Science Curriculum Map: Horticulture 2023

updated 9/1/2023

Unit	Topics	Time Frame
Soil	Porosity and Permeability Soil texture and composition Soil pH Soil analysis Soil amendments Soilless mediums	**21 periods**
Fertilizers	Macronutrients Chemical vs. Organic Fertilizers Reading a fertilizer label Composting	**21 periods**
Plant Anatomy- Leaves, Roots, and Stems	Structure and function of leaves, roots, and stems Bulbs Propagation from leaf and stem cuttings	**21 periods**
Plant Anatomy- Flowers and Seeds	Flower anatomy Self pollination vs. cross pollination Seed structure Seed germination Pollinators	**21 periods**
Pest Management	Common pests and pathogens Pests vs. beneficial organisms Integrated pest management methods Pros and cons of chemical pest management Colony collapse disorder	**15 periods**
Landscaping and Urban Gardening	Choosing garden site Choosing plants for a garden Elements of design Alternatives to traditional gardens Hydroponics and aquaponics	**15 periods**
Careers	Horticulture Fields Training and Education Skills and daily tasks	**10 periods**

Unit 1 Summary: Soil

In this unit we will delve into the world of soil science and explore the intricate components that make up the foundation of our terrestrial ecosystems. We will navigate through several crucial topics, including the fundamental structure of soil, its permeability and porosity, the influential role of pH, the intriguing realm of soilless mediums, and the transformative power of soil amendments. Students will uncover the diverse characteristics and dynamics of soils, shedding light on their pivotal role in sustaining life and supporting agricultural endeavors. They will also deepen their understanding of the intricate interplay between soil components and their impact on plant growth, nutrient availability, and overall soil health.

Essential Questions:

How does soil structure influence the physical, chemical, and biological properties of soils, and what implications does this have for plant growth, water movement, and ecosystem health?

How can we improve soil structure to support healthy plant growth?

Vocabulary/Key Terms

Tier 2: soil, nutrient, agriculture, texture, composition, analysis

Tier 3: pH, permeability, porosity, soilless medium, soil, amendments, clay, sand, gravel, humus, loam, sandy loam, silt loam, clay loam

Evidence of Learning:

Major Assessments: Summative/Performance Assessments (Tests/Projects = 40%)
Test: Soil
Performance Assessment: Plant Care (rubric example)

Minor Assessments: Quizzes (20%)

Labs (30%)

- pH lab activity
- Jar Test
- Soilless medium project
- Porosity and Permeability Lab (directions, data and conclusions)

Practice (Homework/Classwork =10 %)
Practice assignments will include small group activities, literacy activities, teacher generated worksheets, ed-puzzles, and writing assignments. . Examples of activities can be found linked to this document (more activities will be added to this folder as they are created.)

Formative Assessments:
Formative assessments will consist of questioning techniques utilizing a variety of strategies during classroom discussions, observation of student performance in hands-on activities, student answers to practice assignments, warm ups and exit tickets .

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Resources

Shared Google Drive Folder

- https://agclassroom.org/teacher/
- https://learnaboutag.org/wgo/
- https://www.nifa.usda.gov/agriculture-education-toolkit
- https://www.agfoundation.org//free-resources/
- https://nutrientsforlife.org/
- https://virtualfarmtrips.com/agweekvfts/
- https://kidsgardening.org/resource-lesson-plans/
- https://www.calacademy.org/
- http://robertsonclass.weebly.com/plant--soil-science.html

Science Recommended Accommodations & Modifications for Curriculum Implementation

STANDARDS for Learning Targets

NJSLS Science	Literacy	Cross curricular	CTE(NJSLS 9) Technology(NJSLS)
HS-ESS2-1: Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. **HS-ETS1-1**: Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. **HS-ETS1-2**: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.	**LA.RH.9-10.2**: Determine the theme, central ideas, key information and/or perspective(s) presented in a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas. **LA.RST.9-10.4**: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics. **LA.RST.9-10.7**: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. **LA.RST.9-10.3**: Follow precisely a complex	**Math** **MA.A-REI.A.1**: Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. **MA.A-REI.D.10**: Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).	**9.3.12.AG-NR.4**: Demonstrate responsible management procedures and techniques to protect or maintain natural resources.

