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ABSTRACT

The basic elective course in introductory botany is designed for secondary students who probably will not continue study in plant science. The objectives of the course are to help the student 1) identify, compare and differentiate types of plants; 2) identify plant cell structures; 3) distinguish between helpful and harmful plants; 4) predict economic uses of plants; 5) gather data on plant growth; and, 6) justify the use of plants as food for humans. The course content focuses on commercial uses of plants, identification and structure of plants, enemies of plants, and plants and health. Forty-two experiments are listed and coordinated with the course content. Additional features include a project listing; 16 types of Florida plants requiring students to identify and provide other information; lists of innovative activities, suggested report topics, discussion questions, state adopted texts, suggested field trips in Florida, speakers and resource people, references, resources, audio visual materials; and, lists including prices of film loops, color slides, bio-plastic mounts, and models. Related documents are SO 002 701 through SO 002 718. (Author/SJM)

AUTHORIZED COURSE OF INSTRUCTION FOR THE QUINMESTER PROGRAM

WHO NEEDS PLANTS:

5314.04
SCIENCE
(Experimental)

DADE COUNTY PUBLIC SCHOOLS
DIVISION OF INSTRUCTION•1971

WHO NEEDS PLANTS?

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SCIENCE
(Experimental)

Written by Bernard H. Ropeik and David Z. Kleinman
for the
DIVISION OF INSTRUCTION
Dade County Public Schools
Miami, Florida
1971

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TABLE OF CONTENTS

WHO NEEDS PLANTS?

COURSE DESCRIPTION:

A basic course in introductory Botany, it discusses the commercial and everyday use of plants and their relationships to the lives of students.

ENROLLMENT GUIDELINES:

This is an elective course for the student who probably will not go further in plant science.

STATE ADOPTED TEXTS

1. Biological Science Curriculum Study. Biological Science: An Inquiry into Life. 2nd. ed. New York: Harcourt Brace and World, 1968.

2. Biological Science Curriculum Study. Biological Science: Molecules to Man. 2nd. ed. Atlanta: Houghton Mifflin, 1968.

3. Biological Science Curriculum Study. High School Biology: BSCS Green Version, 2nd. ed. Chicago: Rand McNally, 1968.

4. Biological Science Curriculum Study. Patterns and Processes. New York: Holt, Rinehart and Winston, 1966.

5. Brandwein et al. Life Its Forms and Changes. New York: Harcourt Brace and World, 1968.

6. Brandwein et al. The Earth: Its Living Things. 2nd. ed. New York: Harcourt,Brace, Jovanovich, 1970.

7. Oxenhorn and Idelson. Pathways in Science: Biology. Vol. 1, 2, 3. New York: Globe Book Co., 1968-1970.

8. Smallwood and Green. Biology. Morristown, New Jersey: Silver Burdett, 1971.

9. Wong and Dolmatz. Ideas and Investigations in Science: Biology. Englewood Cliffs, New Jersey: Prentice Hall, Inc., 1971.

PERFORMANCE OBJECTIVES

The student will:

1. Given an assortment of plants, identify at least one type of:
   a. algae
   b. fungi
   c. fern
   d. monocot
   e. dicot
2. Given the above list, compare one characteristic of any two plants.
3. Given elodea, lettuce or onions, find the following plant cell structures:
   a. cell wall
   b. chloroplast
   c. nucleus
   d. guard cell
4. Distinguish between a given number of harmful and helpful South Florida plants.
5. Given various plant stems including the trunk of a local pine tree or hardwood, predict the economic uses of the plant.
6. Given colored cellophane and/or colored glass and a number of green plants, gather data on the effects on growth of different colored light.
7. Given a lima bean or other food plant, justify the use of the plant as food for humans.
8. Differentiate between a shrub, vine and tree.
9. Optional -- Make a plant collection which demonstrates the following types of plants:
   a. fungi
   b. ferns
   c. gymnosperm
   d. angiosperm
      (1) monocot
      (2) dicot

COURSE OUTLINE

I. Commercial Uses of Plants

A. Economic importance of gymnosperms
1. Wood source for lumber
2. Chemicals such as alcohol, turpentine
3. Food source - seeds
4. Beautification - shade trees, ornamentals, and hedges

