within science. (DOK 3)
- Research and possibly participate in a citizen science project. (DOK 3)
- Explore relevant topics based on class discussion and interest in regards to food and agriculture. (DOK 1)

Core Activities and Corresponding Instructional Methods:

Do to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.

1. Students will take notes via Smart Notebook and other presentation software and use guided outlines and graphic organizers.
2. Students will participate in class discussions and group work regarding materials in Unit 3.

3. Students will conduct research through media, text, or other resources on issues facing the planet today and prepare discussion questions.
4. Students will research current events and participate in class discussion and current event assignments.
5. Students will read case studies to answer content questions, write summary paragraphs, or create materials for debate, discussion, or presentation.
6. Students will utilize relevant video resources to introduce, enforce, or foster questions regarding issues in the science community.
7. Students will read and analyze science articles in relation to biodiversity and cycles in nature and energy.
8. Students will complete note sheets, worksheets, vocabulary evaluations, and content evaluations to demonstrate understanding of the concepts within the unit.

Assessments:

Diagnostic:

- Informal questioning
- Pre-tests or pre-surveys based on topic
- Nature walks to explore prior knowledge for this topic

Formative:

- Observations
- Assorted worksheets
- Vocabulary practice
- Diagrams if applicable
- Study guides
- Video guides
- Current event logs/journals
- Structured class discussion

Summative:

- Case studies and questions
- Video summaries
- Essays, debates, presentations, and other class projects
- Vocabulary quizzes
- Content Exams

Extensions:

- Teacher demonstrations

- Extended reading
- Current event articles and videos
- Online Resources and activities
- Science Applied readings
- Science Behind the Stories readings
- Nature walks to make connections with the local ecosystem

Correctives:

- Reviewing objectives
- Testing your comprehension handouts for each unit/topic
- Guided reading with guides as needed

Materials and Resources:

1. Current Events—news articles, videos, media resources.
2. Documentaries that apply to the topic (tentative potential list in Appendix)
3. Short videos for each topic—utilizing available video resources and other resources (Discovery, PBS, TED, news websites, YouTube, NPR, etc)
4. ChromeBooks
5. Science magazines
6. Case Studies
7. Teacher generated worksheets
8. "The Science Behind the Stories" reading segments (textbook)
9. "Applied Science" reading segments (textbook)
10. Environmental Science textbook resources from other courses and a variety of textbooks

11. —initial list is included in the appendix.

MARKING PERIOD 2:

Marking Period Two -Overview based on 45 days:

UNIT 4: Consumerism and Human Population Issues
UNIT 5: Your Biome in Winter
UNIT 6: Citizen Science in the World-Part 1

Marking Period Two -Goals:

Understanding of:

- Ongoing exploration of relevant current events on a local, state, national, and global level as they become available to foster science literacy in society.
- Consumerism and Human Population Issues
    - Topics may include but are not limited to the following:
        - Issues with growing Human Population
        - Developed vs. Developing Counties
        - "Cradle to grave" manufacturing
        - Fair Trade and EarthWise Consumerism
        - "Throw-away Society"
        - Waste generation and management
        - Water Issues
        - Who owns your water?
        - Who owns your food?
        - The rise of the monopolies
        - Energy issues
        - Mining Issues
        - FF use and extraction issues
        - Renewable vs nonrenewable energy
        - Developed vs. Developing
        - Pollution issues
        - Air, Water, Soil, Noise Pollution
        - Acid Rain
        - Ozone layer and Issues
- Your Biome and Winter
    - Topics may include but are not limited to the following:
        - Hibernations
        - Biodiversity Topics for Winter
        - Cycles in Nature and Energy
- Citizen Science in the World
    - Participate in or research a way to get involved in Citizen Science projects.

UNIT 5: Consumerism and Human Population issues

Big Idea #1: Sustainable use of natural resources is essential to provide for the needs and wants of all living things now and in the future.

Essential Questions:

- How are the needs and wants of all living things (including humans) directly connected to successful management of natural resources?

Concepts:

- Humans can cause changes directly and indirectly to ecosystems over time.
- New technologies affect the use and management of our natural resources.

Competencies:

- Describe in detail how sustainability balances the needs of humans and society with the needs of a natural system.
- Discuss how the availability of our natural resources in dependent on climatic occurrences, available technologies and consumer wants and desires.

Big Idea #2: People acting individually and/or as groups influence the environment.

Essential Questions:

- How do humans influence the environment?

Concepts:

- Human actions affect ecosystems.
- Human practices can lead to water, air, soil, and indoor pollution.

Competencies:

- Describe how human actions affect the balance within an ecosystem.
- Compare and contrast how human practices affect the health of the environment.

Big Idea #3: The health of all living things is directly related to the quality of the environment.

Essential Questions:

- How does the quality of the environment affect the health of all living things within it?

Concepts:

- Human health is affected by pollution.
- Environmental health and biological diversity are affected by human practices.

Competencies:

- Analyze the effect of air, water, soil, noise, and indoor pollution on society.
- Analyze the effects of human activities on the health of organisms in an ecosystem.

Big Idea #4: Humans depend on the management and practices of agricultural systems.

Essential Questions:

- In what ways are human societies and cultures impacted by management and practices of agricultural systems?

Concepts:

- Agriculture has influenced culture, standard of living and foreign trade.
- Laws and regulations affect conservation and management of food and fiber production.
- Agricultural science influences farming practices, efficiency, and nutrition over time.
- Technological advancements increase efficiency in production and environmental impacts of agriculture.
- Integrated pest management (IPM) carries both benefits and risks when associated with agriculture.
- Society's needs and standard of living directly impact the sustainability of natural resources.
- Natural resource use and availability affect the sustainability of society.
- Technological advancements have changed society's standard of living and affect the sustainability of natural resources.
- Human activity affects ecosystems for better or worse.
- Human and societal supply and demand impact the environment in a variety of ways.

Competencies:

- Identify how agriculture is vitally important in meeting the needs of society and maintaining the economy.
- Recognize that agricultural sciences and technologies strive to increase efficiency while balancing the needs of society with the conservation of our natural resources.
- Describe how agricultural components and systems affect—and are affected by—social, pollical, environmental, and economic factors.
- Recognize that sustainability of natural resources fluctuates based on society's needs or wants and the technological advances used.
- Discuss and describe how human activities cause changes within ecosystems. —positively, negatively, or both.

Science Long Term Transfer Goals:

1. Approach science as a reliable and tentative way of knowing and explaining the natural world.
2. Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
3. Make and use observations to analyze relationships and patterns to explain phenomena, develop models, and make predictions.
4. Evaluate Systems, to connect how form determines function and how any change in one component affects the entire system.
5. Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.

Unifying Themes Big Ideas and Essential Questions:

- The flow of energy and matter into, out of, and within systems can be tracked to understand the systems' possibilities and limitations.
  - How does the flow of energy contribute to the functioning of a system?
- Data must be presented in a form that can reveal any patterns and relationships that allows results to be communicated to others.
  - In what ways are data analyzed, interpreted, and communicated?

Curriculum Plan

Unit 5: Consumerism and Human Population Issues
Time Range in Days: 18-20 days

Standard(s):
Biology; Environment and Ecology; Technology

3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry

4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6

3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchor(s):
BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5,
Unifying Themes: 3.3.12.A

Overview:
The Citizen Science is an interdisciplinary science course that focuses on current events relating to scientific issues and the events that occur within the biome of the temperate deciduous forest, especially Northeastern Pennsylvania. Current events will take a precedent throughout the course and will be incorporated freely throughout each unit. In this unit, students will examine current issues relating to consumerism and the growing human population on Earth. They will compare issues among developed and developing nations, examine manufacturing and waste and the ever-growing "throw-away society" culture. Besides waste and waste management, students will also examine water and food issues in relation to consumption and distribution as well as equity among the people of the world. Energy will also be examined with the goal of studying energy issues in terms of sustainability, use, extraction and use of nonrenewable energy and their impacts on the planet in comparison with the use of renewable energy resources. Students will also examine pollution issues with air, water, soil, and noise pollution as well as acid rain and ozone layer depletion as topics of interest.

Focus Question(s):

- What are the key science related issues in your life or in your community?
- Can we provide the necessary resources for over 7 billion people on the planet without depleting resources for future generations (sustainability)?
- What are the differences between consumerism and population issues among developed and developing nations?
- What are issues relating to waste and waste generation?
- What are issues relating to water use, consumption, and ownership?
- What are issues relating to food?
- Who owns your water, food, and energy?
- What are energy issues regarding extraction, use, impact on the environment, and pollution regarding nonrenewable and renewable resources?
- What are issues in pollution—air, water, soil, noise?
- What are the impacts of acid rain?
- What are the impacts of the ozone layer depeletion?
- What role do statistics and graphical analysis play in science literacy?
- How can data be manipulated?

Goals:
Students will be able to independently use their learning to:

- Approach science as a reliable and tentative way of knowing and explaining the natural world.

- Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
- Make and use observations to analyze relationships and patterns to explain phenomena, develop models, and make predictions.
- Evaluate systems, to connect how form determines function and how any change to one component affects the entire system.
- Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.
- To introduce students to science current events that apply to the course.
- To define and identify issues and challenges in relation to human population growth.
- To compare issues in developed and developing countries regarding consumerism, waste, pollution, water, food, and energy use.
- To examine energy issues in the world in relation to extraction, use, impacts, and pollution for both renewable and nonrenewable resources.
- To investigate pollution issues in developed and developing countries.
- To examine the formation of and impacts of acid rain.
- To examine the causes of ozone depletion in the stratosphere and the impacts.
- To investigate statistics and statistical interpretation regarding data analysis and interpretation.
- To research and possibly participate in a citizen science project.

Objectives:

- Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
- Diagnose and discuss some of the major scientific dilemmas of today. (DOK 3)
- Analyze the issues that are associated with the impacts of providing for a growing human population. (DOK 4)
- Compare consumerism and sustainability issues in both developed and developing countries. (DOK 3)
- Investigate waste generation and waste management. (DOK 3)
- Investigate water issues in the world. (DOK 3)
- Investigate food issues in the world. (DOK 3)
- Analyze types of pollution and the impacts of each (air, water, soil, noise). (DOK 4)
- Investigate acid rain formation and impacts. (DOK 3)
- Investigate ozone layer depletion and its impacts. (DOK 3)
- Examine graphs, statistics, interpretation and analysis. (DOK 3)
- Explore the process of peer review and credible sources within science. (DOK 3)
- Research and possibly participate in a citizen science project. (DOK 3)
- Explore relevant topics based on class discussion and interest regarding consumerisms and human population growth. (DOK 1)

Core Activities and Corresponding Instructional Methods:

Do to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.

1. Students will take notes via Smart Notebook and other presentation software and use guided outlines and graphic organizers.
2. Students will participate in class discussions and group work regarding materials in Unit 4.
3. Students will conduct research through media, text, or other resources on issues facing the planet today and prepare discussion questions.
4. Students will research current events and participate in class discussion and current event assignments.
5. Students will read case studies to answer content questions, write summary paragraphs, or create materials for debate, discussion, or presentation.
6. Students will utilize relevant video resources to introduce, enforce, or foster questions regarding issues in the science community.
7. Students will read and analyze science articles in relation to biodiversity and cycles in nature and energy.
8. Students will complete note sheets, worksheets, vocabulary evaluations, and content evaluations to demonstrate understanding of the concepts within the unit.

Assessments:

Diagnostic:

- Informal questioning
- Pre-tests or pre-surveys based on topic
- Nature walks to explore prior knowledge for this topic

Formative:

- Observations
- Assorted worksheets
- Vocabulary practice
- Diagrams if applicable
- Study guides
- Video guides
- Current event logs/journals
- Structured class discussion

Summative:

- Case studies and questions
- Video summaries
- Essays, debates, presentations, and other class projects
- Vocabulary quizzes
- Content Exams

Extensions:

- Teacher demonstrations
- Extended reading
- Current event articles and videos
- Online Resources and activities
- Science Applied readings
- Science Behind the Stories readings
- Nature walks to make connections with the local ecosystem

Correctives:

- Reviewing objectives
- Testing your comprehension handouts for each unit/topic
- Guided reading with guides as needed

Materials and Resources:

1. Current Events—news articles, videos, media resources.
2. Documentaries that apply to the topic (tentative potential list in Appendix)
3. Short videos for each topic—utilizing available video resources and other resources (Discovery, PBS, TED, news websites, YouTube, NPR, etc.)
4. ChromeBooks
5. Science magazines
6. Case Studies
7. Teacher generated worksheets
8. "The Science Behind the Stories" reading segments (textbook)
9. "Applied Science" reading segments (textbook)
10. Environmental Science textbook resources from other courses and a variety of textbooks

11. —initial list is included in the appendix.