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	multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. **LA.RST.9-10.10**: By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently. **LA.WHST.9-10.4**: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. **LA.WHST.9-10.6**: Use technology, including the Internet, to produce, share, and update writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.	

Sample Measurable Objectives for Lesson Planning
• Describe the texture, grain size, feel, and smell of clay, sand, gravel, and humus. • Identify the advantage that each component gives to the soil for growing plants. • Explain how soil structure affects porosity and permeability. • Identify the percent of sand, silt and clay in loam. • Describe the characteristics of sandy loam, silt loam, and clay loam • Use the jar test to determine the percent of sand, silt and clay in a soil sample. • Use the soil triangle to determine the type of soil present in a sample. • Recommend soil amendments that can be used to fix soil that has too much clay or too much sand. • Explain how soil pH affects plant growth. • Describe ways to fix soil with pH that is too high or too low • Describe the effect of soil pH on the color of Hydrangeas

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Unit 2 Summary: Fertilizers

In this unit we will embark on an exploration of the essential elements that fuel plant growth and nourish our agricultural systems. Students will enhance their knowledge of plant nutrition and gain practical insights into optimizing fertilizer use for bountiful harvests. Students will also delve into the fascinating realm of composting, exploring how organic matter can be transformed into a rich, nutrient-dense soil amendment. Students will also compare and contrast organic and chemical fertilizers, examining their benefits and potential environmental impacts, and learn how to decipher fertilizer labels to determine the optimal amount of fertilizer required for their plants.

Essential Questions:

How can we ensure that our plants have everything they need to thrive?
What are the benefits and drawbacks associated with the use of different types of fertilizers?
How can we minimize the negative environmental impact associated with fertilizing our plants?

Vocabulary/Key Terms

Tier2: fertilizer, nutrients, moisture
Tier 3: organic, compost, macronutrients, microorganism, aeration

Evidence of Learning:

Major Assessments: Summative/Performance Assessments (Tests/Projects = 40%)
Test: Fertilizers
Performance Assessment: Plant Care (rubric example)

Minor Assessments: Quizzes (20%)

Labs (30%)
Radish Lab- https://www.fishersci.com/shop/products/investigating-plant-macronutrients-using-hydroponics/S20961
Fish Fertilizer Lab
Build a compost system from inexpensive materials
Reading Fertilizer Labels

Practice (Homework/Classwork =10 %)
Practice assignments will include small group activities, literacy activities, teacher generated worksheets, ed-puzzles, and writing assignments. . Examples of activities can be found linked to this document (more activities will be added to this folder as they are created.)

Macronutrients Reading
How to read a fertilizer label reading
Fertilizer Label Practice
Chemical Vs. Organic Fertilizer reading
What is compost worksheet
Do's and Don'ts of Composting

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Compost Rummi
Compost Critters

Formative Assessments:
Formative assessments will consist of questioning techniques utilizing a variety of strategies during classroom discussions, observation of student performance in hands-on activities, student answers to practice assignments, warm ups and exit tickets .

Resources

Shared Google Drive Folder
https://agclassroom.org/teacher/
https://learnaboutag.org/wgo/
https://www.nifa.usda.gov/agriculture-education-toolkit
https://www.agfoundation.org//free-resources/
https://nutrientsforlife.org/
https://virtualfarmtrips.com/agweekvfts/
https://kidsgardening.org/resource-lesson-plans/
https://www.calacademy.org/
http://robertsonclass.weebly.com/plant--soil-science.html

Science Recommended Accommodations & Modifications for Curriculum Implementation

STANDARDS for Learning Targets			
NJSLS Science	**Literacy**	**Cross curricular**	**CTE(NJSLS 9) Technology(NJSLS)**
HS-LS2-7: 7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. **HS-ESS3-4:** Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.	**LA.RH.9-10.2**: Determine the theme, central ideas, key information and/or perspective(s) presented in a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas. **LA.RST.9-10.4**: Determine the meaning of symbols, key terms, and other domain-specific	**Math** **A-REI.A.1**: Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable	**CTE** **9.3.12.AG-ENV.3:** Develop proposed solutions to environmental issues, problems and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry and ecology.

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HS-ETS1-1: 1: Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

HS-ETS1-2: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.

LA.RST.9-10.7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LA.RST.9-10.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

LA.RST.9-10.10: By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.

LA.WHST.9-10.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

LA.WHST.9-10.6: Use technology, including the Internet, to produce, share, and update writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

argument to justify a solution method.

A-REI.3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

Social Studies:
SOC.6.1.12.GeoHE.5.a: Generate/make an evidence-based argument regarding the impact of rapid urbanization on the environment and on the quality of life in cities.

SOC.6.1.12.EconEM.5.a : Analyze the economic practices of corporations and monopolies regarding the production and marketing of goods and determine the positive or negative impact of these practices on individuals and the nation and the need for government regulations.

9.3.12.AG-NR.3: Develop plans to ensure sustainable production and processing of natural resources.

9.3.12.AG-NR.4: Demonstrate responsible management procedures and techniques to protect or maintain natural resources.

Technology:
8.2.12.ETW.1: Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation, and maintenance of a chosen product.

8.2.12.ETW.2: Synthesize and analyze data collected to monitor the effects of a technological product or system on the environment.

8.2.12.ETW.3: Identify a complex, global environmental or climate change issue, develop a systematic plan of investigation, and propose an innovative sustainable solution.

8.2.12.ED.1: Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.

8.2.12.ED.2: Create scaled engineering drawings for a new product or system and make modifications to increase optimization based on feedback.

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	8.2.12.ED.3: Evaluate several models of the same type of product and make recommendations for a new design based on a cost benefit analysis.

Sample Measurable Objectives for Lesson Planning
● Identify the three macronutrients needed by all plants ● Describe the effects of too much or too little of the three macronutrients on plants ● Compare and contrast chemical and organic fertilizers ● Use information on a fertilizer label to identify the amounts of N, P, and K present. ● Choose the fertilizer best suited to a plant's needs. ● Use knowledge of factors that affect plant growth to determine the cause of a farm’s decreasing productivity. ● Identify the components necessary for a thriving compost pile. ● Describe the role that micro and macro organisms play in a compost pile. ● Explain why it is important to turn a compost pile.

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Unit 3 Summary: Plant Anatomy- Leaves, Roots, and Stems

In this unit we will journey through the intricate anatomy of plants, focusing on the structures of roots, stems, and leaves. We will explore the world of plant propagation, investigating the methods of propagation via cuttings and bulbs, unlocking the secrets of how new plants can be born from existing ones. Students will learn about leaf structure and function, unraveling the external and internal features that enable these green wonders to carry out photosynthesis and transpiration. Delving into the subterranean domain, we will study the contrasting root systems of tap and fibrous roots, to discover their unique adaptations and contributions to plant survival and nutrient absorption. Additionally, we will examine stems, understanding their structural variations and multifaceted functions in providing support, transport, and storage. Lastly, we will uncover intriguing tales hidden within tree rings, unraveling the history and insights they offer about a tree's growth and environmental conditions.

Essential Questions:

What role does each part of the plant play in its overall health?
How does the structure of different plant parts relate to their function?
What are the different methods of plant propagation?

Vocabulary/Key Terms

Tier 2: root, leave, stem, flower, seed fruit, vein, humidity, surface area, lateral, absorption, erosion, adventitious, aerial
Tier 3: tap root, fibrous root, lamina, midrib, pigment, photosynthesis, transpiration, stomate, epidermis, blade, petiole, vascular tissue, monocot, dicot, guard cells, cuticle, mesophyll, chloroplast, xylem, phloem, lenticel, terminal bud, vascular cambium, tuber, corm

Evidence of Learning:

Major Assessments: Summative/Performance Assessments (Tests/Projects = 40%)
Test: Leaves, Roots and Stems
Performance Assessment: Plant Care (rubric example)

Minor Assessments: Quizzes (20%)

Labs (30%)
Stomata Observation
Leaf Chromatography
Measuring Trees Gizmo
Photosynthesis Gizmo
Tree Ring Growth Study
Propagate new plants from stem and leaf cuttings (suggested plants: pothos, spider plants, african violets, celery, green onions)

Practice (Homework/Classwork =10 %)
Practice assignments will include small group activities, literacy activities, teacher generated worksheets, ed-puzzles, and writing assignments. . Examples of activities can be found linked to this document (more activities will be added to this folder as they are created.)

