



MIDLAND PARK PUBLIC SCHOOLS
Midland Park, New Jersey
CURRICULUM

Horticulture

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*Approved by the Midland Park Board of Education on
August 16, 2016*

Horticulture (Semester Course)

Course Description:

Horticulture is designed to help the student develop an in-depth understanding of the science and art of cultivating and processing plants for human use. Students will apply knowledge, skills and technologies to produce plants for human food. Students will participate in a variety of in-class and out-of-class learning activities designed to teach them plant propagation, cultivation, improving plant growth, and yields. Successful horticulture depends on control of the environment, including light, water, temperature, soil structure, pests and diseases. The “green industry” is all around you, from the food you eat, to parks and landscaping.

A guided inquiry program, problem-based learning experiences and gardening projects will give students the opportunity to explore topics and concepts through investigations. Participating in this hands-on program helps students:

1. To be prepared for College/Career by emphasizing key skills and practices (NGSS, CCSS, STEM).
2. Become lifelong learners and engaged citizens.

Suggested Course Sequence*:

Unit 1

Overview of Plants (10-20 days)

Unit 2

Seeded Plants (29-31 days)

Unit 3

Plant Processes (14-16 days)

Unit 4

Productivity, Irrigation, Pest Control & Invasive Species (9-11 days)

Unit 5

Feeding the World (10-12 days)

**The number of instructional days is an estimate based on the information available at this time. 1 day equals approximately 48 minutes of seat time. Teachers are strongly encouraged to review the entire unit of study carefully and collaboratively to determine whether adjustments to this estimate need to be made.*

Unit Overview

Content Area: Science

Unit Title: Seeded Plants & Plant Reproduction

Grade Level: 9-12

Unit Summary: Seed Plants have adaptations that enable them to live and reproduce in diverse environments.

Interdisciplinary

Connections:

HS-LS1-2, HS-LS1-3, HS-LS2-1, HS-LS2-2, HS-LS4-4, HS-LS4-5

RST.11-12.1, WHST.9-12.7, WHST.11-12.8, WHST.11-12.9, WHST.9-12.2, SL.11-12.5

MP.2, MP.4,

21st Century

Themes and Skills:

CRP2, CRP4, CRP5, CRP6, CRP8, CRP7, CRP9, CRP11

Technology: 8.1.12.C.1, 8.1.12.E.1, 8.1.12.F.1

Learning Targets

Standards (Content and Technology):

CPI#:	Statement:
HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
HS-LS2-1	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
HS-LS4-2	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.

Unit Essential Question(s):

- What are the parts of plants and how do they function?
- What is the difference between gymnosperms and angiosperms?
- How do plants reproduce?

Unit Enduring Understandings:

- Humans depend on seed plants for food, clothing and shelter.
- Structure of plants.
- Different types of plants and how plants reproduce.
- Importance of bees.

Unit Learning Targets/Objectives:

Students will

- Identify the characteristics of seed plants.
- Explain the structures and functions of roots, stems, and leaves.
- Describe the main characteristics and importance of gymnosperms and angiosperms.
- Compare similarities and differences between monocots and dicots.

- Distinguish between the two types of plant reproduction.
- Describe the two stages in a plant's life cycle.
- Relate flowers to plant reproduction.

Evidence of Learning

Formative Assessments: Test, Completed project

"Where's the Bees" Project Rubric

Test

Summative/Benchmark Assessment(s): Quizzes, homework, Q&A, worksheets

Lab Reports

Q&A

Worksheets

Exit Slip

Group Problem Solving

Quizzes

Resources/Materials (copy hyperlinks for digital resources):

Plant Biology (ISBN 9780-0-07-336944-0)

Grow Lab (ISBN 0-915873-32-X)

From Bacteria to Plants (ISBN 0-13-1150-86-3)

From Bacteria to Plants (ISBN 978-0-07-877815-5)

Plants (ISBN 0-8251-3757-8)

Investigating Plants (ISBN 0-941212-21-1)

Modifications: group problem solving, peer tutoring, modeling,

- Special Education Students: Hands on lab activity, cooperative learning, peer tutoring, extended time

- English Language Learners:
 - Hands-on activities & explanations
 - Assess comprehension through demonstration
 - Give instructions/directions in writing & orally
 - Use translation dictionaries to locate words in the native language

- At-Risk Students
- Hands on activity
- cooperative learning
- reteach in various methods
- Gifted and Talented Students
- Provide extension activities on project per student interest

Lesson Plans

Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete)
Seed Plants	Characteristics of Seed Plants	3 days
Plant Structure	Structures & functions of roots, stems and leaves	3 days
Types of Plants	Gymnosperms	2 days
	Reproduction in Gymnosperms	2 days
	Angiosperms & Types of Angiosperms	3 days

	Reproduction of Angiosperms	2 days
Flowers	Structures of Flowers	3 days
	Flowers in Reproduction	2 days
Lab	Lab- Parts of a Plant & Flowers	2 days
Plants	Importance of Seed Plants	2 days
Pollination	Pollinating insects	2 days
PBL	Where are the Bees?	5 days

Teacher Notes:

Additional Resources

Click links below to access additional resources used to design this unit.