UNIT 5: Your Biome in Winter—Biodiversity and Cycles in Nature

Big Idea #1: Sustainable use of natural resources is essential to provide for the needs and wants of all living things now and in the future.

Essential Questions:

- How are the needs and wants of all living things (including humans) directly connected to successful management of natural resources?

Concepts:

- Humans can cause changes directly and indirectly to ecosystems over time.
- New technologies affect the use and management of our natural resources.

Competencies:

- Describe in detail how sustainability balances the needs of humans and society with the needs of a natural system.
- Discuss how the availability of our natural resources in dependent on climatic occurrences, available technologies and consumer wants and desires.

Big Idea #2: People acting individually and/or as groups influence the environment.

Essential Questions:

- How do humans influence the environment?

Concepts:

- Human actions affect ecosystems.
- Human practices can lead to water, air, soil, and indoor pollution.

Competencies:

- Describe how human actions affect the balance within an ecosystem.
- Compare and contrast how human practices affect the health of the environment.

Big Idea #3: Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.

Essential Questions:

- How and why do organisms interact with their environment and what are the effects of these interactions?

Concepts:

- Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support.
- Matter is transferred though organisms in an ecosystem; some is stored, most is lost.
- Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy of life processes.

Competencies:

- Evaluate data to explain resources availability and other environmental factors that affect carrying capacity of ecosystems.
- Use data to develop mathematical models to describe the flow of matter and energy between organism and the ecosystem.
- Use data to develop mathematical models to describe the flow of matter and energy between organism and the ecosystem.

Big Idea #4: The Health of all living things is directly related to the quality of the environment.

Essential Questions:

- How does the quality of the environment affect the health of all living things within it?

Concepts:

- Human health is affected by pollution.
- Environmental health and biological diversity are affected by human practices.

Competencies:

- Analyze the effect of air, water, soil, noise, and indoor pollution on society.
- Analyze the effects of human activities on the health of organisms in an ecosystem.

Science Long Term Transfer Goals:

1. Approach science as a reliable and tentative way of knowing and explaining the natural world.
2. Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
3. Make and use observations to analyze relationships and patterns in order to explain phenomena, develop models, and make predictions.
4. Evaluate Systems, in order to connect how form determines function and how any change in one component affects the entire system.
5. Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.

Unifying Themes Big Ideas and Essential Questions:

- The flow of energy and matter into, out of, and within systems can be tracked to understand the systems' possibilities and limitations.
    - How does the flow of energy contribute to the functioning of a system?
- Data must be presented in a form that can reveal any patterns and relationships that allows results to be communicated to others.
    - In what ways are data analyzed, interpreted, and communicated?

Inquiry and Design Big Ideas and Essential Questions:

- Data must be presented in a form that can reveal any patters and relationships and that allows results to be communicated to others.
    - In what ways are data analyzed, interpreted, and communicated?

Curriculum Plan

Unit 5: Your Biome in Winter—Biodiversity and Cycles in Nature

Time Range in Days: 18-22 days

Standard(s):
Biology; Environment and Ecology; Technology

3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry

4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6

3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchor(s):
BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5,
Unifying Themes: 3.3.12.A

Overview:
The Citizen Science is an interdisciplinary science course that focuses on current events relating to scientific issues and the events that occur within the biome of the temperate deciduous forest, especially Northeastern Pennsylvania. Current events will take a precedent throughout the course and will be incorporated freely throughout each unit. Students will identify biodiversity and cycles in nature in relation to the temperate deciduous forest. The topics include, but are not limited to: the Delaware River,

hibernations, biodiversity for winter, and cycles in nature and energy. Weather will be investigated as well as other topics dealing with the ecology of Pennsylvania. Students will be encouraged to examine what is happening in their community and to examine any current events or science issues that their biome faces in the winter in an attempt to build science literacy and understanding on the local, state, national, and global level.

Focus Question(s):

- What are the key science related issues currently occurring in your life or in your community?
- What is the biodiversity of your biome and what issues are the local ecological communities facing?
- How does weather influence your ecological community?
- What are the cycles of nature in your ecological community and how does it change during this season?
- How does weather influence your biome?

Goals:
Students will be able to independently use their learning to:

- Approach science as a reliable and tentative way of knowing and explaining the natural world.
- Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
- Make and use observations to analyze relationships and patterns in order to explain phenomena, develop models, and make predictions.
- Evaluate systems, to connect how form determines function and how any change to one component affects the entire system.
- Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.
- To introduce students to science current events that apply to the course.
- To examine the biodiversity of the temperate deciduous forest in winter; including topics of species identification, hibernation, seasonal change, and the Delaware River.
- To examine cycles in nature and energy in the community as well as the impact of weather on cycles.

Objectives:

- Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
- Examine and discuss biodiversity issues within the temperate deciduous forest in relation to scientific issues. (DOK 3)

- Explore and evaluate the changing biological communities surround us. (DOK 2)
- Examine and discuss cycles in nature and energy in the community as well as the impact of weather on cycles in nature. (DOK 3)
- Diagnose and discuss some of the major scientific dilemmas of today. (DOK 3)
- Examine graphs, statistics, interpretation and analysis. (DOK 3)
- Explore the process of peer review and credible sources within science. (DOK 3)
- Research and possibly participate in a citizen science project. (DOK 3)

Core Activities and Corresponding Instructional Methods:

Do to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.

1. Students will take notes via Smart Notebook and other presentation software and use guided outlines and graphic organizers.
2. Students will participate in class discussions and group work regarding materials in Unit 5.
3. Students will research through media, text, or other resources issues facing the planet today and prepare discussion questions.
4. Students will research current events and participate in class discussion.
5. Students will read case studies to answer content questions, write summary paragraphs, or create materials for debate, discussion, or presentation.
6. Students will utilize relevant video resources to introduce, enforce, or foster questions regarding issues in the science community.
7. Students will read and analyze science articles in relation to biodiversity and cycles in nature and energy.
8. Students will complete note sheets, worksheets, vocabulary evaluations, and content evaluations to demonstrate understanding of the concepts within the unit.
9. Students will explore their community and the biodiversity on campus in an effort to look up, look out, and see what is happening in the ecological community that surrounds them.

Assessments:

Diagnostic:

- Informal questioning
- Pre-tests or pre-surveys based on topic
- Nature walks with discussion of prior knowledge of the ecological community

Formative:

- Observations
- Assorted worksheets

- Vocabulary practice
- Diagrams if applicable
- Study guides
- Video guides
- Current event logs/journals
- Structured class discussion

Summative:

- Case studies and questions
- Video summaries
- Biodiversity studies
- Essays, debates, presentations, and other class projects
- Vocabulary quizzes
- Content Exams

Extensions:

- Teacher demonstrations
- Extended reading
- Current event articles and videos
- Online Resources and activities
- Science Applied readings
- Science Behind the Stories readings
- Nature walks and biodiversity studies
- Other readings from a variety of applicable sources

Correctives:

- Reviewing objectives
- Testing your comprehension handouts for each unit/topic
- Guided reading with guides as needed

Materials and Resources:

1. Field guides and identification keys
2. Current Events—news articles, videos, media resources.
3. Documentaries that apply to the topic (tentative potential list in Appendix)
4. Short videos for each topic—utilizing available video resources and other resources (Discovery, PBS, TED, news websites, YouTube, NPR, etc)
5. ChromeBooks
6. Science magazines

7. Case Studies
8. Teacher generated worksheets
9. “The Science Behind the Stories” reading segments (textbook)
10. “Applied Science” reading segments (textbook)
11. Environmental Science textbook resources from other courses and a variety of textbooks

12. —initial list is included in the appendix.

UNIT 6: Citizen Science in the World

Big Idea #1: People acting individually and/or as groups influence the environment.

Essential Questions:

- How do humans influence the environment?

Concepts:

- Human actions affect ecosystems.
- Human practices can lead to water, air, soil, and indoor pollution.

Competencies:

- Describe how human actions affect the balance within an ecosystem.
- Compare and contrast how human practices affect the health of the environment.

Science Long Term Transfer Goals:

1. Approach science as a reliable and tentative way of knowing and explaining the natural world.
2. Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
3. Make and use observations to analyze relationships and patterns in order to explain phenomena, develop models, and make predictions.
4. Evaluate Systems, in order to connect how form determines function and how any change in one component affects the entire system.
5. Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.

Unifying Themes Big Ideas and Essential Questions:

- The flow of energy and matter into, out of, and within systems can be tracked to understand the systems' possibilities and limitations.
    - How does the flow of energy contribute to the functioning of a system?
- Data must be presented in a form that can reveal any patterns and relationships that allows results to be communicated to others.
    - In what ways are data analyzed, interpreted, and communicated?

DELAWARE VALLEY SCHOOL DISTRICT

Curriculum Plan

Unit 6: Citizen Science in the World
Time Range in Days: 2-4 days

Standard(s):
Biology; Environment and Ecology; Technology

3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry

4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6

3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchor(s):
BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5,
Unifying Themes: 3.3.12.A

Overview:
The Citizen Science is an interdisciplinary science course that focuses on current events relating to scientific issues and the events that occur within the biome of the temperate deciduous forest, especially Northeastern Pennsylvania. Current events will take a precedent throughout the course and will be incorporated freely throughout each unit. In this unit, students will examine opportunities to get involved in the community and to participate in true citizen science. Students will research opportunities for science research and possibly participate in a citizen science project.

Focus Question(s):

- What are the key science related issues in your life or in your community?
- What are some citizen science opportunities in the community?
- How can you get involved and help?

Goals:
Students will be able to independently use their learning to:

- Approach science as a reliable and tentative way of knowing and explaining the natural world.

- Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
- Make and use observations to analyze relationships and patterns in order to explain phenomena, develop models, and make predictions.
- Evaluate systems, in order to connect how form determines function and how any change to one component affects the entire system.
- Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.
- To introduce students to science current events that apply to the course.
- To investigate statistics and statistical interpretation in regards to data analysis and interpretation.
- To research and possibly participate in a citizen science project.

Objectives:

- Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
- Diagnose and discuss some of the major scientific dilemmas of today. (DOK 3)
- Research and possibly participate in a citizen science project. (DOK 3)

Core Activities and Corresponding Instructional Methods:

Do to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.

1. Students will take notes via Smart Notebook and other presentation software and use guided outlines and graphic organizers.
2. Students will participate in class discussions and group work regarding materials in Unit 6.
3. Students will conduct research through media, text, or other resources on opportunities to participate in citizen science.
4. Students will utilize relevant video resources to introduce, enforce, or foster questions regarding issues in the science community.
5. Students will read and analyze science articles.
6. Students will participate in potential citizen science projects and/or observations in their communities.

Assessments:

Diagnostic:

- Informal questioning
- Pre-tests or pre-surveys based on topic

Formative:

- Observations
- Current event logs/journals
- Structured class discussion

Summative:

- Case studies and questions
- Video summaries
- Essays, debates, presentations, and other class projects

Extensions:

- Teacher demonstrations
- Extended reading
- Current event articles and videos
- Online Resources and activities
- Science Applied readings
- Science Behind the Stories readings

Correctives:

- Reviewing objectives
- Testing your comprehension handouts for each unit/topic
- Guided reading with guides as needed

Materials and Resources:

1. Current Events—news articles, videos, media resources.
2. Documentaries that apply to the topic (tentative potential list in Appendix)
3. Short videos for each topic—utilizing available video resources and other resources (Discovery, PBS, TED, news websites, YouTube, NPR, etc)
4. ChromeBooks
5. Science magazines
6. Case Studies
7. Teacher generated worksheets
8. “The Science Behind the Stories” reading segments (textbook)
9. “Applied Science” reading segments (textbook)
10. Environmental Science textbook resources from other courses and a variety of textbooks

11. —initial list is included in the appendix.