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Plant Part Ranking Discussion Starter
Name that Part- Do you know what you are eating?
Stem interior model
Terminal scar worksheet
Leaf anatomy worksheet
Root system identification practice
Fibrous vs. Tap Root Reeding
Weeding warm up

Formative Assessments:
Formative assessments will consist of questioning techniques utilizing a variety of strategies during classroom discussions, observation of student performance in hands-on activities, student answers to practice assignments, warm ups and exit tickets .

Resources

Shared Google Drive Folder
https://agclassroom.org/teacher/
https://learnaboutag.org/wgo/
https://www.nifa.usda.gov/agriculture-education-toolkit
https://www.agfoundation.org//free-resources/
https://nutrientsforlife.org/
https://virtualfarmtrips.com/agweekvfts/
https://kidsgardening.org/resource-lesson-plans/
https://www.calacademy.org/
http://robertsonclass.weebly.com/plant--soil-science.html

Science Recommended Accommodations & Modifications for Curriculum Implementation

STANDARDS for Learning Targets			
NJSLS Science	**Literacy**	**Cross curricular**	**CTE(NJSLS 9) Technology(NJSLS)**
HS-PS1-7: Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.	**LA.RH.9-10.2:** . Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.	**MA.G-MG.A.1:** Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).	**9.3.12.AG-PL.2**: Apply the principles of classification, plant anatomy and plant physiology to plant production and management.

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HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. **HS-LS1-5**: Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.	**LA.RST.9-10.4**: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics. **LA.RST.9-10.7:** Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. **LA.RST.9-10.3:** Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. **LA.RST.9-10.10:** By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently. **LA.WHST.9-10.4**: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. **LA.WHST.9-10.6**: Use technology, including the Internet, to produce, share, and update writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.	**MA.A-REI.D.10** [*Standard*] - Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).	**9.3.12.AG-PL.3**: Propagate, culture and harvest plants and plant products based on current industry standards.

Sample Measurable Objectives for Lesson Planning
• Identify the 6 main parts of a plant and describe the function of each part. • Describe 4 jobs done by the root for the plant and 1 job roots do for the environment • Classify root systems as fibrous roots or tap roots • Identify the advantages and disadvantages of tap root systems and fibrous root systems • Explain why some plants develop aerial roots • Identify the following parts on a stem: Node, internode, bud, terminal bud, terminal bud scar, leaf scar, lenticile • Determine the amount of current year growth and past year's growth from the external stem characteristics

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- Identify what goes in and what comes out of photosynthesis
- State where the components that go into photosynthesis come from and where the products of photosynthesis go
- Describe the anatomy of a leaf.
- Define transpiration
- Identify factors that affect the rate of transpiration and what each does to the rate of transpiration
- Identify adaptations some plants have to decrease the rate of transpiration in dry climates
- Grow new plants from stem and leaf cuttings.

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Unit 4 Summary: Plant Anatomy- Reproductive Parts

In this chapter, we will explore the world of plant propagation, investigating the methods of propagation via cuttings and bulbs, unlocking the secrets of how new plants can be born from existing ones. Through hands-on activities, scientific exploration, and practical applications, students gained a comprehensive understanding of both sexual and asexual plant propagation methods and the science behind each technique and their significance in horticulture, agriculture, and conservation.

Essential Questions:

How do plants reproduce, and what are the key differences between sexual and asexual reproduction in plants?
What are the primary reproductive structures in plants, and how do they contribute to the process of reproduction?
How does pollination occur, and what are the various mechanisms by which plants ensure successful fertilization?
What role do pollinators, such as insects, birds, and wind, play in plant reproduction, and how does this interaction benefit both plants and pollinators?
What is the purpose of each part of a seed, including the embryo, seed coat, and stored nutrients, and how do these parts function during germination?
What roles do the different floral organs, including petals, sepals, stamens, and carpels, play in attracting pollinators and facilitating fertilization?