B. Economic importance of angiosperms
1. Foods - vegetable, fruits, nuts, berries
2. Lumber and wood products
3. Chemicals and drugs
4. Helpful and harmful effects
5. Erosion control
6. Beautification - house plants, landscaping

C. Shrubs and bushes

D. Annuals, bulbs, and vines

E. One-celled plants in industry
1. Algae
a. Beneficial - food source, fertilizers, space flight
b. Non-beneficial - decomposition, toxin, pollution of aquatic environment
2. Fungi - saphrophitic, parasitic relationships
a. Effects of molds and mildews
b. Effects of rusts
c. Mushroom - a food source or a killer
d. Bacteria
1. Harmful - diseases, toxins
2. Helpful - medicine, industrial processes (cheese, chemicals,) plant nutrition (nitrogen fixation).
e. Yeast

II. Identification of Common Florida Plants

A. Edible

B. Medicinal

C. Toxic

D. Destructive

E. Household

III. Structure of Plants

A. Cells
1. Nucleus
2. Cytoplasm
3. Inclusions

B. Stems

C. Roots

D. Leaves

E. Flowers

F. Fruit

IV. Enemies of Plants

A. Insects

B Pollution

V. Plants and Health

A. Disease Producing Bacteria

B. Antibiotic Producing Plants

EXPERIMENTS

B. S. C. S. Laboratory Guide, Biological Science: An Inquiry into Life. 2nd. ed. New York: Harcourt Brace and World, 1968.

1. Simple Key to Flowering Plants (Ex. 17-2, p. 111)
2. Plants or Animals (Ex. 18-2, p. 124)
3. Cells of Living Plants (Ex. 3-2, p. 25)
4. Distribution of Microorganisms (Ex. 10-1, p. 70)
5. Staining and Observing Bacterial Cells (Ex. 10-2, p. 72)
6. Fungus Among Us (Ex. 12-2, p. 83)
7. Green Algae, Simple and Complex (Ex. 13-2, p. 89)
8. A Primitive Vascular Plant (Ex. 14-2, p. 92)
9. Flowers (Ex. 17-1, p. 110)
10. The Significance of Leaf Color (Ex. 15-1, p. 96)
11. Leaf Structure and Function (Ex. 15-2, p. 97)
12. The Pigments in a Leaf (Ex. 15-3, p. 98)
13. The Gateway into a Leaf (Ex. 15-6, p. 102)
14. Stems (Ex. 16-1, p. 104)
15. Roots (Ex. 16-2, p. 105)
16. Transpiration in Plants (Ex. 16-3, p. 106)

Otto, Towle, Crider. Biology Investigations. New York: Holt, Rinehart and Winston, 1965.

17. Variations in Organisms (Ex. 13-1, p. 97)
18. A Study of Classification (Ex. 14-1, p. 99)
19. Laboratory Culture of Bacteria (Ex. 16-2, p. 111)
20. Distribution of Bacteria (Ex. 16-3, p. 115)
21. Staining Bacteria (Ex. 16-4, p. 121)

22. Dilution and Plating out Procedures (Ex. 16-5, p. 121)
23. Bacterial Analysis of Milk Products (Ex. 16-6, p. 125)
24. Effect of Temperature on Growth of Bacteria in Milk (Ex. 16-7, p. 127)
25. Structure and Distribution of Common Mold (Ex. 19-1, p. 155)
26. Mushroom (Ex. 19-3, p. 164)
27. Study of Yeast (Ex. 19-2, p. 159)
28. Algae (Ex. 20-1, p. 165)
29. Diversity in Algae (Ex. 20-2, p. 171)
30. The Bacteria -- Forms and Motility (Ex. 16-1, p. 107)
31. Lichens (Ex. 20-3, p. 175)
32. The Mosses (Ex. 21-1, p. 177)
33. The Ferns (Ex. 21-2, p. 183)
34. Woody Stems (Ex. 24-1, p. 207)
35. The Flower - Reproductive Structure (Ex. 26-1, p. 223)
36. Root Structure (Ex. 23-1, p. 189)
37. Absorption of Roots (Ex. 23-2, p. 191)

B. S. C. S. Laboratory Investigations for Biological Science: Molecules to Man. New York: Houghton Mifflin, 1968.

38. Investigating and Classifying Various Living Things (Ex. 2-5, p. 43)
39. Investigating Sources of Bacterial Growth (Ex. 4-6, p. 94)
40. Yeast -- Characteristics and Population Growth (Ex. 11-4, p. 67)

Green and Bolrowsky. Laboratory Investigations in Biology. Morristown, New Jersey: Silver Burdett, 1971.

41. Structure and Function of the Flower (Ex. 38, p. 163)
42. Structure and Function of Pollen Grains (Ex. 39, p. 167)

B. S. C. S. High School Biology: BSCS Green Version, 2nd. ed. Chicago: Rand McNally Inc., 1968.

43. Study of Yeast Population (Ex. 2.2, p. 53)
44. Levels of Classification (Ex. 4.1, p. 108)

PROJECTS

The student will collect samples of the following plants and will tell the name and economic importance of each. If the plant listed is harmful to people, pictures or sketches should be used. These plants may be brought from home, found on school grounds or in lakes and canals.

1. Yeast
2. Fungus (edible)
3. Spirogyra
4. Molds
5. Blue-green algae
6. A vine
7. An annual plant
8. A plant which grows from a bulb
9. A non-flowering plant
10. A plant which usually grows from cuttings
11. A legume
12. A plant not native (exotic) to Florida
13. A plant which is native to Florida
14. A sample of a hardwood plant
15. A medicinal plant
16. A parasitic plant

REPORTS

1. The explanation of fluid rise in stems.
2. Photosynthesis - what it is, how it is accomplished, what benefits are derived from it.
3. Explain plant responses to light (phototropism) and gravity (geotropism).
4. How are algae potential sources of energy for human usage?
5. How are bacteria beneficial to man? Examples could be cheese production, linen and rope production, tanning industry and nitrogen from the atmosphere.
6. List 10 angiosperms and tell of man's dependence on these plants.
7. Have pupils investigate the activities of some of the unusual plants such as Venus-flytrap, minosa, sundew, evening blooming primrose and welwitschia.

FIELD TRIPS

1. Everglades National Park
   State Rd. 27, Homestead, Fla.
   Ph. 247-6211
2. U. S. Department of Agriculture
   2690 N. W. 7th Ave.
   Miami, Fla.
3. Agricultural Research and Education Center of the University of Florida's Institute of Food and Agricultural Science
   18905 S. W. 280 St., Homestead, Fla.
   (Formerly Sub-Tropical Experiment Station)
4. Aquatic Weed Experiment Station
   Plantation, Florida
5. Sewell Park
   N. W. S. River Drive
   Miami, Florida
   Ph. 642-3660

SPEAKERS AND RESOURCE PEOPLE

1. Tropical Audobon Society - Mrs. Flora O'Brien, 4440 W. Flagler
2. Dade County Redland Fruit and Spice Park, 24801 S. W. 187 Ave., Rt. 2, Homestead, Fla.
3. Everglades National Park - Ph. 247-6211
4. Agricultural Research and Education Center of the University of Florida's Institute of Food and Agricultural Science
   18905 S. W. 280 St.
   Homestead, Florida 33030

AV MATERIALS AVAILABLE FROM AUDIO VISUAL SERVICES

FILMS

1. Adaptations in Plants
   AV# 1-11107, 15' C
2. Algae
   AV# 1-11117, 16' C
3. Carnivorous Plants
   AV# 1-02323, 10' C
4. Colour of Life, The
   AV# 1-30664, 24' C
5. Flowering Desert
   AV# 1-02347, 11' C
6. Flowers and Their Purpose
   AV# 1-11105, 15' C
7. Flowers at Work
   AV# 1-02349, 11' BW
8. Flying Seeds
   AV# 1-02322, 10' BW
9. Fruits of Plants, The
   AV# 1-11106, 12' C
10. Gift of Green, The
    AV# 1-11090, 20' C
11. Growth of Flowers
    AV# 1-02354 11' C
12. Growth of Seeds
    AV# 1-11103, 14' C
13. How Plants Reproduce
    AV# 1-02332, 10' BW
14. How Seeds are Scattered
    AV# 1-02258, 11' C
15. Learning About Leaves
    AV# 1-02267, 11' C
16. Leaves
    AV# 1-02262, 10' BW
17. Lichens and Mosses
    AV# 1-11113, 22' C
18. Life of a Plant
    AV# 1-02269, 10' C
19. Living Traps
    AV# 1-02326, 10' C
20. Plant Growth
    AV# 1-02273, 10' BW
21. Plant Life at Work
    AV# 1-02280, 10' C
22. Plants Traps
    AV# 1-02327, 11' C
23. Plants Obtain Food
    AV# 1-11100, 15' C
24. Reproduction in Plants
    AV# 1-11051, 14' C

25. Roots of Plants
AV# 1-02320, 11' C
26. Seasonal Changes in Plants
AV# 1-02331, 10' C
27. Seasonal Changes in Trees
AV# 1-02343, 10' C
28. Seed Dispersal
AV# 1-02293, 11' BW
29. Seed Germination
AV# 1-11104, 14' C

SLIDES

1. Everglades National Park
AV# 5-20095, 14 slides
2. Flowers Set 1
AV# 5-20080, 30 slides
3. Flowers Set 2
AV# 5-20077, 34 slides
4. Plants and Trees
AV# 5-20046, 28 slides
5. Plants Set 1
AV# 5-00013, 25 slides
6. Trees
AV# 5-20078, 29 slides
7. Trees and Flowering Plants
AV# 5-20001, 30 slides

FILM LOOPS

Available from: Film Loops Co., 2225 Massachusetts Ave., Cambridge, Mass. 02140

	Title	Catalog Number	
1.	Grass Bottom Environment	81-5852	3:40 min
2.	Plankton - Adult Forms	81-6872	3:40 min
3.	Stomatal Opening and Closing	81-6710	3:25 min
4.	Carnivorous Plants	81-970	2:00 min
5.	Plankton Diversity	81-6835	3:40 min
6.	Plankton Mobility	81-6843	3:40 min
7.	Collecting Plankton	81-6827	3:40 min
8.	Plankton Food Webs and Feeding Relationships	81-6850	3:40 min

FILM LOOPS

Available from: Wards Natural Science Establishment, Rochester, New York

9.	Bean Germination	
	73 W 0100 Standard 8mm	17.50
	73 W 0105 Super-8	18.50
10.	Plant Responses	
	73 W 0200 Standard 8mm	17.50
	73 W 0585 Super-8	18.50
11.	The Magic of Tree Buds	
	73 W 0400 Standard 8mm	17.50
	73 W 0405 Super-8	18.50
12.	Rapid Movement In Plants	
	73 W 0540 Standard 8mm	17.50
	73 W 0545 Super-8	18.50
13.	Paper Chromatography - 1	
	73 W 1805 5 min.	18.50
14.	Paper Chromatography - 11	
	73 W 1806 5 min. 45 sec	18.50
15.	Paper Chromatography - 111	
	73 W 1808 5 min.	18.50
16.	Histological Techniques	
	73 W 1808 5 min.	18.50
17.	Smear and Squash Techniques-1 73 W 1810 3 min. 20 sec.	18.50
18.	Smear and Squash Techniques-11 73 W 1809 3 min. 20 sec.	18.50
19.	Pollen Tube Growth	
	73 W 1704 3 min. 12 sec.	18.50
20.	Cells of Onion Root Tip-Mitotic Divisions	
	73 W 1299 Standard 8mm	14.00
	73 W 6407 Super-8	17.50

COLOR SLIDES
Available from: Ward's Natural Science Establishment, Rochester, New York

1.	Plant Mitosis	
	171 W 0400 set of 10 slides	$ 9.00
	Individual slides, each	1.00
2.	A Survey of The Algae	
	171 W 1500 set of 40 slides and booklet	41.00
	Individual slides, each	1.00
	32 W 3515 booklet, available separately	2.00
3.	Plant Anatomy	
	(See Ward 1971 Catalog)	
	Individual slides, each	1.00

BIO-PLASTIC MOUNTS
Available from: Ward's Natural Science Establishment, Rochester, New York

1.	Liverwort Types	
	56 W 2200	5.00
2.	Marchantia Life History	
	56 W 2240	5.00
	MOSSES	
3.	Moss Collection	
	56 W 2100	6.50
4.	Sphagnum Life History	
	56 W 2140	5.25
5.	Polytrichum Life History	
	56 W 2160	5.25
	PTERIDOPHYTES	
6.	Selaginella	
	56 W 3120	5.00
7.	Equisetum	
	56 W 3160	5.25
8.	Fern Life History	
	56 W 3200	6.25
	SPERMATOPHYTES	
9.	Cycads	
	Zamia Life History Flower Case	
	56 W 5100	16.50
	ANGIOSPERMS	
	INSECTIVOROUS PLANTS	
10.	Dionaea (Venus's flytrap)	
	56 W 6030	10.25
11.	Sarracenia (Pitcher Plant)	
	56 W 6040	5.00
12.	Drosera (Sundew)	
	56 W 6050	5.25

PARASITIC PLANTS

13.	Misteltoe 56 W 6250	$6.25
14.	Cuscuta (Dodder) 56 W 6250	6.25

LEAVES

15.	Leaf Morphology 56 W 6600	7.75

STEM AND ROOT MORPHOLOGY

16.	Stem Types 56 W 6700	9.75
17.	Thallophytes 56 W 0010	6.25
18.	Bryophytes 56 W 2010	6.00
19.	Pteridophytes 56 W 3010	6.00
20.	Spermatophytes 56 W 5010	7.75

ALGAE

21.	Algae Collection 56 W 0050	6.50
22.	Marine Algae Collection 56 W 0070	8.00

BLUE-GREEN ALGAE

23.	Nostoc 56 W 0110	4.75

GREEN ALGAE

24.	Ulva 56 W 0330	4.75
25.	Chara 56 W 0390	4.75

BROWN ALGAE

26.	Laminaria (Kelp) 56 W 0620	5.75
27.	Fucus (Bladderwack) 56 W 0640	5.25

RED ALGAE

28.	Corallinacease: Corallina or Lithothamnion	4.25
29.	Chondrus Crispus (Irish moss) 56 W 0740	4.00
30.	Polysiphonia 56 W 0750	4.25

MODELS

Available from: Ward's Natural Science Establishment, Rochester, New York

1.	Plant Cell 81 W 6120	$34.00
2.	Root Tip, Fern 81 W 6160	85.00
3.	Stem 81 W 6170	40.00
4.	Leaf 81 W 6130	49.00
5.	Flower 81 W 6150	59.00
6.	Fruit and Seed (Wheat Grain) 81 W 6140	104.00

Available from: The Stansi Scientific Division, Fisher Scientific Company, 1231 North Honore Street, Chicago, Illinois 60622

7.	Monocot (Corn) Stem Section 17209	66.40
8.	Plant Mitosis Series (Somso) 17215	144.00
9.	Plant Mitosis (Staco) 17214	244.00
10.	Dicot Leaf (Stansi) 17207	70.00
11.	Microscopic Structure of Root Tip 17216	36.00
12.	Plant Cell 17178	27.25
13.	Plant Cell 17199	133.00
14.	Plant Cell Plaque 17249	37.50

DISCUSSION QUESTIONS

1. Discuss how bacteria are helpful to certain industries.
2. Prepare a list of plants that you would use in making your home a pretty place to see. Why did you select these plants?
3. Many plants are used for industrial purposes, which plants familiar to you can be used in industry?
4. Discuss how plants are being affected by chemicals, smoke and smog.
5. Prepare a list of some of the insects that are both beneficial and destructive. Tell how each affects a certain kind of plant.

ADDITIONAL INNOVATIVE ACTIVITIES

1. Have students report or demonstrate, with tomatoes, peppers or other vegetables, the effects trace elements have on plant growth.
2. Have students demonstrate the need for useful insects such as the honeybee in the propagation of plants.
3. Have students debate the effectiveness of insecticides as DDT or Dieldrin in the control of insects and the effects on the environment.
4. Have students gather data on the effects of exotic plants (croton, and water hyacynith, for example) in South Florida and propose methods for their control.
5. Bring in the plants or pictures of the plants which supply us with the following products. This can also be done as posters, displays or notebooks.

a. Turpentine
b. Flax
c. Linen
d. Flour
e. Penicillin
f. Alcohol
g. Rayon
h. Paper
i. Furniture
j. Vitamins A, B, C
k. Cellophane
l. Proteins
m. Clothing

REFERENCES

1. Hanson, Herbert C. and Churchill, Ethan D. The Plant Community. New York: Reinhold Publishing Company, 1961.
2. Morholt, Evelyn and others. A Source Book of the Biological Sciences. New York: Harcourt Brace and World, 1966.
3. Morton, Julia. Wild Plants for Survival in South Florida. Miami, Florida: Hurricane House Publisher, Inc., 1968.
4. Northern, Henry. Introduction to Plant Science. New York: The Ronald Press, 1953.
5. Weier, Elliot, Robbins, W., Stocking, Ralph. Botany: An Introduction to Plant Science. New York: John Wiley and Sons, Inc., 1957.
6. Weisz, Paul B. and Fuller, Melvin S. The Science of Botany. New York: McGraw-Hill Book Co., Inc., 1962.
7. Went, Frits W. The Plants. Life Nature Library. New York: Time Life Books, 1963.
8. Wilson, Carl and Loomis, Walter E. Botany. New York: Holt, Rinehart and Winston, 1962.

RESOURCES

A. Pamphlets and Periodicals available from:
Dade County Department of Agriculture
2690 N. W. 7 Avenue or 18710 S. W. 208 Street
Miami, Florida Homestead, Florida

1.	Botany Handbook for Florida	Bulletin #187
2.	Common Aquatic Weeds	Ag. Handbook #352
3.	Florida Weeds	Circular #331
4.	Miscellaneous Tropical and Subtropical Plants	Bulletin #156A
5.	Native and Exotic Palms of Florida	Bulletin #152A
6.	Ornamental Hedges in Florida	Bulletin #178
7.	Ornamental Vines of Florida	Bulletin #172A
8.	Plants That Poison Farm Animals	Bulletin #510A
9.	Poison Ivy, Oak and Sumac (Identification)	Bulletin #1972
10.	Poisonous Plants Around the Home	Bulletin #175B
11.	Weeds of the Southern United States	(No Number)

B. Golden Nature Series -- Golden Press, New York

12. Everglades
13. Flowers
14. Non-flowering plants
15. Pond life
16. The Southeast
17. Trees

MASTER SHEET - WHO NEEDS PLANTS?

Objectives	Experiments	Project	Library Reports	Field Trips	Speakers	Discussion Questions	Films	Film Loops	Bio-Plastic Mounts	Slides	Additional Activities	Resources	Models	Texts
1	12,38	1	6	1	1,2		1	1,2	1,3,7, 10,13, 15,16	1		1,2,4, 5,11	1,5,7, 10	pp.782-803 3 Ch.4,5, 6
2	3,5, 25,26, 28	1	7	1,2	3	2	1,5, 13,18		4-8, 10,21, 22	1,2,3		1,2, 11	10,11, 12	3 pp.782-803 3 Ch.4,5, 6
3	3,38	1	1	1	3,4		11,12, 15,19, 24	3,10, 12	11-16	1,2,3		1,2,3	1,3,4, 5	3 Ch.4,19
4	6,30, 29,31, 32,33			1,2	1,2	3,5	21,25	2,4, 5,6	13-14	1	1,2,3	2,3,10		
5	4,6,7		5	3,4, 5	1,2, 3	1-2	2,6,7, 9,10	8	26-27 28-29	1,4,5	1,2,3, 4,5	1,2,8, 9,10	6	3 Ch.4,5,6
6	10,11		2,3	5			26,27 28,29	2,14, 19		1	3,4	3		3 Ch. 12 2 Ch.9,19 1 Ch. 15
7	15,39, 34,27		4	2,3	3		8,9	7,8,9	26,16	1		1,3		
8		1	6	5	1-4	2	14,17	11,13	16	1,4,5, 6		1,2.3. 4,5,6, 7		3 Ch.4,5,6
9	44	1	6	1	1,2,3	2	15	1	ANY	1,4,5, 6,7	4	1,2,3, 4,5		