Marking Period Three -Overview based on 45 days:

UNIT 7—Climate Change
UNIT 8—Human Health, Evolution, and Reproductive Technology
UNIT 9—Your Biome in Spring

Marking Period Three –Goals:
Understanding of:

- Ongoing exploration of relevant current events on a local, state, national, and global level as they become available to foster science literacy in society.
- Climate Change
    - Topics may include but are not limited to the following:
        - Data
        - Issues
        - Impacts on the world
- Human Health, Evolution, and Reproductive Technology
    - Topics may include but are not limited to the following:
        - Developed vs. Developing Countries
        - Emerging and reemerging diseases
        - Endocrine system disrupters and the human impact
        - Vaccines—Fact vs. fiction
        - Equity in sanitation and health
        - Sanitation
        - Water Quality and Availability
        - Antibiotic resistance and evolution
        - Stem cells
        - Cloning
        - Gene Modification
        - Gene Therapy
        - Genetic Testing
- Your Biome in Spring
    - Topics may include but are not limited to the following:
        - Invasive species
        - The timing of nature
        - Bird songs
        - Pollinators
        - Maple syrup in Pennsylvania
        - Amphibians and water issues
        - Mating and Migration
        - Biodiversity topics in Spring
        - Cycles in Nature and Energy

Unit 7: Climate Change

Big Idea #1: Sustainable use of natural resources is essential to provide for the needs and wants of all living things now and in the future.

Essential Questions:

- How are the needs and wants of all living things (including humans) directly connected to successful management of natural resources?

Concepts:

- Humans can cause changes directly and indirectly to ecosystems over time.
- New technologies affect the use and management of our natural resources.

Competencies:

- Describe in detail how sustainability balances the needs of humans and society with the needs of a natural system.
- Discuss how the availability of our natural resources in dependent on climatic occurrences, available technologies and consumer wants and desires.

Big Idea #2: People acting individually and/or as groups influence the environment.

Essential Questions:

- How do humans influence the environment?

Concepts:

- Human actions affect ecosystems.
- Human practices can lead to water, air, soil, and indoor pollution.

Competencies:

- Describe how human actions affect the balance within an ecosystem.
- Compare and contrast how human practices affect the health of the environment.

Big Idea #3: The health of all living things is directly related to the quality of the environment.

Essential Questions:

- How does the quality of the environment affect the health of all living things within it?

Concepts:

- Human health is affected by pollution.
- Environmental health and biological diversity are affected by human practices.

Competencies:

- Analyze the effect of air, water, soil, noise, and indoor pollution on society.
- Analyze the effects of human activities on the health of organisms in an ecosystem.

Big Idea #4: Environmental Laws and regulations impact humans, the environment, and the economy in both positive and negative ways.

Essential Questions:

- What are the positive and negative effects of environmental laws and regulations, the environment, and the economy?

Concepts:

- Laws and regulations exist to protect humans and the environment.
- Environmental issues lead to environmental laws and regulations.
- Local, state, and federal governments play a role in the development of environmental laws and regulations.
- Environmental laws and regulations can change over time.

Competencies:

- Recognize that laws and regulations exist to protect humans and the environment.
- Detail and describe how environmental laws and regulations are developed and enacted.
- Identify how changes in economic conditions and advances in technology/scientific/environmental knowledge spur change in laws and regulations?

Science Long Term Transfer Goals:

1. Approach science as a reliable and tentative way of knowing and explaining the natural world.
2. Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
3. Make and use observations to analyze relationships and patterns in order to explain phenomena, develop models, and make predictions.
4. Evaluate Systems, to connect how form determines function and how any change in one component affects the entire system.
5. Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.

Unifying Themes Big Ideas and Essential Questions:

- The flow of energy and matter into, out of, and within systems can be tracked to understand the systems' possibilities and limitations.
    - How does the flow of energy contribute to the functioning of a system?

- Data must be presented in a form that can reveal any patterns and relationships that allows results to be communicated to others.
    - In what ways are data analyzed, interpreted, and communicated?

Curriculum Plan

Unit 7: Climate Change **Time Range in Days: 10-12 days**

Standard(s):
Biology; Environment and Ecology; Technology

3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry

4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6

3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchor(s):
BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5,
Unifying Themes: 3.3.12.A

Overview:
The Citizen Science is an interdisciplinary science course that focuses on current events relating to scientific issues and the events that occur within the biome of the temperate deciduous forest, especially Northeastern Pennsylvania. Current events will take a precedent throughout the course and will be incorporated freely throughout each unit. In this unit, students will examine the issues involving climate change. Students will examine facts vs fiction by using data and current scientific information. Students will also examine the impacts of climate change on the world and current national and global legislation and treaties related to climate change.

Focus Question(s):

- What are the key science related issues in your life or in your community?
- What is climate change?
- What are the impacts of climate change on the world?
- What are the issues associated with climate change?

- How are global leaders dealing with climate change?
- How climate change data be examined to make sustainable decisions?
- What role do statistics and graphical analysis play in science literacy?
- How can data be manipulated?

Goals:
Students will be able to independently use their learning to:

- Approach science as a reliable and tentative way of knowing and explaining the natural world.
- Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
- Make and use observations to analyze relationships and patterns to explain phenomena, develop models, and make predictions.
- Evaluate systems, to connect how form determines function and how any change to one component affects the entire system.
- Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.
- To introduce students to science current events that apply to the course.
- To define and identify issues and challenges in relation to climate change.
- To examine the global impact and response to climate change.
- To examine the cause and affect impacts of climate change.
- To investigate statistics and statistical interpretation regarding data analysis and interpretation.
- To research and possibly participate in a citizen science project.

Objectives:

- Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
- Diagnose and discuss some of the major scientific dilemmas of today. (DOK 3)
- Explain the phenomena of climate change. (DOK 1)
- Examine the global issues relating to climate change. (DOK 3)
- Explore the process of global leaders preparing for the impacts of climate change and efforts to slow down climate change. (DOK 3)
- Examine graphs, statistics, interpretation and analysis. (DOK 3)
- Explore the process of peer review and credible sources within science. (DOK 3)

Core Activities and Corresponding Instructional Methods:

Do to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.

1. Students will take notes via Smart Notebook and other presentation software and use guided outlines and graphic organizers.
2. Students will participate in class discussions and group work regarding materials in Unit 7.
3. Students will conduct research through media, text, or other resources on issues facing the planet today and prepare discussion questions.
4. Students will research current events and participate in class discussion and current event assignments.
5. Students will read case studies to answer content questions, write summary paragraphs, or create materials for debate, discussion, or presentation.
6. Students will utilize relevant video resources to introduce, enforce, or foster questions regarding issues in the science community.
7. Students will read and analyze science articles in relation to biodiversity and cycles in nature and energy.
8. Students will complete note sheets, worksheets, vocabulary evaluations, and content evaluations to demonstrate understanding of the concepts within the unit.

Assessments:

Diagnostic:

- Informal questioning
- Pre-tests or pre-surveys based on topic
- Nature walks to explore prior knowledge for this topic

Formative:

- Observations
- Assorted worksheets
- Vocabulary practice
- Diagrams if applicable
- Study guides
- Video guides
- Current event logs/journals
- Structured class discussion

Summative:

- Case studies and questions
- Video summaries
- Essays, debates, presentations, and other class projects
- Vocabulary quizzes

- Content Exams

Extensions:

- Teacher demonstrations
- Extended reading
- Current event articles and videos
- Online Resources and activities
- Science Applied readings
- Science Behind the Stories readings
- Nature walks to make connections with the local ecosystem

Correctives:

- Reviewing objectives
- Testing your comprehension handouts for each unit/topic
- Guided reading with guides as needed

Materials and Resources:

1. Current Events—news articles, videos, media resources.
2. Documentaries that apply to the topic (tentative potential list in Appendix)
3. Short videos for each topic—utilizing available video resources and other resources (Discovery, PBS, TED, news websites, YouTube, NPR, etc.)
4. ChromeBooks
5. Science magazines
6. Case Studies
7. Teacher generated worksheets
8. “The Science Behind the Stories” reading segments (textbook)
9. “Applied Science” reading segments (textbook)
10. Environmental Science textbook resources from other courses and a variety of textbooks

11. —initial list is included in the appendix.

UNIT 8: Human Health, Reproductive Technology, Evolution, Biotechnology

Big Idea #1: Sustainable use of natural resources is essential to provide for the needs and wants of all living things now and in the future.

Essential Questions:

- How are the needs and wants of all living things (including humans) directly connected to successful management of natural resources?

Concepts:

- Humans can cause changes directly and indirectly to ecosystems over time.
- New technologies affect the use and management of our natural resources.

Competencies:

- Describe in detail how sustainability balances the needs of humans and society with the needs of a natural system.
- Discuss how the availability of our natural resources in dependent on climatic occurrences, available technologies and consumer wants and desires.

Big Idea #2: People acting individually and/or as groups influence the environment.

Essential Questions:

- How do humans influence the environment?

Concepts:

- Human actions affect ecosystems.
- Human practices can lead to water, air, soil, and indoor pollution.

Competencies:

- Describe how human actions affect the balance within an ecosystem.
- Compare and contrast how human practices affect the health of the environment.

Big Idea #3: The health of all living things is directly related to the quality of the environment.

Essential Questions:

- How does the quality of the environment affect the health of all living things within it?

Concepts:

- Human health is affected by pollution.
- Environmental health and biological diversity are affected by human practices.

Competencies:

- Analyze the effect of air, water, soil, noise, and indoor pollution on society.
- Analyze the effects of human activities on the health of organisms in an ecosystem.

Big Idea #4: Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organism and the physical environment.

Essential Questions:

- How and why do organisms interact with their environment and what are the effects of these interactions?

Concepts:

- Ecosystems have carrying capacities, which are limits to the number of organisms and populations they can support.

Competencies:

- Evaluate data to explain resource availability and other environmental factors that affect carrying capacity of ecosystems.

Big Idea #5: All organisms are made of cells and can be characterized by common aspects of their structure and functioning.

Essential Questions:

- How do organisms live, grow, and respond to their environment, and reproduce?

Concepts:

- DNA molecules contain genetic information that is found in all cells.
- Genes are sections of DNA that code for proteins, which are important for cell functioning.
- Organisms maintain homeostasis in response changing conditions via positive and negative feedback mechanisms.
- In sexual reproduction, specialized cell division, meiosis, occurs resulting in the production of sex cells (sperm and egg cells). Offspring inherit 23.

Competencies:

- Use models to demonstrate how DNA sequences determine the structure and function of proteins.
- Use a model to describe the role of cellular division and differentiation to produce and maintain complex organisms composed of organ systems and tissue subsystems that work together to meet the needs of the entire organism.
- Use a model to explain that role of cellular division and the mechanisms in meiosis for transmitting genetic information from parents to offspring.

Big Idea #6: Heredity refers to specific mechanisms by which characteristics or traits are passed from one generation to the next via genes, and explains why offspring resemble, but are not identical to their parents.

Essential Questions:

- How are the characteristics of one generation passed to the next?
- How can individuals of the same species and even siblings have different characteristics?

Concepts:

- The information passed from parents to offspring is coded in the DNA molecules that form the chromosomes.
- Environmental factors can also cause mutations in genes, and viable mutations are inherited.
- Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population.

Competencies:

- Use probability to explain the variation and distribution of expressed traits in a population.
- Communicate information that inheritable genetic variations may result from genetic combinations of haploid cells, errors occurring in replication, crossover between homologous chromosomes during meiosis, or environmental factors.

Big Idea #7: Biological evolution explains both eh unity and diversity of species and provides a unifying principle for the history and diversity of life on Earth.

Essential Questions:

- How can there be so many similarities among organisms yet so many different kinds of plants, animals, and microorganisms?

Concepts:

- Natural selection is the result of four factors: the potential for a species to increase in number, the genetic variation of individuals in a species due to mutation and sexual reproduction, competition for an environment's limited supply of the resources, and the increase in number of those organisms that are better able to survive and reproduce in that environment.

Unit 8: Human Health, Reproductive Technology, Evolution, Biotechnology

Time Range in Days: 10-15 days
Standard(s):
Biology; Environment and Ecology; Technology

3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry

4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6

3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchor(s):
BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5,
Unifying Themes: 3.3.12.A

Overview:
The Citizen Science is an interdisciplinary science course that focuses on current events relating to scientific issues and the events that occur within the biome of the temperate deciduous forest, especially Northeastern Pennsylvania. Current events will take a precedent throughout the course and will be incorporated freely throughout each unit. In this unit, students will examine topics relating to human health, evolution, and reproductive technology. Topics may include diseases of the developed and developing world and the long-term impacts of both emerging and reemerging diseases. The impacts of human health in relation to lifestyle, environmental sustainability, water and air quality, food security, and sanitation will also be explored. Equity in sanitation and health, as well as health care resources and vaccines will also be studied. Students will also explore endocrine system disruptors, antibiotic resistance, and the rise of super bugs. Reproductive biotechnology topics will also be examined and may include cloning, stem cells, gene therapy and modification and genetic testing.

Focus Question(s):

- What are the key science related issues in your life or in your community?
- How are diseases impacting the global population?
- What are emerging and reemerging diseases?

- How does water and air quality, sanitation and food security impact human health?
- Is there equity in health resources throughout the world?
- What are the impacts of vaccines, antibiotic resistance, and “superbugs” on the world?
- How has reproductive technology changed in the past 50 years?
- How has biotechnology regarding DNA and genetic testing, therapy, and modification changed in the past 50 years?
- What are some ethical issues regarding biotechnology that people may face in the near future?
- What role do statistics and graphical analysis play in science literacy?
- How can data be manipulated?

Goals:
Students will be able to independently use their learning to:

- Approach science as a reliable and tentative way of knowing and explaining the natural world.
- Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
- Make and use observations to analyze relationships and patterns to explain phenomena, develop models, and make predictions.
- Evaluate systems, to connect how form determines function and how any change to one component affects the entire system.
- Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.
- To introduce students to science current events that apply to the course.
- To define and identify issues and challenges in relation to diseases of the world and the impacts.
- To evaluate issues of equity in sanitation, health care, water and food quality and security, and the growing human population.
- To examine issues and controversy with reproductive technology.
- To examine issues and controversy with genetic research and biotechnology.
- To investigate statistics and statistical interpretation regarding data analysis and interpretation.
- To research and possibly participate in a citizen science project.

Objectives:

- Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
- Diagnose and discuss some of the major scientific dilemmas of today. (DOK 3)

- Identify patterns of emerging and reemerging diseases in relation to the developed and developing world. (DOK 2)
- Examine how diseases impact global population. (DOK 2)
- Explain in terms of concepts how air and water quality, sanitation, and food security impact human health. (DOK 3)
- Analyze equity in health resources throughout the world. (DOK 4)
- Analyze the impacts of vaccines, antibiotic resistance, and “superbugs” on the world. (DOK 4)
- Assess how reproductive technology has changed in the past 50 years and the impacts of this biotechnology. (DOK 3)
- Assess how biotechnology regarding DNA and genetic testing, therapy, and modification changed in the past 50 years and the impacts of this biotechnology. (DOK 3)
- Critique the ethical issues regarding biotechnology that people will face in the near future. (DOK 3)
- Examine graphs, statistics, interpretation and analysis. (DOK 3)
- Explore the process of peer review and credible sources within science. (DOK 3)
- Research and possibly participate in a citizen science project. (DOK 3)

Core Activities and Corresponding Instructional Methods:

Do to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.

1. Students will take notes via Smart Notebook and other presentation software and use guided outlines and graphic organizers.
2. Students will participate in class discussions and group work regarding materials in Unit 8.
3. Students will conduct research through media, text, or other resources on issues facing the planet today and prepare discussion questions.
4. Students will research current events and participate in class discussion and current event assignments.
5. Students will read case studies to answer content questions, write summary paragraphs, or create materials for debate, discussion, or presentation.
6. Students will utilize relevant video resources to introduce, enforce, or foster questions regarding issues in the science community.
7. Students will read and analyze science articles in relation to biodiversity and cycles in nature and energy.
8. Students will complete note sheets, worksheets, vocabulary evaluations, and content evaluations to demonstrate understanding of the concepts within the unit.

Assessments:

Diagnostic:

- Informal questioning
- Pre-tests or pre-surveys based on topic
- Nature walks to explore prior knowledge for this topic

Formative:

- Observations
- Assorted worksheets
- Vocabulary practice
- Diagrams if applicable
- Study guides
- Video guides
- Current event logs/journals
- Structured class discussion

Summative:

- Case studies and questions
- Video summaries
- Essays, debates, presentations, and other class projects
- Vocabulary quizzes
- Content Exams

Extensions:

- Teacher demonstrations
- Extended reading
- Current event articles and videos
- Online Resources and activities
- Science Applied readings
- Science Behind the Stories readings
- Nature walks to make connections with the local ecosystem

Correctives:

- Reviewing objectives
- Testing your comprehension handouts for each unit/topic
- Guided reading with guides as needed

Materials and Resources:

1. Current Events—news articles, videos, media resources.
2. Documentaries that apply to the topic (tentative potential list in Appendix)
3. Short videos for each topic—utilizing available video resources and other resources (Discovery, PBS, TED, news websites, YouTube, NPR, etc.)
4. ChromeBooks
5. Science magazines
6. Case Studies
7. Teacher generated worksheets
8. "The Science Behind the Stories" reading segments (textbook)
9. "Applied Science" reading segments (textbook)
10. Environmental Science textbook resources from other courses and a variety of textbooks

11. —initial list is included in the appendix.

UNIT 9: Your Biome in Spring—Biodiversity and Cycles in Nature

Big Idea #1: Sustainable use of natural resources is essential to provide for the needs and wants of all living things now and in the future.

Essential Questions:

- How are the needs and wants of all living things (including humans) directly connected to successful management of natural resources?

Concepts:

- Humans can cause changes directly and indirectly to ecosystems over time.
- New technologies affect the use and management of our natural resources.

Competencies:

- Describe in detail how sustainability balances the needs of humans and society with the needs of a natural system.
- Discuss how the availability of our natural resources in dependent on climatic occurrences, available technologies and consumer wants and desires.

Big Idea #2: People acting individually and/or as groups influence the environment.

Essential Questions:

- How do humans influence the environment?

Concepts:

- Human actions affect ecosystems.
- Human practices can lead to water, air, soil, and indoor pollution.

Competencies:

- Describe how human actions affect the balance within an ecosystem.
- Compare and contrast how human practices affect the health of the environment.

Big Idea #3: Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.

Essential Questions:

- How and why do organisms interact with their environment and what are the effects of these interactions?

Concepts:

- Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support.
- Matter is transferred though organisms in an ecosystem; some is stored, most is lost.
- Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy of life processes.

Competencies:

- Evaluate data to explain resources availability and other environmental factors that affect carrying capacity of ecosystems.
- Use data to develop mathematical models to describe the flow of matter and energy between organism and the ecosystem.
- Use data to develop mathematical models to describe the flow of matter and energy between organism and the ecosystem.

Big Idea #4: The Health of all living things is directly related to the quality of the environment.

Essential Questions:

- How does the quality of the environment affect the health of all living things within it?

Concepts:

- Human health is affected by pollution.
- Environmental health and biological diversity are affected by human practices.

Competencies:

- Analyze the effect of air, water, soil, noise, and indoor pollution on society.
- Analyze the effects of human activities on the health of organisms in an ecosystem.

Science Long Term Transfer Goals:

1. Approach science as a reliable and tentative way of knowing and explaining the natural world.
2. Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
3. Make and use observations to analyze relationships and patterns in order to explain phenomena, develop models, and make predictions.
4. Evaluate Systems, in order to connect how form determines function and how any change in one component affects the entire system.

5. Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.

Unifying Themes Big Ideas and Essential Questions:

- The flow of energy and matter into, out of, and within systems can be tracked to understand the systems' possibilities and limitations.
  - How does the flow of energy contribute to the functioning of a system?
- Data must be presented in a form that can reveal any patterns and relationships that allows results to be communicated to others.
  - In what ways are data analyzed, interpreted, and communicated?

Inquiry and Design Big Ideas and Essential Questions:

- Data must be presented in a form that can reveal any patters and relationships and that allows results to be communicated to others.
  - In what ways are data analyzed, interpreted, and communicated?

Curriculum Plan

Unit 9: Your Biome in Spring—Biodiversity and Cycles in Nature

Time Range in Days: 15-20 days

Standard(s):
Biology; Environment and Ecology; Technology

3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry

4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6

3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchor(s):
BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5,
Unifying Themes: 3.3.12.A

Overview:
The Citizen Science is an interdisciplinary science course that focuses on current events relating to scientific issues and the events that occur within the biome of the temperate deciduous forest, especially Northeastern Pennsylvania. Current events will

take a precedent throughout the course and will be incorporated freely throughout each unit. Students will identify biodiversity and cycles in nature in relation to the temperate deciduous forest. The topics include, but are not limited to: the Delaware River, invasive species, timing of nature and its cycles, bird songs, pollinators, maple syrup and other local economic issues, amphibians and water issues, mating, migrations, biodiversity in spring, and cycles in nature and energy. Weather will be investigated as well as other topics dealing with the ecology of Pennsylvania. Students will be encouraged to examine what is happening in their community and to examine any current events or science issues that their biome faces in the spring to build science literacy and understanding on the local, state, national, and global level.

Focus Question(s):

- What are the key science related issues currently occurring in your life or in your community?
- What is the biodiversity of your biome and what issues are the local ecological communities facing?
- How does weather influence your ecological community?
- What are the cycles of nature in your ecological community and how does it change during this season?
- How does weather influence your biome?

Goals:
Students will be able to independently use their learning to:

- Approach science as a reliable and tentative way of knowing and explaining the natural world.
- Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
- Make and use observations to analyze relationships and patterns in order to explain phenomena, develop models, and make predictions.
- Evaluate systems, to connect how form determines function and how any change to one component affects the entire system.
- Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.
- To introduce students to science current events that apply to the course.
- To examine the biodiversity of the temperate deciduous forest in spring; including topics of species identification, the Delaware River, invasive species, timing of nature and its cycles, bird songs, pollinators, maple syrup and other local economic issues, amphibians and water issues, mating, migrations, biodiversity in spring, and cycles in nature and energy.
- To examine cycles in nature and energy in the community as well as the impact of weather on cycles.

Objectives:

- Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
- Examine and discuss biodiversity issues within the temperate deciduous forest in relation to scientific issues. (DOK 3)
- Explore and evaluate the changing biological communities surround us. (DOK 2)
- Examine and discuss cycles in nature and energy in the community as well as the impact of weather on cycles in nature. (DOK 3)
- Diagnose and discuss some of the major scientific dilemmas of today. (DOK 3)
- Examine graphs, statistics, interpretation and analysis. (DOK 3)
- Explore the process of peer review and credible sources within science. (DOK 3)
- Research and possibly participate in a citizen science project. (DOK 3)

Core Activities and Corresponding Instructional Methods:

Do to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.

1. Students will take notes via Smart Notebook and other presentation software and use guided outlines and graphic organizers.
2. Students will participate in class discussions and group work regarding materials in Unit 9.
3. Students will research through media, text, or other resources issues facing the planet today and prepare discussion questions.
4. Students will research current events and participate in class discussion.
5. Students will read case studies to answer content questions, write summary paragraphs, or create materials for debate, discussion, or presentation.
6. Students will utilize relevant video resources to introduce, enforce, or foster questions regarding issues in the science community.
7. Students will read and analyze science articles in relation to biodiversity and cycles in nature and energy.
8. Students will complete note sheets, worksheets, vocabulary evaluations, and content evaluations to demonstrate understanding of the concepts within the unit.
9. Students will explore their community and the biodiversity on campus in an effort to look up, look out, and see what is happening in the ecological community that surrounds them.

Assessments:

Diagnostic:

- Informal questioning

- Pre-tests or pre-surveys based on topic
- Nature walks with discussion of prior knowledge of the ecological community

Formative:

- Observations
- Assorted worksheets
- Vocabulary practice
- Diagrams if applicable
- Study guides
- Video guides
- Current event logs/journals
- Structured class discussion

Summative:

- Case studies and questions
- Video summaries
- Biodiversity studies
- Essays, debates, presentations, and other class projects
- Vocabulary quizzes
- Content Exams

Extensions:

- Teacher demonstrations
- Extended reading
- Current event articles and videos
- Online Resources and activities
- Science Applied readings
- Science Behind the Stories readings
- Nature walks and biodiversity studies
- Other readings from a variety of applicable sources

Correctives:

- Reviewing objectives
- Testing your comprehension handouts for each unit/topic
- Guided reading with guides as needed

Materials and Resources:

1. Field guides and identification keys

2. Current Events—news articles, videos, media resources.
3. Documentaries that apply to the topic (tentative potential list in Appendix)
4. Short videos for each topic—utilizing available video resources and other resources (Discovery, PBS, TED, news websites, YouTube, NPR, etc)
5. ChromeBooks
6. Science magazines
7. Case Studies
8. Teacher generated worksheets
9. "The Science Behind the Stories" reading segments (textbook)
10. "Applied Science" reading segments (textbook)
11. Environmental Science textbook resources from other courses and a variety of textbooks

12. —initial list is included in the appendix.

MARKING PERIOD 4

Marking Period Four –Overview based on 45 days:

UNIT 10—Water Issues
UNIT 11—Your Biome in Summer
UNIT 12—Humans and Issues—Humans and Science
UNIT 13—Citizen Science in the World—Part 2

Marking Period Four -Goals:
Understanding of:

- Ongoing exploration of relevant current events on a local, state, national, and global level as they become available to foster science literacy in society.
- Water Issues
    - Topics may include but are not limited to the following:
        - Ocean Issues
        - Fishing Issues
        - Overfishing
        - Acidification
        - Coral Reefs
        - Plastic Pollution
        - Who owns the groundwater
        - Water use in industry, agriculture, domestic
        - Other Ocean Issues
- Your Biome in Summer
    - Topics may include but are not limited to the following:
        - Pollinators and Issues
        - Earth Day
        - Spring wildflowers
        - Invasive species
    - Biodiversity Topics in Summer
    - Cycles in Nature and Energy
- Humans and Issues--Humans and Science
    - Topics may include but are not limited to the following:
        - Equity
        - Human Rights
        - Personal Choice and Worldviews
        - Capstone Projects
- Citizen Science in the World
    - Participate in or research a way to get involved in Citizen Science projects.

UNIT 10: Water Issues

Big Idea #1: Sustainable use of natural resources is essential to provide for the needs and wants of all living things now and in the future.

Essential Questions:

- How are the needs and wants of all living things (including humans) directly connected to successful management of natural resources?

Concepts:

- Humans can cause changes directly and indirectly to ecosystems over time.
- New technologies affect the use and management of our natural resources.

Competencies:

- Describe in detail how sustainability balances the needs of humans and society with the needs of a natural system.
- Discuss how the availability of our natural resources in dependent on climatic occurrences, available technologies and consumer wants and desires.

Big Idea #2: People acting individually and/or as groups influence the environment.

Essential Questions:

- How do humans influence the environment?

Concepts:

- Human actions affect ecosystems.
- Human practices can lead to water, air, soil, and indoor pollution.

Competencies:

- Describe how human actions affect the balance within an ecosystem.
- Compare and contrast how human practices affect the health of the environment.

Big Idea #3: The health of all living things is directly related to the quality of the environment.

Essential Questions:

- How does the quality of the environment affect the health of all living things within it?

Concepts:

- Human health is affected by pollution.
- Environmental health and biological diversity are affected by human practices.

Competencies:

- Analyze the effect of air, water, soil, noise, and indoor pollution on society.
- Analyze the effects of human activities on the health of organisms in an ecosystem.

Big Idea #4: Environmental Laws and regulations impact humans, the environment, and the economy in both positive and negative ways.

Essential Questions:

- What are the positive and negative effects of environmental laws and regulations, the environment, and the economy?

Concepts:

- Laws and regulations exist to protect humans and the environment.
- Environmental issues lead to environmental laws and regulations.
- Local, state, and federal governments play a role in the development of environmental laws and regulations.
- Environmental laws and regulations can change over time.

Competencies:

- Recognize that laws and regulations exist to protect humans and the environment.
- Detail and describe how environmental laws and regulations are developed and enacted.
- Identify how changes in economic conditions and advances in technology/scientific/environmental knowledge spur change in laws and regulations?

Science Long Term Transfer Goals:

6. Approach science as a reliable and tentative way of knowing and explaining the natural world.
7. Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
8. Make and use observations to analyze relationships and patterns in order to explain phenomena, develop models, and make predictions.
9. Evaluate Systems, to connect how form determines function and how any change in one component affects the entire system.
10. Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.

Unifying Themes Big Ideas and Essential Questions:

- The flow of energy and matter into, out of, and within systems can be tracked to understand the systems' possibilities and limitations.
    - How does the flow of energy contribute to the functioning of a system?

- Data must be presented in a form that can reveal any patterns and relationships that allows results to be communicated to others.
    - In what ways are data analyzed, interpreted, and communicated?

Curriculum Plan

Unit 10: Water Issues **Time Range in Days: 10-12 days**

Standard(s):
Biology; Environment and Ecology; Technology

3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry

4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6

3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchor(s):
BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5,
Unifying Themes: 3.3.12.A

Overview:
The Citizen Science is an interdisciplinary science course that focuses on current events relating to scientific issues and the events that occur within the biome of the temperate deciduous forest, especially Northeastern Pennsylvania. Current events will take a precedent throughout the course and will be incorporated freely throughout each unit. In this unit, students will examine issues relating to water and water ecosystems, both freshwater and marine systems. Topics may also include: ocean issues, fishing, overfishing, acidification, coral reef extinction, plastic pollution, freshwater and groundwater issues, who owns the water, and other topical issues regarding water in the world.

Focus Question(s):

- What are the key science related issues in your life or in your community?
- What are issues relating to freshwater on a local, state, national, and global level?
- What are issues relating to groundwater on a local, state, national, and global level?
- What are issues relating to marine ecosystems on a local, state, national, and global level?

- How are we overfishing the oceans?
- What are the impacts of acidification on the ocean and especially on coral reefs?
- What the issues regarding plastic pollution in our bodies of water?
- What are issues regarding groundwater?
- Who owns your water?
- What role do statistics and graphical analysis play in science literacy?
- How can data be manipulated?

Goals:

Students will be able to independently use their learning to:

- Approach science as a reliable and tentative way of knowing and explaining the natural world.
- Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
- Make and use observations to analyze relationships and patterns to explain phenomena, develop models, and make predictions.
- Evaluate systems, to connect how form determines function and how any change to one component affects the entire system.
- Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.
- To introduce students to science current events that apply to the course.
- To define and identify issues and challenges in relation to freshwater, groundwater, and marine ecosystems.
- To examine the causes and impacts of overfishing the ocean.
- To examine the impact of acidification on the ocean.
- To explore the issues facing coral reefs.
- To examine plastic pollution and the ocean.
- To explore groundwater ownership issues.
- To investigate statistics and statistical interpretation in regards to data analysis and interpretation.
- To research and possibly participate in a citizen science project.

Objectives:

- Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
- Diagnose and discuss some of the major scientific dilemmas of today. (DOK 3)
- Investigate the issues and challenges in relation to freshwater, groundwater, and marine ecosystems. (DOK 3)
- Examine the causes and impacts of overfishing the ocean. (DOK 2)
- Examine the impact of acidification on the ocean. (DOK 2)
- Assess the issues facing coral reefs. (DOK 3)

- Examine plastic pollution and the ocean impacts. (DOK 2)
- Explore groundwater ownership issues. (DOK 2)
- Investigate statistics and statistical interpretation in regards to data analysis and interpretation. (DOK 3)
- Examine graphs, statistics, interpretation and analysis. (DOK 3)
- Explore the process of peer review and credible sources within science. (DOK 3)
- Research and possibly participate in a citizen science project. (DOK 3)

Core Activities and Corresponding Instructional Methods:

Do to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.

1. Students will take notes via Smart Notebook and other presentation software and use guided outlines and graphic organizers.
2. Students will participate in class discussions and group work regarding materials in Unit 10.
3. Students will conduct research through media, text, or other resources on issues facing the planet today and prepare discussion questions.
4. Students will research current events and participate in class discussion and current event assignments.
5. Students will read case studies to answer content questions, write summary paragraphs, or create materials for debate, discussion, or presentation.
6. Students will utilize relevant video resources to introduce, enforce, or foster questions regarding issues in the science community.
7. Students will read and analyze science articles in relation to biodiversity and cycles in nature and energy.
8. Students will complete note sheets, worksheets, vocabulary evaluations, and content evaluations to demonstrate understanding of the concepts within the unit.

Assessments:

Diagnostic:

- Informal questioning
- Pre-tests or pre-surveys based on topic
- Nature walks to explore prior knowledge for this topic

Formative:

- Observations
- Assorted worksheets
- Vocabulary practice

- Diagrams if applicable
- Study guides
- Video guides
- Current event logs/journals
- Structured class discussion

Summative:

- Case studies and questions
- Video summaries
- Essays, debates, presentations, and other class projects
- Vocabulary quizzes
- Content Exams

Extensions:

- Teacher demonstrations
- Extended reading
- Current event articles and videos
- Online Resources and activities
- Science Applied readings
- Science Behind the Stories readings
- Nature walks to make connections with the local ecosystem

Correctives:

- Reviewing objectives
- Testing your comprehension handouts for each unit/topic
- Guided reading with guides as needed

Materials and Resources:

1. Current Events—news articles, videos, media resources.
2. Documentaries that apply to the topic (tentative potential list in Appendix)
3. Short videos for each topic—utilizing available video resources and other resources (Discovery, PBS, TED, news websites, YouTube, NPR, etc.)
4. ChromeBooks
5. Science magazines
6. Case Studies
7. Teacher generated worksheets
8. “The Science Behind the Stories” reading segments (textbook)
9. “Applied Science” reading segments (textbook)

10. Environmental Science textbook resources from other courses and a variety of textbooks

11. —initial list is included in the appendix.

UNIT 11: Your Biome in Summer—Biodiversity and Cycles in Nature

Big Idea #1: Sustainable use of natural resources is essential to provide for the needs and wants of all living things now and in the future.

Essential Questions:

- How are the needs and wants of all living things (including humans) directly connected to successful management of natural resources?

Concepts:

- Humans can cause changes directly and indirectly to ecosystems over time.
- New technologies affect the use and management of our natural resources.

Competencies:

- Describe in detail how sustainability balances the needs of humans and society with the needs of a natural system.
- Discuss how the availability of our natural resources in dependent on climatic occurrences, available technologies and consumer wants and desires.

Big Idea #2: People acting individually and/or as groups influence the environment.

Essential Questions:

- How do humans influence the environment?

Concepts:

- Human actions affect ecosystems.
- Human practices can lead to water, air, soil, and indoor pollution.

Competencies:

- Describe how human actions affect the balance within an ecosystem.
- Compare and contrast how human practices affect the health of the environment.

Big Idea #3: Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.

Essential Questions:

- How and why do organisms interact with their environment and what are the effects of these interactions?

Concepts:

- Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support.
- Matter is transferred though organisms in an ecosystem; some is stored, most is lost.
- Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy of life processes.

Competencies:

- Evaluate data to explain resources availability and other environmental factors that affect carrying capacity of ecosystems.
- Use data to develop mathematical models to describe the flow of matter and energy between organism and the ecosystem.
- Use data to develop mathematical models to describe the flow of matter and energy between organism and the ecosystem.

Big Idea #4: The Health of all living things is directly related to the quality of the environment.

Essential Questions:

- How does the quality of the environment affect the health of all living things within it?

Concepts:

- Human health is affected by pollution.
- Environmental health and biological diversity are affected by human practices.

Competencies:

- Analyze the effect of air, water, soil, noise, and indoor pollution on society.
- Analyze the effects of human activities on the health of organisms in an ecosystem.

Science Long Term Transfer Goals:

1. Approach science as a reliable and tentative way of knowing and explaining the natural world.
2. Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
3. Make and use observations to analyze relationships and patterns in order to explain phenomena, develop models, and make predictions.
4. Evaluate Systems, in order to connect how form determines function and how any change in one component affects the entire system.
5. Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.

Unifying Themes Big Ideas and Essential Questions:

- The flow of energy and matter into, out of, and within systems can be tracked to understand the systems' possibilities and limitations.
    - How does the flow of energy contribute to the functioning of a system?
- Data must be presented in a form that can reveal any patterns and relationships that allows results to be communicated to others.
    - In what ways are data analyzed, interpreted, and communicated?

Inquiry and Design Big Ideas and Essential Questions:

- Data must be presented in a form that can reveal any patters and relationships and that allows results to be communicated to others.
    - In what ways are data analyzed, interpreted, and communicated?

Curriculum Plan

Unit 11: Your Biome in Summer—Biodiversity and Cycles in Nature

Time Range in Days: 16-22 days

Standard(s):
Biology; Environment and Ecology; Technology

3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry

4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6

3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchor(s):
BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5,
Unifying Themes: 3.3.12.A

Overview:
The Citizen Science is an interdisciplinary science course that focuses on current events relating to scientific issues and the events that occur within the biome of the temperate deciduous forest, especially Northeastern Pennsylvania. Current events will take a precedent throughout the course and will be incorporated freely throughout each unit. Students will identify biodiversity and cycles in nature in relation to the temperate deciduous forest. The topics include, but are not limited to: biodiversity in summer, pollinators, Earth day and local activism, spring and summer wildflowers, invasive

species, and cycles in nature and energy. Weather will be investigated as well as other topics dealing with the ecology of Pennsylvania. Students will be encouraged to examine what is happening in their community and to examine any current events or science issues that their biome faces in the summer to build science literacy and understanding on the local, state, national, and global level.

Focus Question(s):

- What are the key science related issues currently occurring in your life or in your community?
- What is the biodiversity of your biome and what issues are the local ecological communities facing?
- How does weather influence your ecological community?
- What are the cycles of nature in your ecological community and how does it change during this season?
- How does weather influence your biome?

Goals:
Students will be able to independently use their learning to:

- Approach science as a reliable and tentative way of knowing and explaining the natural world.
- Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
- Make and use observations to analyze relationships and patterns to explain phenomena, develop models, and make predictions.
- Evaluate systems, to connect how form determines function and how any change to one component affects the entire system.
- Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.
- To introduce students to science current events that apply to the course.
- To examine the biodiversity of the temperate deciduous forest in summer; including but not limited to the following topics: biodiversity in summer, pollinators, Earth day and local activism, spring and summer wildflowers, invasive species, and cycles in nature and energy.
- To examine weather impacts on the ecology of Pennsylvania
- To examine cycles in nature and energy in the community as well as the impact of weather on cycles.

Objectives:

- Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)

- Examine and discuss biodiversity issues within the temperate deciduous forest in relation to scientific issues. (DOK 3)
- Explore and evaluate the changing biological communities surround us. (DOK 2)
- Examine and discuss cycles in nature and energy in the community as well as the impact of weather on cycles in nature. (DOK 3)
- Diagnose and discuss some of the major scientific dilemmas of today. (DOK 3)
- Examine graphs, statistics, interpretation and analysis. (DOK 3)
- Explore the process of peer review and credible sources within science. (DOK 3)
- Research and possibly participate in a citizen science project. (DOK 3)

Core Activities and Corresponding Instructional Methods:

Do to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.

1. Students will take notes via Smart Notebook and other presentation software and use guided outlines and graphic organizers.
2. Students will participate in class discussions and group work regarding materials in Unit 11.
3. Students will research through media, text, or other resources issues facing the planet today and prepare discussion questions.
4. Students will research current events and participate in class discussion.
5. Students will read case studies to answer content questions, write summary paragraphs, or create materials for debate, discussion, or presentation.
6. Students will utilize relevant video resources to introduce, enforce, or foster questions regarding issues in the science community.
7. Students will read and analyze science articles in relation to biodiversity and cycles in nature and energy.
8. Students will complete note sheets, worksheets, vocabulary evaluations, and content evaluations to demonstrate understanding of the concepts within the unit.
9. Students will explore their community and the biodiversity on campus to look up, look out, and see what is happening in the ecological community that surrounds them.

Assessments:

Diagnostic:

- Informal questioning
- Pre-tests or pre-surveys based on topic
- Nature walks with discussion of prior knowledge of the ecological community

Formative:

- Observations
- Assorted worksheets
- Vocabulary practice
- Diagrams if applicable
- Study guides
- Video guides
- Current event logs/journals
- Structured class discussion

Summative:

- Case studies and questions
- Video summaries
- Biodiversity studies
- Essays, debates, presentations, and other class projects
- Vocabulary quizzes
- Content Exams

Extensions:

- Teacher demonstrations
- Extended reading
- Current event articles and videos
- Online Resources and activities
- Science Applied readings
- Science Behind the Stories readings
- Nature walks and biodiversity studies
- Other readings from a variety of applicable sources

Correctives:

- Reviewing objectives
- Testing your comprehension handouts for each unit/topic
- Guided reading with guides as needed

Materials and Resources:

1. Field guides and identification keys
2. Current Events—news articles, videos, media resources.
3. Documentaries that apply to the topic (tentative potential list in Appendix)
4. Short videos for each topic—utilizing available video resources and other resources (Discovery, PBS, TED, news websites, YouTube, NPR, etc)

5. ChromeBooks
6. Science magazines
7. Case Studies
8. Teacher generated worksheets
9. "The Science Behind the Stories" reading segments (textbook)
10. "Applied Science" reading segments (textbook)
11. Environmental Science textbook resources from other courses and a variety of textbooks

Various Web Resources—initial list is included in the appendix.

UNIT 12: Humans, Issues, and Science

Big Idea #1: Sustainable use of natural resources is essential to provide for the needs and wants of all living things now and in the future.

Essential Questions:

- How are the needs and wants of all living things (including humans) directly connected to successful management of natural resources?

Concepts:

- Humans can cause changes directly and indirectly to ecosystems over time.
- New technologies affect the use and management of our natural resources.

Competencies:

- Describe in detail how sustainability balances the needs of humans and society with the needs of a natural system.
- Discuss how the availability of our natural resources in dependent on climatic occurrences, available technologies and consumer wants and desires.

Big Idea #2: People acting individually and/or as groups influence the environment.

Essential Questions:

- How do humans influence the environment?

Concepts:

- Human actions affect ecosystems.
- Human practices can lead to water, air, soil, and indoor pollution.

Competencies:

- Describe how human actions affect the balance within an ecosystem.
- Compare and contrast how human practices affect the health of the environment.

Big Idea #3: The health of all living things is directly related to the quality of the environment.

Essential Questions:

- How does the quality of the environment affect the health of all living things within it?

Concepts:

- Human health is affected by pollution.
- Environmental health and biological diversity are affected by human practices.

Competencies:

- Analyze the effect of air, water, soil, noise, and indoor pollution on society.
- Analyze the effects of human activities on the health of organisms in an ecosystem.

Big Idea #4: Humans depend on the management and practices of agricultural systems.

Essential Questions:

- In what ways are human societies and cultures impacted by management and practices of agricultural systems?

Concepts:

- Agriculture has influenced culture, standard of living and foreign trade.
- Laws and regulations affect conservation and management of food and fiber production.
- Agricultural science influences farming practices, efficiency, and nutrition over time.
- Technological advancements increase efficiency in production and environmental impacts of agriculture.
- Integrated pest management (IPM) carries both benefits and risks when associated with agriculture.
- Society's needs and standard of living directly impact the sustainability of natural resources.
- Natural resource use and availability affect the sustainability of society.
- Technological advancements have changed society's standard of living and affect the sustainability of natural resources.
- Human activity affects ecosystems for better or worse.
- Human and societal supply and demand impact the environment in a variety of ways.

Competencies:

- Identify how agriculture is vitally important in meeting the needs of society and maintaining the economy.
- Recognize that agricultural sciences and technologies strive to increase efficiency while balancing the needs of society with the conservation of our natural resources.
- Describe how agricultural components and systems affect—and are affected by—social, pollical, environmental, and economic factors.
- Recognize that sustainability of natural resources fluctuates based on society's needs or wants and the technological advances used.
- Discuss and describe how human activities cause changes within ecosystems.—positively, negatively, or both.

Science Long Term Transfer Goals:

1. Approach science as a reliable and tentative way of knowing and explaining the natural world.
2. Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
3. Make and use observations to analyze relationships and patterns in order to explain phenomena, develop models, and make predictions.
4. Evaluate Systems, to connect how form determines function and how any change in one component affects the entire system.
5. Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.

Unifying Themes Big Ideas and Essential Questions:

- The flow of energy and matter into, out of, and within systems can be tracked to understand the systems' possibilities and limitations.
  - How does the flow of energy contribute to the functioning of a system?
- Data must be presented in a form that can reveal any patterns and relationships that allows results to be communicated to others.
  - In what ways are data analyzed, interpreted, and communicated?

Curriculum Plan

Unit 12: Humans, Issues, and Science **Time Range in Days: 5-7 days**

Standard(s):
Biology; Environment and Ecology; Technology

3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry

4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6

3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchor(s):
BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5,
Unifying Themes: 3.3.12.A

Overview:

The Citizen Science is an interdisciplinary science course that focuses on current events relating to scientific issues and the events that occur within the biome of the temperate deciduous forest, especially Northeastern Pennsylvania. Current events will take a precedent throughout the course and will be incorporated freely throughout each unit. In this unit, students will utilize all course knowledge for a capstone experience based on their understanding of the topics. Students will examine equity, human rights, personal choice, and world views to complete a final project.

Focus Question(s):

- What are the key science related issues in your life or in your community?
- How does equity factor into scientific issues and discovery?
- How must human rights be considered with science decisions?
- What is your worldview and how does that impact personal choice and decisions?
- What role do statistics and graphical analysis play in science literacy?
- How can data be manipulated?

Goals:
Students will be able to independently use their learning to:

- Approach science as a reliable and tentative way of knowing and explaining the natural world.
- Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
- Make and use observations to analyze relationships and patterns in order to explain phenomena, develop models, and make predictions.
- Evaluate systems, in order to connect how form determines function and how any change to one component affects the entire system.
- Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.
- To introduce students to science current events that apply to the course.
- To define and identify issues and challenges in relation to equity, human rights, personal choice and worldview when considering scientific issues and literacy.
- To investigate statistics and statistical interpretation regarding data analysis and interpretation.
- To research and possibly participate in a citizen science project.

Objectives:

- Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
- Diagnose and discuss some of the major scientific dilemmas of today. (DOK 3)

- Analyze and apply concepts learned to define and identify issues and challenges in relation to equity, human rights, personal choice and worldview when considering scientific issues and literacy. (DOK 4)
- Examine graphs, statistics, interpretation and analysis. (DOK 3)
- Explore the process of peer review and credible sources within science. (DOK 3)
- Research and possibly participate in a citizen science project. (DOK 3)

Core Activities and Corresponding Instructional Methods:

Do to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.

1. Students will take notes via Smart Notebook and other presentation software and use guided outlines and graphic organizers.
2. Students will participate in class discussions and group work regarding materials in Unit 12.
3. Students will conduct research through media, text, or other resources on issues facing the planet today and prepare discussion questions.
4. Students will complete note sheets, worksheets, vocabulary evaluations, and content evaluations to demonstrate understanding of the concepts within the unit.
5. Students will complete a capstone project based on topics learned throughout the course.

Assessments:

Diagnostic:

- Informal questioning
- Pre-tests or pre-surveys based on topic
- Nature walks to explore prior knowledge for this topic

Formative:

- Observations
- Current event logs/journals
- Structured class discussion

Summative:

- Content Exams
- Capstone project

Extensions:

- Teacher demonstrations
- Extended reading
- Current event articles and videos
- Online Resources and activities
- Science Applied readings
- Science Behind the Stories readings
- Nature walks to make connections with the local ecosystem

Correctives:

- Reviewing objectives
- Testing your comprehension handouts for each unit/topic
- Guided reading with guides as needed

Materials and Resources:

1. Current Events—news articles, videos, media resources.
2. Documentaries that apply to the topic (tentative potential list in Appendix)
3. Short videos for each topic—utilizing available video resources and other resources (Discovery, PBS, TED, news websites, YouTube, NPR, etc.)
4. ChromeBooks
5. Science magazines
6. Case Studies
7. Teacher generated worksheets
8. “The Science Behind the Stories” reading segments (textbook)
9. “Applied Science” reading segments (textbook)
10. Environmental Science textbook resources from other courses and a variety of textbooks

11. Various Web Resources—initial list is included in the appendix.

UNIT 13: Citizen Science in the World—Part 2—Final Projects
Time Range in Days—2-4 days

Big Idea #1: People acting individually and/or as groups influence the environment.

Essential Questions:

- How do humans influence the environment?

Concepts:

- Human actions affect ecosystems.
- Human practices can lead to water, air, soil, and indoor pollution.

Competencies:

- Describe how human actions affect the balance within an ecosystem.
- Compare and contrast how human practices affect the health of the environment.

Science Long Term Transfer Goals:

1. Approach science as a reliable and tentative way of knowing and explaining the natural world.
2. Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
3. Make and use observations to analyze relationships and patterns in order to explain phenomena, develop models, and make predictions.
4. Evaluate Systems, in order to connect how form determines function and how any change in one component affects the entire system.
5. Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.

Unifying Themes Big Ideas and Essential Questions:

- The flow of energy and matter into, out of, and within systems can be tracked to understand the systems' possibilities and limitations.
    - How does the flow of energy contribute to the functioning of a system?
- Data must be presented in a form that can reveal any patterns and relationships that allows results to be communicated to others.
    - In what ways are data analyzed, interpreted, and communicated?

DELAWARE VALLEY SCHOOL DISTRICT

Curriculum Plan

Unit 13: Citizen Science in the World—Final Projects-Part 2
Time Range in Days: 2-4 days

Standard(s):
Biology; Environment and Ecology; Technology

3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry

4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6

3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchor(s):
BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5,
Unifying Themes: 3.3.12.A

Overview:
The Citizen Science is an interdisciplinary science course that focuses on current events relating to scientific issues and the events that occur within the biome of the temperate deciduous forest, especially Northeastern Pennsylvania. Current events will take a precedent throughout the course and will be incorporated freely throughout each unit. In this unit, students will examine opportunities to get involved in the community and to participate in true citizen science. Students will research opportunities for science research and possibly participate in a citizen science project.

Focus Question(s):

- What are the key science related issues in your life or in your community?
- What are some citizen science opportunities in the community?
- How can you get involved and help?

Goals:
Students will be able to independently use their learning to:

- Approach science as a reliable and tentative way of knowing and explaining the natural world.

- Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
- Make and use observations to analyze relationships and patterns in order to explain phenomena, develop models, and make predictions.
- Evaluate systems, in order to connect how form determines function and how any change to one component affects the entire system.
- Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.
- To introduce students to science current events that apply to the course.
- To investigate statistics and statistical interpretation in regards to data analysis and interpretation.
- To research and possibly participate in a citizen science project.

Objectives:

- Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
- Diagnose and discuss some of the major scientific dilemmas of today. (DOK 3)
- Research and possibly participate in a citizen science project. (DOK 3)

Core Activities and Corresponding Instructional Methods:

Do to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.

1. Students will take notes via Smart Notebook and other presentation software and use guided outlines and graphic organizers.
2. Students will participate in class discussions and group work regarding materials in Unit 13.
3. Students will conduct research through media, text, or other resources on opportunities to participate in citizen science.
4. Students will utilize relevant video resources to introduce, enforce, or foster questions regarding issues in the science community.
5. Students will read and analyze science articles.
6. Students will participate in potential citizen science projects and/or observations in their communities.

Assessments:

Diagnostic:

- Informal questioning
- Pre-tests or pre-surveys based on topic

Formative:

- Observations
- Current event logs/journals
- Structured class discussion

Summative:

- Case studies and questions
- Video summaries
- Essays, debates, presentations, and other class projects

Extensions:

- Teacher demonstrations
- Extended reading
- Current event articles and videos
- Online Resources and activities
- Science Applied readings
- Science Behind the Stories readings
- Reading from other applicable resources
- Nature walks for local ecosystem connections

Correctives:

- Reviewing objectives
- Testing your comprehension handouts for each unit/topic
- Guided reading with guides as needed

Materials and Resources:

1. Current Events—news articles, videos, media resources.
2. Documentaries that apply to the topic (tentative potential list in Appendix)
3. Short videos for each topic—utilizing available video resources and other resources (Discovery, PBS, TED, news websites, YouTube, NPR, etc)
4. ChromeBooks
5. Science magazines
6. Case Studies
7. Teacher generated worksheets
8. "The Science Behind the Stories" reading segments (textbook)
9. "Applied Science" reading segments (textbook)
10. Environmental Science textbook resources from other courses and a variety of textbooks
11. Various Web Resources (See Appendix)

DELAWARE VALLEY SCHOOL DISTRICT

Primary Textbook(s) Used for this Course of Instruction

No textbook assigned currently (June 2017)

Name of Textbook:

Textbook ISBN #:

Textbook Publisher &Year of Publication:

Curriculum Textbook is utilized in (title of course):

Please complete one sheet for each primary textbook.

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APPENDIX

Other Resources:

1. Current Events—news articles, videos, media resources.
2. Documentaries that apply to the topic (tentative potential list in Appendix)
3. Short videos for each topic—utilizing available video resources and other resources (Discovery, PBS, TED, news websites, YouTube, NPR, etc)
4. ChromeBooks
5. Science magazines
6. Case Studies
7. "The Science Behind the Stories" reading segments (textbook)
8. "Applied Science" reading segments (textbook)
9. Environmental Science textbook resources from other courses and a variety of textbooks

Web Resources:

Including but not limited to:

a. **Northwest Association for Biomedical Research** - excellent lessons on what ethical questions are, value systems, decision-making strategies, and debate. Also delves into specific scenarios for different ethical situations
   i. https://www.nwabr.org/teacher-center/bioethics-101#overview
b. **National Center for Case Study teaching of Science** - easily a favorite - many accessible stories and topics that provide lessons, questions and conversation points
   i. http://sciencecases.lib.buffalo.edu/cs/collection/
c. **Presidential Commission for the study of Bioethical Issues** - modules on many topics including privacy, compensation, research design
   i. https://bioethicsarchive.georgetown.edu/pcsbi/node/2847.html
d. **University of Utah Learn.Genetics Page** - MANY resources on biotechnologies (cloning, stem cells) and basic cell science - very interactive. also has e "teach" page with handouts and lessons
   i. http://learn.genetics.utah.edu/
e. **Scholastic Science World Subscription** - the monthly newsletter ordered for the class
   i. http://scienceworld.scholastic.com/
f. **Integrating Citizen Science Into your Classroom**—ideas for science programs in the classroom to engage students in citizen science
   i. https://blog.scistarter.com/2013/12/integrating-citizen-science-classroom-organization/#sthash.8U81mrEH.dpbs
g. **Citizen Science**—Links to science projects
   i. https://www.resa.net/curriculum/curriculum/science/eresources/citizen-science/
h. **Citizen Science—Real-World Applications for Science Students**
   i. http://www.learnnc.org/lp/pages/7210

Citizen Science Resources:

1. Citizen Science—National Geographic
2. NTSA Science Store—Science as Inquiry
3. BARD College—Citizen Science
4. Dr. Holly
5. NPR-Public Lab
6. National Audubon Society
7. PEEC-BioBlitz
8. Critter Count
9. Various other Citizen Science resources and Projects

Video Resources (Preliminary and subject to change based on current events and news stories):

Subject	Speaker	Title
Climate Change	Gavin Schmidt	The emergent patterns of climate change
nuclear energy	Michel Laberge	How synchronized hammer strikes could generate nuclear fusion
Parasites	Ed Yong	Suicidal crickets, zombie roaches and other parasite tales
population	Hans Roling	Global population growth, box by box
	Hans Roling	Religion and Babies
	Hans Roling	The good news of the decade?
	Stewart Brand	4 Environmental "Heresies"
	Stewart Brand	The Long Now
	Stewart Brand	De-extinction to save a species
	Stewart Brand	The Dawn of de-extinction. Are you Ready

demographics	Stewart Brand	What squatter cities can teach us
Energy	Stewart Brand and MarkZ. Jacobson	Debate: Does the world need nuclear energy?
water	Rose George	Let's talk Crap. Seriously
water	Micheal Prichard	Turning filthy water drinkable
	Anupam Mishra	The ancient ingenuity of water-harvesting
Biofuels	Bilai Bomani	Plant fuels that could power a jet
Climate change	Al Gore	What comes after An Inconvenient Truth?
Scientific Inquiry	Laura Snyder	The Philosophical Breakfast Club
Biofuels	Jonathan Trent	Energy from floating algae ponds
Tar Sands	Garth Lenz	The true cost of oil
Gulf Oil spill	Carl Safina	The oil spill's unseen culprits ,victims
	Peter Ward	A theory of earth's mass extinctions
	Greg Stone	Saving the Ocean one island at a time
	Rob Dunbar	Discovering ancient climates in oceans and ice
	Arthur Potts Dawson	A vision for sustainable restaurants
agriculture	Jonathan Foley	The other inconvenient truth
urbanization	James Howard Kunstler	The ghastly tragedy of the suburbs

Other Video Resources:

Name	Year	Run Time	Topic
11th Hour, The	2007	92	global environmental crisis
30 Days: Working in a Coal Mine	2008	42	
300 Years of Fossil Fuels in 300 Seconds	2010	5	
A Crude Awakening: the Oil Crash	2006	83	Energy
A Global Warming?	2007	97	Global Warming
An Inconvenient Truth	2007	96	Global Warming
Avatar	2009	162	
Bag It: Is Your Life Too Plastic	2010	78	recycling
Becoming Green	2008	300	Future of environment
Big Energy Gamble, The	2009	60	California's Greenhouse policy
Bioterror	2001	60	Disease
Black Blizzard	2008		drought, farming, env. and society
Blind Spot	2008	88	oil, energy
Blue Gold	2009	90	Water Issues
Blue Planet: IMAX	1990	42	
Blue Planet: Seas of Life: Open Oceans/The Deep	2001	98	Ocean Ecology
Blue Planet: Seas of Life: Open Oceans/The Deep	2001	97	Ocean Ecology
Blue Planet: Seas of Life: Open Oceans/The Deep	2001	100	Ocean Ecology
Blue Planet: Seas of Life: Open Oceans/The Deep	2001	98	Ocean Ecology
Blue Vinyl: The World's First Toxic Comedy	2002	178	Health; toxicity
Burning the Future: Coal in America	2008	89	
Cadillac Desert	1997		Water Issues
Can Buildings Make You Sick?	1995	60	Indoor Pollution
Cane Toads: An Unnatural History	1988	47	Ecosystem balance; Predators
Chernobyl Heart		35	Nuclear Issues
Core Biology	2007	120	Biolgy Basics
Cove, The	2009		Animal Cruelty
Creek Runs Red, The			lead mining/human response to env. disaster
Crude: The Incredible Journey of Oil	2007	89	oil, climate change
Day After Tomorrow, The	2004	123	After Global Warming
Design E2	2006	180	Effect of urbanization
Dimming the Sun	2006	56	Global Warming
Dirt! The Movie	2009	80	soil conservation

E2 Design Season three	2008	180	Economics of green energy
E2 Design Season two	2007	180	Green Architecture
E2 Energy	2007	180	Alternative Energy
E2 Transport	2008	180	Green Transportation
Earth	2007	96	Earth Science
Earth Report: State of the Planet	2009	50	
Earth: The Operator's Manual	2011	159	energy, climate change
Easter Island	2002	51	
Empty Oceans, Empty Nets	2002	30	Aquatic ecosystems; fishing
Everything's Cool	2007	89	Global Warming
Evolution: Evolutionary Arms Race	2002	56	
Farming the Oceans	2005	30	
Fast Food Nation	2006	113	Health; toxicity
Fire Next Time, The	2005	82	Forest Management politics
Fire Wars	2002	120	
Flow: For the Love of Water	2008	84	Water Issues
Food, Inc.	2009	94	Food Industry Abuses
Freeze, Freeze, Fry: Climate Past, Present, and Future			Climate Change
Fresh	2009	72	good food movement
Frontline: Heat	2008	120	Global Warming
Frontline: Poisoned Waters	2009	120	Water Issues
Fuel	2010	112	biofuels
Future of Food, The	2004	90	agriculture and biotechnology
Global Warming: Rising Storm	2007	116	Global Warming
Global Warming: Solutions	2006	58	Global Warming
Global Warming: The Signs and the Science	2005	60	Global Warming
Global Warming: Whats Up With the Weather?	2000	120	
Godfrey Reggio: Koyaanisqatsi: Life Out of Balance	1983	87	
Godfrey Reggio: Naqoyqatsi	2002	89	
Godfrey Reggio: Powaqqatsi	1988	97	
Going to Green: balancing Greenspace with the Buildings	2009	90	Ecology
Going to Green: Elements of Sustainability	2009	90	Ecology
Going to Green: Implementing Urban Greening	2009	90	Ecology
Going to Green: Public Policy and Green Collar Opportunities	2009	90	Ecology
Going to Green: Toward a More Sustainable Community	2009	90	Ecology
Grand Canyon Adventure: River at Risk	2008	45	Water Issues
Greening of Southie, The	2008		sustainable building
Grocery Store Wars			
Guns, Germs, and Steel	2005		Jared Diamond/Society

Home	2009	120	Diversity on Earth; Ecological Balance
How the Earth Was Made	2007	94	Earth Science
I am Legend	2007	100	
Jean-Michel Cousteau: Call of the Killer Whale	2009		climate change, pollution, habitat loss
Journey to Planet Earth: Future Conditional			
Journey to Planet Earth: Hot Zones			
Journey to Planet Earth: Land of Plenty, Land of Want			
Journey to Planet Earth: On the Brink			
Journey to Planet Earth: Rivers of Destiny		60	
Journey to Planet Earth: Seas of Grass			
Journey to Planet Earth: The State of the Ocean's Animals			
Journey to Planet Earth: The State of the Planet			
Journey to Planet Earth: The State of the Planet's Oceans			
Journey to Planet Earth: The State of the Planet's Wildlife			
Journey to Planet Earth: The Urban Explosion			
Kilowatt Ours	2008	56	electricity production
King Corn	2007	90	agriculture, GMOs, nutrition
King of Sushi, The			
Last Call at the Oasis	2011	105	global water crisis
Libby, Montana	2005	124	Mining; toxicity
Life After People	2008	94	Earth After Humans
Life: Birds	2009	60	
Life: Challenges of Life	2009	60	
Life: Creatures of the Deep	2009	60	
Life: Fish	2009	60	
Life: Hunters and Hunted	2009	60	
Life: Insects	2009	60	
Life: Mammals	2009	60	
Life: Plants	2009	60	
Life: Primates	2009	60	
Life: Reptiles and Amphibians	2009	60	
Living Planet, The	2001	720	Nature
Lorax, The	1972	29	Tragedy of the commons
Magnetic Storm	2004	60	
Making Stuff	2011	240	waste
Manufactured Landscapes	2007	90	
March of the Penguins	2004	80	
Meatrix, Meatrix 2, and Meatrix 2 1/2			

Miracle Planet	2005	250	Earth Science
Modern Marvels: Coal			Energy
Modern Marvels: Farming Technology	2000		
Modern Marvels: Renewable Energy		60	Energy
Naked Science: Extinctions		45	
National Geographic: Human Footprint	2008	90	
National Parks: America's Best Idea (Ken Burns)	2009	720	
Never Cry Wolf	1983	105	Wildlife Preservation; Keystone Species
No Impact Man	2009	90	ecological footprint
Planet Earth - Disc 1	2007	165	Ecology
Planet Earth - Disc 2	2007	165	Ecology
Planet Earth - Disc 3	2007	165	Ecology
Planet Earth - Disc 4	2007	100	Ecology
Planet Earth - Disc 5	2007	150	Ecology
Planet in Peril	2007	180	
Poisoned Waters	2009	115	Water pollution, CWA, intensive animal farming, sewage treatment, water treatment
Project Earth: Brighter Earth			Global Warming
Project Earth: Fixing Carbon			Global Warming
Project Earth: Hungry Oceans			Global Warming
Project Earth: Infinite Winds			Global Warming
Project Earth: Orbital Power Plant			Global Warming
Project Earth: Raining Forests			Global Warming
Project Earth: Space Sunshield			Global Warming
Project Earth: Wrapping Greenland			Global Warming
Rachel Carson's Silent Spring (American Experience)	2007	55	
Real Eve, The	2002	103	
Recycled Life, The	2005	38	Waste Management
Running Dry		90	
Sharkwater	2007	89	Fishing/exploitation
Six Degrees Could Change the World	2007	90	Global Warming
Small Fortunes			
Storm that Drowned a City, The	2005	56	Natural Disasters
Story of Bottled Water, The	2010		
Story of Cap and Trade, The	2009		
Story of Stuff, The	2007	20	
Strange Days on Planet Earth	2005	240	
Super Size Me	2004	98	Nutrition
Supervolcano - Its Under Yellowstone		105	

Tapped	2009	76	bottled water
Ten Things Kids Want to Know About Farming		22	
The End of the Line	2009	83	overfishing
The Last Mountain	2011	95	mountaintop removal
The Poisoned Dream: The Love Canal Nightmare	1997	48	
The Rise of Ecology	2011	52	ecological disasters
The Works: Garbage	2008	44	
Tropical Rainforest: IMAX	1992	40	
Vanishing of the Bees	2009	87	agriculture, pesticides
Wall-E	2008	98	Earth After Humans
Whaledreamers	2006	90	human/nature connection
Who Killed the Electric Car?	2006	93	
Wolves, A Legend Returns to Yellowstone	2007	55	
World in the Balance	2004	120	population
World Population	2007	7	historic population growth

Standards and Anchors:

Standards for Citizen Scientist

Biology

3.1.12.A2—Energy Flow--Evaluate how organisms must derive energy from their environment or their food in order to survive.

3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry

- Compare and contrast scientific theories.
- Know that both direct and indirect observations are used by scientists to study the natural world and universe.
- Identify questions and concepts that guide scientific investigations.
- Formulate and revise explanations and models using logic and evidence.
- Recognize and analyze alternative explanations and models.
- Explain the importance of accuracy and precision in making valid measurements.
- Examine the status of existing theories.
- Evaluate experimental information for relevance and adherence to science processes.
- Judge that conclusions are consistent and logical with experimental conditions.
- Interpret results of experimental research to predict new information, propose additional investigable questions or advance a solution.
- Communicate and defend a scientific argument.

Environment and Ecology

4.5.12.A—Sustainability—Research how technology influences the sustainable use of natural resources. Analyze how consumer demands have driven the development of technology enabling the sustainable use of natural resources.

4.5.12.B—Integrated Pest Management—Evaluate pest management using methods such as cost/benefit analysis, cumulative effects analysis, environmental impact analysis, ethical analysis, and risk analysis.

4.5.12.C—Pollution—Analyze the costs and benefits of means to control pollution.

4.5.12.D—Waste Management—Evaluate waste management practices.

4.5.12.E—Human Health Issues—Analyze how consumer demands promote the production of pollutants that affect human health

Agriculture and Society

4.4.12.A—Food and Fiber System—Research and analyze the social, political, economic, and environmental factors that affect agricultural systems.

4.4.12.B—Importance of Agriculture—Research and evaluate laws and policies that affect the food and fiber system.

4.4.12.C—Applying Sciences to Agriculture—Analyze research and develop initiatives as they relate to agriculture.

4.4.12.D—Technology Influences on Agriculture—Describe how policies, regulations, and laws affect the technologies adopted in agriculture.

4.4.12.E—Science as Inquiry—Examine the status of existing theories, evaluate information for relevance and adherence to science processes, judge that conclusions are consistent and logical with experimental conditions, interpret results of experimental research to predict new information, propose additional investigable questions or advance a solution, and communicate and defend a scientific argument.

4.3.12.A—Use of Natural Resources—Evaluate the advantages and disadvantages of using renewable and nonrenewable resources.

4.3.12.B—Availability of Natural Resources—Analyze factors that influence the local, regional, national, and global availability of natural resources.

4.2.12.A-Watersheds and Wetlands—Examine environmental laws related to land use management and its impact on the water quality.

4.2.12.B—Watersheds and Wetlands—Analyze the effects of policies and regulations at various governmental levels on wetlands and their surrounding environments.

4.2.12.C—Watersheds and Wetlands—Explain the relationship between water quality and the diversity of life in a freshwater ecosystem.

4.2.12.D—Watersheds and Wetlands—Examine the status of existing theories.

4.1.12.A—The Environment—Analyze the significance of biological diversity in an ecosystem.

4.1.12.B—Materials Cycles—Research solutions to problems caused by interrupting natural cycles.

4.1.12.C—Energy Flow—Research how humans affect energy flow within an ecosystem.

4.1.12.D—Energy Flow—Analyze the effects of new and emerging technologies on biodiversity in specific environments.

4.1.12.E—Succession—Research solutions addressing human impacts on ecosystems over time.

3.1.12.B1—Heredity—Explain gene inheritance and expression at the molecular level.

3.1.12.B2—Reproduction—Evaluate the process of sexual reproduction in influencing genetic variability in a population.

3.1.12.B4—Biotechnology—Evaluate the societal impact of genetic engineering techniques and applications.

3.1.12.B5—Unifying Themes—Relate the monomer structure of biomacromolecules to their functional role.

3.1.12.C1—Natural Selection—Analyze how natural selection leads to speciation.

3.3.12.A1—Earth Features and the Processes that Change It—Explain how parts are related to other parts in weather systems, solar systems, and earth systems, including how the output from one part can become an input to another part.

3.3.12.A2—Earth's Resources and Materials—Analyze the availability, location, and extraction of Earth's resources.

3.3.12.A5—Water—Explain how the ocean dominates the Earth's carbon cycle.

3.3.12.A6—Weather and Climate—Explain how the unequal heating of the Earth's surface leads to atmospheric global circulation.

Anchor: 3.3.12.A—Unifying Themes:

Models—Interpret and analyze a combination of ground-based observations, satellite data, and computer models to demonstrate Earth systems and their interconnections.

Constancy/Change—Infer how human activities may impact the natural course of Earth's cycles.

Patterns—Summarize the use of data in understanding seismic events, meteorology, and geologic time.

Technology

3.4.12.A3—Technology Connections—Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).

3.4.12.B1—Effects of Technology—Analyze ethical, social, economic, and cultural considerations as related to the development, selecting, and use of technologies.

3.4.12.B2—Effects of Technology—Illustrate how, with the aid of technology, various aspects of the environment can be monitored to provide information for decision making.

3.4.12.E1—Medical Technologies—Compare and contrast the emerging technologies of telemedicine, nanotechnology, prosthetics and biochemistry as they relate to improving human health.

3.4.12.E2—Agricultural and Related Biotechnologies—Compare and contrast the technologies of biotechnology, conservation, bio-fuels, and ecosystems as they relate to managing Earth's resources effectively.

3.4.12.E3—Energy and Power Technologies—Compare and contrast energy and power systems as they relate to pollution, renewable and nonrenewable resources and conservation.

3.4.12.E6—Manufacturing Technologies—Compare and contrast the importance of science, technology, engineering, and math (STEM), as it pertains to the manufactured world.

3.4.12.C3—Research and Development, Invention and Innovation, Experimentation/Problem Solving and Troubleshooting—Apply the concept that many technological problems require a multi-disciplinary approach.

DELAWARE VALLEY SCHOOL DISTRICT

Checklist to Complete and Submit:
(Scan and email)

_____ Copy of the curriculum using the template entitled "Planned Instruction," available on the district website.

_____ The primary textbook form(s).

_____ The appropriate payment form, in compliance with the maximum curriculum writing hours noted on the first page of this document.

Each principal and/or department chair has a schedule of "First and Second Reviewers." Each Reviewer must sign & date below.

First Reviewer Printed Name_____

First Reviewer Signature_____ Date_____

Second Reviewer Printed Name_____

Second Reviewer Signature _____ Date_____