Unit Overview

Content Area: Science

Unit Title: Overview of Plants

Grade Level: 9-12

Unit Summary: Plants have adaptations that enable them to survive in the many environments on Earth.

Interdisciplinary

Connections:

HS-LS1-2, HS-LS1-3, HS-LS2-1, HS-LS2-2, HS-LS4-4, HS-LS4-5
 RST.11-12.1, WHST.9-12.7, WHST.11-12.8, WHST.11-12.9, WHST.9-12.2, SL.11-12.5
 MP.2, MP.4

21st Century

Themes and Skills: CRP4, CRP5, CRP6, CRP8, CRP9, CRP11

Technology: 8.1.12.C.1, 8.1.12.E.1, 8.1.12.F.1

Learning Targets

Standards (Content and Technology):

CPI#:	Statement:
HS-LS4-2	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
HS-LS4-5	Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

Unit Essential Question(s):

Unit Enduring Understandings:

<ul style="list-style-type: none"> · What is a plant? · How is soil classified? 	<ul style="list-style-type: none"> · Parts of a plant. · Vascular vs. nonvascular plants. · Characteristics of soil for growing plants.
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Unit Learning Targets/Objectives:

Students will

- Identify characteristics common to all plants.
- Explain which plant adaptations make it possible for plants to survive on land.
- Compare and contrast vascular and nonvascular plants.
- List characteristics used to classify soil.
- Examine different soils for growing plants.

Evidence of Learning

Formative Assessments:

Test

Summative/Benchmark Assessment(s):

Lab Reports

Q&A

Worksheets

Exit Slip

Group Problem Solving

Quizzes

Resources/Materials (copy hyperlinks for digital resources):

Plant Biology (ISBN 9780-0-07-336944-0)

Grow Lab (ISBN 0-915873-32-X)

From Bacteria to Plants (ISBN 0-13-1150-86-3)

From Bacteria to Plants (ISBN 978-0-07-877815-5)

Plants (ISBN 0-8251-3757-8)

Investigating Plants (ISBN 0-941212-21-1)

Modifications: group problem solving, peer tutoring, modeling,

- | | |
|---|---|
| <ul style="list-style-type: none"> ● Special Education Students: Hands on lab activity, cooperative learning, peer tutoring, extended time | <ul style="list-style-type: none"> ● At-Risk Students ● Hands on activity ● cooperative learning ● reteach in various methods |
| <ul style="list-style-type: none"> ● English Language Learners: | <ul style="list-style-type: none"> ● Gifted and Talented Students |
| <ul style="list-style-type: none"> ● Hands-on activities & explanations | <ul style="list-style-type: none"> ● Provide extension activities on project per student interest |
| <ul style="list-style-type: none"> ● Assess comprehension through demonstration | |
| <ul style="list-style-type: none"> ● Give instructions/directions in writing & orally | |

- Use translation dictionaries to locate words in the native language
- Provide extension activities per student interest

Lesson Plans

Lesson Name/ Topic	Lesson Objective(s)	Time frame (day(s) to complete)
Plants	What is a plant?	1 day
	Adaptations for Living on Land	2 days
	Classification of Plants	2 days
	Compare and Contrast Vascular vs. Non Vascular Plants	2 days
	Plant Care	Continuous
Lab	Plants from Seeds	Continuous
PBL	“Seed Germination”	21 days
Soil	Soil Characteristics	2 days
	Why is Composting a Beneficial Process?	1 day
	Setting up Greenhouse	10 days

Teacher Notes:

Additional Resources

Click links below to access additional resources used to design this unit:

Unit Overview

Content Area: Science

Unit Title: Plant Processes

Grade Level: 9-12

Unit Summary: Photosynthesis and cellular respiration help cycle carbon dioxide and oxygen in the environment. Plant responses can result from internal and/or external stimuli.