Vocabulary/Key Terms

Tier 2: anatomy, structure
Tier 3: pollination, seed, germination, pollinator, propagation, cuttings, bulbs, complete flower, incomplete flower, cross pollination, self-pollination, pollen, endosperm, seed coat, embryo, plumule, epicotyl, hypocotyl, radicle, cotyledon, monocot, dicot, pistil, stigma, style, pollen tube, ovary, ovule, sepal, receptacle, petal, stamen, anther, filament

Evidence of Learning:

Major Assessments: Summative/Performance Assessments (Tests/Projects = 40%)
Test: Flowers and Seeds
Performance Assessment: Plant Care (example rubric)

Minor Assessments: Quizzes (20%)
- Flower structure quiz

Labs (30%)
- Pollinator Seeking Flower
- Flower dissection lab
- Germination Lab
- Gizmo: Germination Lab
- Seed Dissection Lab

Practice (Homework/Classwork =10 %)
Practice assignments will include small group activities, literacy activities, teacher generated worksheets, ed-puzzles, and writing assignments. . Examples

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of activities can be found linked to this document (more activities will be added to this folder as they are created.)

- Flower Structure

Formative Assessments:
Formative assessments will consist of questioning techniques utilizing a variety of strategies during classroom discussions, observation of student performance in hands-on activities, student answers to practice assignments, warm ups and exit tickets .

Resources

Shared Google Drive Folder

- https://agclassroom.org/teacher/
- https://learnaboutag.org/wgo/
- https://www.nifa.usda.gov/agriculture-education-toolkit
- https://www.agfoundation.org//free-resources/
- https://nutrientsforlife.org/
- https://virtualfarmtrips.com/agweekvfts/
- https://kidsgardening.org/resource-lesson-plans/
- https://www.calacademy.org/
- http://robertsonclass.weebly.com/plant--soil-science.html

Science Recommended Accommodations & Modifications for Curriculum Implementation

STANDARDS for Learning Targets			
NJSLS Science	**Literacy**	**Cross curricular**	**CTE(NJSLS 9) Technology(NJSLS)**
HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms **HS-LS4-4**: Construct an explanation based on evidence for how natural selection leads to adaptation of populations **HS-ESS3-4**: Evaluate or refine a	**LA.RH.9-10.2**: Determine the theme, central ideas, key information and/or perspective(s) presented in a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas. **LA.RST.9-10.4**: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades	**Math** **MA.A-REI.D.10**: Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).	**9.3.12.AG-PL.2**: Apply the principles of classification, plant anatomy and plant physiology to plant production and management. **9.3.12.AG-PL.3**: Propagate, culture and harvest plants and plant products based on current industry standards.

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technological solution that reduces impacts of human activities on natural systems	9-10 texts and topics. **LA.RST.9-10.7**: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. **LA.RST.9-10.3**: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. **LA.RST.9-10.10**: By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently. **LA.WHST.9-10.4**: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. **LA.WHST.9-10.6**: Use technology, including the Internet, to produce, share, and update writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

Sample Measurable Objectives for Lesson Planning
• List and describe 4 factors that need to be right for a seed to stop sleeping and start growing. • Identify the parts of a seed and identify the function of each part. • Describe the process a seed undergoes as it germinates into a plant. • Describe the function of flowers on a plant. • Explain the difference between a complete flower and an incomplete flower. • Identify the individual parts of a flower and the function of each of those parts. • Describe the processes of pollination and fertilization in a flower. • Compare and contrast pollination and cross pollination. • Describe adaptations that prevent a flower from self-pollinating • Describe special characteristics of flowers and pollen that help to make sure pollen grains get transported between flowers.

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Unit 5 Summary: Pest Management

In this unit we will delve into the realm of Integrated Pest Management, a holistic approach to pest control that aims to strike a balance between effective pest management and minimizing negative environmental impacts. We will explore a range of sustainable strategies employed in IPM, focusing on methods that integrate biological, cultural, physical, and chemical control measures. We will investigate the challenges associated with chemical pesticides, examining their limitations, potential environmental harm, and the emergence of resistant pest populations.

Essential Questions:

What is integrated pest management (IPM), and how does it differ from conventional pest control methods?
What are the economic, environmental, and social implications of implementing integrated pest management practices compared to traditional pesticide-dependent approaches?
What are the key principles and components of integrated pest management, and how do they contribute to reducing pest populations while minimizing negative impacts on human health and the environment?
How can biological, cultural, and mechanical control methods be integrated into an IPM strategy to manage pests effectively? What are the advantages and limitations of each method?

Vocabulary/Key Terms

Tier 2: Pest, pesticides, weed, resistance, sustainability, predators, sustainability
Tier 3: Integrated Pest Management (IPM), biological pest control, cultural control, mechanical control, pheromones, pathogen, habitat, crop rotation, companion planting, biodiversity, ecosystem services

Evidence of Learning:

Major Assessments: Summative/Performance Assessments (Tests/Projects = 40%)
Test: Pest Management
Performance Assessment: Plant Care (example rubric)

Minor Assessments: Quizzes (20%)

Labs (30%)
Trouble with Grainly Farms Case Study (Materials)
Mouthpart Madness
Tomato Hornworm Activity

Practice (Homework/Classwork =10 %)
Practice assignments will include small group activities, literacy activities, teacher generated worksheets, ed-puzzles, and writing assignments. . Examples of activities can be found linked to this document (more activities will be added to this folder as they are created.)

Introduction Activity- Pest or Beneficial Organism?
Beneficial Bugs Wanted Poster
Go Bug Card Game
Insect Identification Using a Dichotomous Key
Chemical Safety Poster

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Formative Assessments:
Formative assessments will consist of questioning techniques utilizing a variety of strategies during classroom discussions, observation of student performance in hands-on activities, student answers to practice assignments, warm ups and exit tickets .

Resources

Shared Google Drive Folder

PennState College Department of Entomology- https://ento.psu.edu/outreach/extension/ipm/english/community/school-ipm/educators
Michigan State University- https://www.canr.msu.edu/ipm/schools-community/schools/elementary_urban_ipm_curriculum
https://agclassroom.org/teacher/
https://learnaboutag.org/wgo/
https://www.nifa.usda.gov/agriculture-education-toolkit
https://www.agfoundation.org//free-resources/
https://nutrientsforlife.org/
https://virtualfarmtrips.com/agweekvfts/
https://kidsgardening.org/resource-lesson-plans/
https://www.calacademy.org/
http://robertsonclass.weebly.com/plant--soil-science.html

Science Recommended Accommodations & Modifications for Curriculum Implementation

STANDARDS for Learning Targets			
NJSLS Science	**Literacy**	**Cross curricular**	**CTE(NJSLS 9) Technology(NJSLS)**
HS-ETS1-1: Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. **HS-ESS3-4:** Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.	**LA.RH.9-10.2**: Determine the theme, central ideas, key information and/or perspective(s) presented in a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas. **LA.RST.9-10.4**: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific	**Math:** **MA.A-REI.D.10**: Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). **Social Studies:** **SOC.6.1.12.GeoHE.5.a**: Generate/make an evidence-based argument regarding the impact of	**CTE:** **9.3.12.AG-NR.4** Demonstrate responsible management procedures and techniques to protect or maintain natural resources. **9.3.12.AG-PL.1** Develop and implement a crop management plan

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HS-ETS1-2: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. **HS-ETS1-3**: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.	scientific or technical context relevant to grades 9-10 texts and topics. **LA.RST.9-10.7:** Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. **LA.RST.9-10.3**: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. **LA.RST.9-10.10:** By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently. **LA.WHST.9-10.4:** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. **LA.WHST.9-10.6**: Use technology, including the Internet, to produce, share, and update writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.	rapid urbanization on the environment and on the quality of life in cities. **SOC.6.1.12.EconEM.5.a** : Analyze the economic practices of corporations and monopolies regarding the production and marketing of goods and determine the positive or negative impact of these practices on individuals and the nation and the need for government regulations.	for a given production goal that accounts for environmental factors. **9.3.12.AG-PL.3** Propagate, culture and harvest plants and plant products based on current industry standards. **Technology:** **8.2.12.ED.5:** Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics). **8.2.12.ETW.1:** Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation, and maintenance of a chosen product. **8.2.12.ETW.2:** Synthesize and analyze data collected to monitor the effects of a technological product or system on the environment. **8.2.12.ETW.3:** Identify a complex, global environmental or climate change issue, develop a systematic plan of investigation, and propose an innovative sustainable solution.

Sample Measurable Objectives for Lesson Planning

- Describe the practice of integrated pest management (IPM) and explain why it is considered a sustainable and environmentally friendly approach to pest control.
- Identify common pests and their impacts on agricultural and environmental systems, including the potential risks associated with conventional pesticide use.
- Distinguish between pests and beneficial organisms.
- Describe the key principles and components of integrated pest management, such as pest monitoring, pest identification, and the use of multiple control strategies.

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- Compare and contrast the different pest control methods used in IPM, including biological, cultural, mechanical, and chemical controls, while considering their advantages and limitations.
- Evaluate the potential impacts of pesticides on human health, non-target organisms, and the environment, and propose alternative methods to minimize risks.
- Create an IPM plan for a specific crop or pest problem, incorporating a variety of control strategies and considering the economic and ecological aspects of implementation.

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Unit 6 Summary: Landscaping and Urban Gardening

In this unit we will learn about garden design—an artful blend of creativity, functionality, and environmental consciousness. We will delve into the multifaceted aspects that contribute to successful garden design, considering the environmental factors that shape location and plant selection. By understanding the unique characteristics of the garden site, such as sunlight, soil composition, and climate, students will be equipped to make informed decisions and create thriving gardens that harmonize with their surroundings. We will also delve into the realm of aesthetic design elements, where we will explore principles such as balance, unity, color, and texture. Students will also explore alternative gardening methods such as container gardening, vertical gardening, and hydroponics.

Essential Questions:

What are the key principles of landscape design?
What factors should be considered when designing a landscape to be both aesthetically pleasing and functional for specific activities?
How do personal preferences and individual lifestyles impact landscape design choices?
How can the principles of permaculture and regenerative design be applied to create landscapes that are both productive and environmentally beneficial?
How does landscaping contribute to the overall aesthetics and functionality of urban spaces?
How can urban gardening contribute to food security and local sustainability?
What are the challenges and opportunities of designing and maintaining green roofs and vertical gardens in urban environments?
How can urban gardening and landscaping help mitigate the urban heat island effect and improve air quality?
How can technology and innovative design concepts be integrated into modern urban gardening practices?

Vocabulary/Key Terms

Tier 2: functionality, design, environmental factors, climate, aesthetics, balance, unity, color, texture
Tier 3: container gardening, vertical gardening, hydroponics, aquaponics, bio solids, closed system, cutting, cloning, coir, growing medium, macronutrients, micronutrients, nutrient solution, rock wool

Evidence of Learning:

Major Assessments: Summative/Performance Assessments (Tests/Projects = 40%)
Test: Garden Design and Urban Gardening
Performance Assessment: Plant Care (example rubric)

Minor Assessments: Quizzes (20%)

Labs (30%)

- Garden Design Project

Practice (Homework/Classwork =10 %)
Practice assignments will include small group activities, literacy activities, teacher generated worksheets, ed-puzzles, and writing assignments. . Examples of activities can be found linked to this document (more activities will be added to this folder as they are created.)

- Hardiness Zones
- Scale Drawings

Formative Assessments:

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Formative assessments will consist of questioning techniques utilizing a variety of strategies during classroom discussions, observation of student performance in hands-on activities, student answers to practice assignments, warm ups and exit tickets .

Resources

Share Google Drive Folder

- https://agclassroom.org/teacher/
- https://learnaboutag.org/wgo/
- https://www.nifa.usda.gov/agriculture-education-toolkit
- https://www.agfoundation.org//free-resources/
- https://nutrientsforlife.org/
- https://virtualfarmtrips.com/agweekvfts/
- https://kidsgardening.org/resource-lesson-plans/
- https://www.calacademy.org/
- http://robertsonclass.weebly.com/plant--soil-science.html

Science Recommended Accommodations & Modifications for Curriculum Implementation

STANDARDS for Learning Targets			
NJSLS Science	**Literacy**	**Cross curricular**	**CTE(NJSLS 9) Technology(NJSLS)**
HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. **HS-ETS1-2**: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. **HS-ETS1-3**: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social,	**LA.RH.9-10.2**: Determine the theme, central ideas, key information and/or perspective(s) presented in a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas. **LA.RST.9-10.4**: . Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics. **LA.RST.9-10.7**: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate	**Technology** **8.2.12.ED.1**: Use research to create a product or system that addresses a problem and make modifications based on input from potential consumers. **8.2.12.ED.2**: : Create scaled engineering drawings for a new product or system and make modification to increase optimization based on feedback. **8.2.12.ED.3**: Evaluate several models of the same type of product and make recommendations for a new design based on a cost benefit	**9.3.12.AG-ENV.3**: Develop proposed solutions to environmental issues, problems and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry and ecology. **9.3.12.AG-NR.3**: Develop plans to ensure sustainable production and processing of natural resources. **9.3.12.AG-NR.4**: Demonstrate responsible management procedures and techniques to protect or maintain natural resources.

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cultural, and environmental impacts.	information expressed visually or mathematically (e.g., in an equation) into words. **LA.RST.9-10.3**: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. **LA.RST.9-10.10**: By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently. **LA.WHST.9-10.4**: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. **LA.WHST.9-10.6**: Use technology, including the Internet, to produce, share, and update writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.	analysis.	**9.3.12.AG-PL.4**: Apply principles of design in plant systems to enhance an environment (e.g., floral, forest, landscape and farm).

Sample Measurable Objectives for Lesson Planning

- Explain what is meant by full sun, partial sun, partial shade, and shade on a plant label.
- Describe how temperatures that are too high and temperatures that are too low affect plants.
- Describe what can happen to plants if humidity is too high or too low.
- Identify states where different plants are likely to grow based on heat and hardiness zones.
- Apply the elements of harmony/contrast, color, proportion, texture, plant structure and form to design an aesthetically pleasing garden.
- Describe methods of creating a garden in an urban setting with limited land availability.
- Explain how hydroponics can be used to grow plants without soil.

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Unit 7 Summary: Careers in Horticulture

In this unit students will learn about various career paths where their knowledge of horticulture can be utilized. Through a series of activities, they will explore different horticulture related professions, identify their personal interests and skills, and research a specific career of their choice. To begin, students will complete a questionnaire designed to assess their interests, skills, and aspirations. This will help them gain insights into their personal preferences and strengths related to horticulture. Once they have identified a horticulture career that aligns with their interests they will conduct research on their chosen career, exploring its key responsibilities, required education and qualifications, potential work settings, and opportunities for growth. They will then create a slide presentation to showcase their research findings.

Essential Questions:

What educational and training pathways are essential for pursuing a successful career in horticulture, and how do they vary across different roles?
What are the key responsibilities and skills required for roles such as landscape designer, nursery manager, arborist, agricultural consultant, ect. ?

Vocabulary/Key Terms

Tier 2: education, training, salary
Tier 3: Horticulture, botany, arborist, nursery manager, landscape designer, garden center manager, greenhouse grower, horticultural therapist, landscape architect, turfgrass manager, plant pathologist, entomologist, floral designer, irrigation specialist, urban farmer

Evidence of Learning:

Major Assessments: Summative/Performance Assessments (Tests/Projects = 40%)
Project: Horticulture Career Presentation

Minor Assessments: Quizzes (20%)

Labs (30%)
Practice (Homework/Classwork =10 %)
Practice assignments will include small group activities, literacy activities, teacher generated worksheets, ed-puzzles, and writing assignments. . Examples of activities can be found linked to this document (more activities will be added to this folder as they are created.)
Careers Scavenger Hunt

Formative Assessments:
Formative assessments will consist of questioning techniques utilizing a variety of strategies during classroom discussions, observation of student performance in hands-on activities, student answers to practice assignments, warm ups and exit tickets .
Careers Discussion/intro

Resources

Shared Google Drive Folder

- https://agclassroom.org/teacher/
- https://learnaboutag.org/wgo/
- https://www.nifa.usda.gov/agriculture-education-toolkit
- https://www.agfoundation.org//free-resources/

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- https://nutrientsforlife.org/
- https://virtualfarmtrips.com/agweekvfts/
- https://kidsgardening.org/resource-lesson-plans/
- https://www.calacademy.org/
- http://robertsonclass.weebly.com/plant--soil-science.html

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	grades 9-10 text complexity band independently and proficiently. **LA.WHST.9-10.4**: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. **LA.WHST.9-10.6**: Use technology, including the Internet, to produce, share, and update writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. **LA.WHST.9-10.7**: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. **LA.WHST.9-10.8**: Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.	

Sample Measurable Objectives for Lesson Planning
• Identify the career options that utilize horticultural skills and knowledge. • Describe 4 career fields within horticulture and a description of what people in these fields do. • Research one career option within the horticulture field and create a presentation to educate your fellow classmates about your horticulture career.

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