Interdisciplinary

Connections:

RST.11-12.1, WHST.9-12.7, WHST.11-12.8, WHST.11-12.9, WHST.9-12.2, SL.11-12.5

MP.2, MP.4

HSN-Q.A.1, HSN-Q.A.2, HSN-Q.A.3

21st Century

Themes and Skills: CRP2, CRP4, CRP5, CRP6, CRP8, CRP9, CRP11

Technology: 8.1.12.C.1, 8.1.12.E.1, 8.1.12.F.1

Learning Targets

Standards (Content and Technology):

CPI#:

Statement:

HS-LS1-5

Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

HS-LS2-4

Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

Unit Essential Question(s):

Unit Enduring Understandings:

- **What is photosynthesis?**
- **What happens when light strikes a green leaf?**
- **How do scientists summarize the process of photosynthesis?**
- **How do plants respond to stimuli?**

- Why photosynthesis is important to plants.
- Why light is important for plants.
- Plant response to stimuli.

Unit Learning Targets/Objectives:

Students will

- Explain how plants take in and give off gases.
- Compare and contrast photosynthesis and cellular respiration.
- Analyze why photosynthesis and cellular respiration are important.
- Identify the relationship between a stimulus and a tropism in plants.
- Compare and contrast long-day and short-day plants.
- Explain how plant hormones and responses are related.

Evidence of Learning

Formative Assessments:

Test
Project

Summative/Benchmark Assessment(s):

Lab reports
Q & A
Worksheets
Group Problem Solving
Quizzes

Resources/Materials (copy hyperlinks for digital resources):

Plant Biology (ISBN 9780-0-07-336944-0)
Grow Lab (ISBN 0-915873-32-X)
From Bacteria to Plants (ISBN 0-13-1150-86-3)
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Plants (ISBN 0-8251-3757-8)
Investigating Plants (ISBN 0-941212-21-1)

Modifications: group problem solving, peer tutoring, modeling,

- | | |
|--|---|
| <ul style="list-style-type: none"> ● Special Education Students: Hands on lab activity, ● cooperative learning, peer tutoring, extended time | <ul style="list-style-type: none"> ● At-Risk Students ● Hands on activity ● cooperative learning ● reteach in various methods |
| <ul style="list-style-type: none"> ● English Language Learners: | |
| <ul style="list-style-type: none"> ● Hands-on activities & explanations | <ul style="list-style-type: none"> ● Gifted and Talented Students |
| <ul style="list-style-type: none"> ● Assess comprehension through demonstration | |

- Give instructions/directions in writing & orally
- Use translation dictionaries to locate words in the native language
- Provide extension activities per student interest

Lesson Plans

Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete)
Plants	Photosynthesis & Cellular Respiration	5 days
	Plant Responses	2 days
	Plant Hormones	2 days
	Photoperiods	2 days
	Lab Activity on Plant Responses	5 days

Teacher Notes:

Additional Resources

Click links below to access additional resources used to design this unit:

Unit Overview

Content Area: Science

Unit Title: Productivity, Irrigation, Pest Control & Invasive Species

Grade Level: 9-12

Unit Summary: Farming/Planting practices to increase productivity.

Interdisciplinary

Connections: HSN-Q.A.1, HSN-Q.A.2, HSN-Q.A.3, HSS-IC.A.1, HSS-IC.B.6, RST.11-12.1, WHST.9-12.7, WHST.11-12.8, WHST.11-12.9, WHST.9-12.2, SL.11-12.5, RST.9-10.8, RST.11-12.7, RST.11-12.8
MP.2, MP.4

21st Century

Themes and Skills: CRP2, CRP4, CRP5, CRP6, CRP8, CRP9, CRP11

Technology: 8.1.12.C.1, 8.1.12.E.1, 8.1.12.F.1

Learning Targets

Standards (Content and Technology):

CPI#:	Statement:
HS-LS2-6	Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
HS-LS2-1	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
HS-LS2-8	Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
HS-LS2-7	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

<p>Unit Essential Question(s):</p> <ul style="list-style-type: none"> • What is the green revolution? • How do pest affect plants? • What are invasive species? 	<p>Unit Enduring Understandings:</p> <ul style="list-style-type: none"> • The benefits and risks of agriculture. • How to be part of the green revolution. • How irrigation & pests affect plant growth. Invasive species and affect on environment. 			
<p>Unit Learning Targets/Objectives:</p> <p><i>Students will</i></p> <ul style="list-style-type: none"> • Discuss the beginnings of agriculture. • Explain the importance of industrial agriculture and the green revolution. • Identify different types of pest control. • Explain the importance of pollinators to agriculture. • Describe how irrigation and pesticide use can improve soil productivity in the short term, but they can pollute soil in the long term. <p style="padding-left: 40px;">Explore invasive species and affect on the environment.</p>				
<p>Evidence of Learning</p>				
<p>Formative Assessments:</p> <p>Power Point & Poster on Invasive Species or Pests (5days)</p> <p>Summative/Benchmark Assessment(s):</p> <p>Lab Reports</p> <p>Worksheets</p> <p>Cooperative Learning</p> <p>Quiz</p> <p>Resources/Materials (copy hyperlinks for digital resources):</p> <p>Plant Biology (ISBN 9780-0-07-336944-0)</p> <p>Grow Lab (ISBN 0-915873-32-X)</p> <p>From Bacteria to Plants (ISBN 0-13-1150-86-3)</p> <p>From Bacteria to Plants (ISBN 978-0-07-877815-5)</p> <p>Plants (ISBN 0-8251-3757-8)</p> <p>Investigating Plants (ISBN 0-941212-21-1)</p>				
<p>Modifications: group problem solving, peer tutoring, modeling,</p> <table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ● Special Education Students: Hands on lab activity, ● cooperative learning, peer tutoring, extended time ● English Language Learners: ● Hands-on activities & explanations </td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ● At-Risk Students ● Hands on activity ● cooperative learning ● reteach in various methods </td> </tr> </table>			<ul style="list-style-type: none"> ● Special Education Students: Hands on lab activity, ● cooperative learning, peer tutoring, extended time ● English Language Learners: ● Hands-on activities & explanations 	<ul style="list-style-type: none"> ● At-Risk Students ● Hands on activity ● cooperative learning ● reteach in various methods
<ul style="list-style-type: none"> ● Special Education Students: Hands on lab activity, ● cooperative learning, peer tutoring, extended time ● English Language Learners: ● Hands-on activities & explanations 	<ul style="list-style-type: none"> ● At-Risk Students ● Hands on activity ● cooperative learning ● reteach in various methods 			

- Assess comprehension through demonstration
- Give instructions/directions in writing & orally
- Use translation dictionaries to locate words in the native language
- Gifted and Talented Students
- Provide extension activities per student interest on going green

Lesson Plans

Lesson Name /Topic	Lesson Objective(s)	Time frame (day(s) to complete)
Agriculture	Agriculture & the green revolution.	3 days
	Pests & Pesticides	2 days
	Invasive Species	5 days

Teacher Notes:		
Additional Resources Click links below to access additional resources used to design this unit:		

Unit Overview

Content Area: Science

Unit Title: Feeding the World

Grade Level: 9-12

Unit Summary: What technologies may help farmers produce more crops?

Interdisciplinary

Connections: HSN-Q.A.1, HSN-Q.A.2, HSN-Q.A.3, HSS-IC.A.1, HSS-IC.B.6, HS-ESS3-1, HS-ESS3-4, RST.11-12.1, WHST.9-12.7, WHST.11-12.8, WHST.11-12.9, WHST.9-12.2, SL.11-12.5, RST.9-10.8, RST.11-12.7, RST.11-12.8, SL.11-12.4
MP.2, MP.4

21st Century

Themes and Skills: CPR1, CRP2, CRP4, CRP5, CRP6, CRP7, CRP8, CRP11

Technology: 8.1.12.C.1, 8.1.12.E.1, 8.1.12.F.1, 8.1.12.A.5

Learning Targets

Standards (Content and Technology):

CPI#:	Statement:
HS-LS2-1	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
HS-LS4-2	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.

HS-LS4-4	Construct an explanation based on evidence for how natural selection leads to adaptation of populations.
HS-LS4-5	Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

<p>Unit Essential Question(s):</p> <ul style="list-style-type: none"> How can we produce enough food for a rapidly growing population while sustaining our ability to produce it? 	<p>Unit Enduring Understandings:</p> <ul style="list-style-type: none"> Why the world needs more food. Can genetically modified food be used to increase food supply.
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<p>Unit Learning Targets/Objectives: <i>Students will</i></p> <ul style="list-style-type: none"> Explain why the world needs to grow more food and to grow it sustainably. Explore benefits of Hydroponics. Discuss genetically modified food. Identify the benefits of Genetic Engineering in Plants. Discuss sustainable agriculture

Evidence of Learning

<p>Formative Assessments: Project Hydroponics or GMO Food</p> <p>Summative/Benchmark Assessment(s): Worksheets Exit slip Group Project Quiz</p> <p>Resources/Materials (copy hyperlinks for digital resources): Plant Biology (ISBN 9780-0-07-336944-0) Grow Lab (ISBN 0-915873-32-X) From Bacteria to Plants (ISBN 0-13-1150-86-3) From Bacteria to Plants (ISBN 978-0-07-877815-5) Plants (ISBN 0-8251-3757-8) Investigating Plants (ISBN 0-941212-21-1) Biotechnology (ISBN13: 978-1-56765-948-1)</p>

Modifications: group problem solving, peer tutoring, modeling,

Teacher Notes:

Additional Resources

Click links below to access additional resources used to design this unit: