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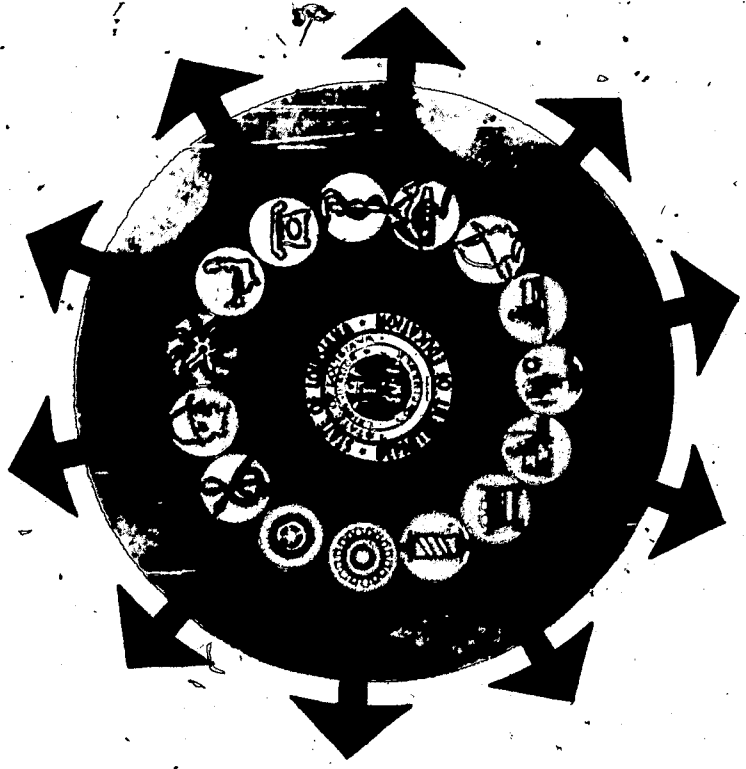
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ABSTRACT

The resource guide integrates learning activities in biological science with an exploration of careers in biology or related fields. The materials are divided into seven units: tools of the scientist, basis for life, diversity (protists, plants, animals), structure and function, continuity (reproduction, development, and genetics), evolution, and ecological concepts. Each unit is discussed by subdividing the information or ideas into categories of: (1) content outline, (2) suggested curriculum activities, and (3) career information (occupational clusters, career activities and careers related to biology). Career activities may or may not relate to the specific subject matter with which it appears. The content outline suggests a possible sequence for covering materials while the activity column suggest exercises that could effectively be used with each unit or sub unit. A list of State adopted biology textbooks (categorized by learning level) and a career bibliography for grades 10-12 conclude the document. (Author/NJ)

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CAREER EDUCATION RESOURCE GUIDE FOR BIOLOGY

WORKING DRAFT

1974

LOUIS J. MICHOT

STATE SUPERINTENDENT OF EDUCATION

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

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ACKNOWLEDGMENT

Public attention is being focused on career education as a means of strengthening our present academic curriculum in Louisiana. With increased concentration in the area of vocational education, recognition of the need for guidelines became apparent. To insure the development of a practical and continuously progressive program, and stressing individualized instruction, teachers were selected to produce a working draft for the dedicated science teachers of Louisiana to expand and improve upon.

Individual and group evaluations will be collected and data tabulated so that excellence can be assured in the completed guide. Acknowledgments then must first be given to the classroom teacher, the key person to an educational endeavor.

Much credit is due all those individuals and agencies who pioneered in the development of the Career Education Resource Guides in Science.

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INTRODUCTION

Since there are different biology texts, programs, and other materials used in the school systems of Louisiana, this guide was written with the anticipation that it will provide assistance to teachers in planning lessons, selecting activities, and in relating materials to the varied occupational clusters to meet the objectives of Career Education. The basic design of this publication is to offer suggestions to instructors as to sequence of materials, related, practical and easy to perform activities, and a listing of occupational clusters as they apply to the specific areas. By no means is this production meant to dictate what teachers and students are to study. Its only purpose is to offer suggestions and stimulate thought.

The materials used in this guide are divided into seven major units: Tools of the Scientist, Basis for Life, Diversity, Structure and Function, Continuity, Evolution, and Ecological Concepts. Each division or unit is discussed by subdividing the information or ideas into categories of Content Outline, Suggested Curriculum Activities, Occupational Clusters, Career Activities and/or Careers Related to Biology. Career activities and information may or may not relate to the specific subject matter by which it appears. The content outline simply suggests a possible sequence for covering materials while the activity column gives suggested exercises that could effectively be used with each unit and/or sub-unit. So as to condense the guide and prevent repetition, the occupational clusters are related to each unit and provide a generalized indication of what careers correspond with the various categories of study. It is intended that teachers will take this material and expand on it to meet the varying needs of their students.

The number at the end of the suggested activities refers to the reference where this activity may be found.

Constructive suggestions are welcome to improve this working draft.

CAREER CONCEPTS AND OBJECTIVES: A SEQUENTIAL PLAN

GRADE

(K-3)

I. CAREER AWARENESS: Recognition of the Adult World of Work-Early Awareness of Careers is the Prelude to Future Achievement

1. The individual is the born resource of society
2. Individuals have many kinds of careers
3. Meaningful, rewarding careers are available to every individual

II. CAREER MOTIVATION: Increasing interest in future world of work in relation to the individual and to society (2-6)

4. Work is basic to human development
5. Occupations contribute to society's progress
6. Careers require different knowledge, abilities, attitudes, and talents
7. Individuals have different abilities, interests, needs, and values
8. Individuals seek careers for varied reasons

Continue:

3. Meaningful, rewarding careers are available to every individual

III. CAREER EXPLORATION: Relating self to needs (5-9)

9. Environmental variability creates variable opportunity
10. Careers can be grouped into clusters
11. Different careers are interrelated
12. Every career requires some special preparation and a plan of special preparation facilitates this

Continue:

7. Individuals have different abilities, interests, needs and values
8. Individuals seek careers for varied reasons

IV. TENTATIVE CAREER DECISIONS AND EXPLORATION:

Focusing career options on a few realistic possibilities

(8-10)

13. Individual careers may change as individuals change throughout life
14. Individuals may be suited for several different careers
15. Individuals adapt to world changes and environment
16. World changes, conditions, and environment affect careers

Continue:

7. Individuals have different abilities, interests, needs, and values
8. Individuals seek careers for varied reasons
10. Careers can be grouped into clusters
11. Different careers are interrelated
12. Every career requires some special preparation and a plan of special preparation facilitates this

V. ACQUISITION OF CAREER ENTRY SKILLS AND CONTINUED EXPLORATION:

Acquiring skills, habits, and attitudes leading to competence

(9-12)

17. Careers require different levels of competence in communication, computation, and analysis
18. Careers have different levels of competence and responsibility
19. Rules, regulations, policies, and procedures affect individuals in all careers
20. Careers are affected by the ability of individuals to relate to each other

Continue:

13. Individual careers may change as individuals change throughout life
14. Individuals may be suited for several different careers
15. Individuals adapt to world changes and environment

CAREERS RELATED TO INTEREST AND ABILITY IN BIOLOGY

Agriculturist
Agricultural Scientist
Agronomist
Animal Husbandry
Bacteriologist
Biochemist
Biologist (Fresh Water)
Biologist (Marine)
Board of Health Inspector
Cattleman
Chemist (Research)
Cytologist
Dermatologist
Doctor
Ecologist
Entomologist
Farmer
Fisherman (Commercial) Fresh Water & Marine
Forest Ranger
Geneticist
Health Unit Director
Herpetologist
Herpetologist
Histologist
Histological Salesman (Equipment)
Horticulturist
Ichthyologist
Laborer
Mammologist
Microbiologist
Nurse
Nurse's Aide
Oceanographer (Chemical)
Oceanographer (Geological)
Oceanographer (Physical)
Ornithologist
Oysterman (Commercial)
Parasitologist
Pathologist
Salesman
Shrimper (Commercial)
Slide Maker (Professional)
Social Worker
Swine Herdsman
Teacher
Technician (Laboratory)
Technician (Water Treatment)
Tobacco Analyst
Veterinarian
Virologist

SUGGESTIONS FOR TEACHING-LEARNING ACTIVITIES

Below are listed ideas which might be helpful in planning for varied types of teaching-learning situations.

1. Interviews
2. Skits
3. Theme writing
4. Bulletin board
5. Debates
6. General discussion
7. Small group discussion
8. Committee work
9. Individual or group study
10. Oral reports
11. Newspaper articles
12. Field trips
13. Movies
14. Filmstrips
15. Slides
16. Overhead or opaque projections
17. Collect want ads
18. Write want ads
19. Employment Commission job lists
20. Exhibits
21. Collect materials
22. Observations
23. Role playing
24. Resource person
25. Brainstorming
26. Games
27. Research projects
28. Demonstrations
29. Prepare lists
30. Radio and television programs
31. Projects
32. Illustrations
33. Chalktalks
34. Panel discussions
35. Make files
36. Tests
37. Problem solving
38. Prepare charts and graphs
39. Window displays
40. Write letters
41. Assigned reading
42. Thought problems
43. Prepare speeches
44. Notebooks
45. Lecture

(From Introduction to Vocations, Teacher's Guide, Course Number 799, July, 1965, prepared by H. E. Beam and J. R. Clary, North Carolina)

CAREER GUIDE FORMAT

1. Physical Working Environment
 - A. Where is the work done?
 - B. Is the work hazardous?
 - C. Will I work alone or with a group?
 - D. Will I be expected to attend social functions?
 - E. What mode of dress or appearance is required for the job?
 - F. Is the work seasonal?
 - G. How many people are employed in this occupation? (As of now and through the '70s)
 - H. Is the number of people employed different than it was ten or twenty years ago?
 - I. How many hours per week will I work?
2. The Steps of Promotion
 - A. Title of the occupation
 - B. Educational requirements for promotion
 - C. Practical experience needed
 - D. Personal qualifications needed
 - E. Duties of the job to which promoted
3. In what way will I enter this work?
 - A. Is previous experience needed?
 - B. Apprenticeship?
 - C. Internship?
 - D. Others?
4. Educational Requirements for Promotion
5. What is the approximate cost of preparing for entry into this occupation?
6. What is the approximate cost of any additional education or training which I might need?
7. Salary Range
8. Avenues from which funds for additional education may be secured
 - A. Student loans
 - B. Student stipends
 - C. Scholarships
 - D. Company stipends

CAREER CLUSTERS

A. The Agri-Business and Natural Resources cluster includes:

- Operations
- Support and regulations
- Research
- Forestry
- Land and water management
- Fisheries and wildlife
- Mining and quarrying
- Petroleum and related products
- Service
- Production
- Processing and marketing

B. The cluster for communication and media includes:

- Operations
- Line communications
- Broadcasting
- Audio-Visual
- Language
- Publishing

C. The construction cluster includes:

- Operations
- Design
- Contracting
- Interior
- Landscaping
- Land development
- Fabrication and installation

D. The Consumer and Homemaking (related occupations) cluster includes

- Operations
- Food service industry

Clothing, apparel and textile industry
Child care, guidance and teaching
Family and community services
Institutional household maintenance services
Interchangeable technician for homemaking
Housing design and interior decoration

E. Included in the cluster for Environment are:

Operations
Soil and mineral conservation and control
Space and atmospheric monitoring and control
Environmental health services
Development and control of physical man-made environment
Forest, range, shore and wildlife conservation and control
Water resource development, conservation and control

F. The cluster for Fine Arts and Humanities includes:

Operations
Fine Arts
Humanities

G. The Health Occupations cluster includes:

Operations
Health information systems
Health services delivery
Mental health, mental illness and retardation
Accidents, injuries and emergency services
Dental Science and services
Pharmaceutical science and services

H. The Manufacturing cluster includes:

Operations
Design
Materials
Production
Distribution
Research

I. Included in the cluster of Marine Sciences Occupations are:

- Operations
- Marine Biology
- Commercial fishing
- Aquaculture
- Marine (oceanographic) exploration
- Underwater construction and salvage

J. The Marketing and Distribution Occupations cluster includes:

- Operations
- Marketing system
- Sales and services
- Buying
- Sales Promotion
- Physical distribution
- Marketing services

K. The cluster for Personal Services Occupations includes:

- Operations
- Physical culture
- Cosmetology
- Mortuary science
- Barbering
- Household pet services

L. Within the Public Service cluster are:

- Operations
- Financial
- Urban development
- Regulatory services
- Education
- Police and fire
- Defense
- Post Office
- Public utilities
- Public health
- Labor affairs
- Highways
- Public transportation

Social and rehabilitation
Courts and corrections
Parks and recreation

M. The cluster for Recreation, Hospitality and Tourism includes:

Operations
Environmental management
Community services
Human development
Mobility
Health care

N. The cluster for Business and Office Occupations includes:

Operations
Record Systems and Control
Secretarial
Clerical
Administrative
Business Ownership

O. The final cluster to be considered, Transportation, includes:

Operations
Aerospace transportation
Pipeline transmission
Water transportation
Land transportation

UNIT 1: TOOLS OF THE SCIENTIST

OUTLINE

TOOLS OF THE SCIENTIST

I. Microscope

II. Measurement

III. Laboratory Techniques

SUGGESTED CURRICULUM ACTIVITIES

1. Demonstrate care and use of microscopes. (2)
2. Use the microscope as an instrument of measurement. (2)
3. Use the stereoscopic microscope as an instrument of measurement and observe opaque objects. (3)
4. Use graphs and charts in the recording of observed data. (4)
5. Derive scientific information from charts and graphs. (4)
6. Make measurements involving mass, volume, and density based on the metric system. (1)
7. Develop skills in the use of pipettes and other titration techniques. (3)
8. Use various methods to determine pH. (1)
9. Prepare microscope slides. (3)
10. Prepare dilutions and concentrations. (11)

CAREER INFORMATION

CAREER CLUSTER

- A I
B J
C K
G L
H M
N

ACTIVITY:

1. Each teacher should show the job possibilities in relationship to the subject matter. This can be done by preparing or having the students prepare a large wall chart. If there is not time for an entire unit, at least some time could be spent pointing out these possibilities.
2. Conduct a survey of occupational intentions of the class using the major job clusters as a basis.

UNIT 2: BASIS FOR LIFE

OUTLINE	SUGGESTED CURRICULUM ACTIVITIES	CAREER INFORMATION
<p><u>BASIS FOR LIFE</u></p> <p>I. Chemical Basis</p> <p>II. Physical Basis</p> <p>III. Life Characteristics</p>	<ol style="list-style-type: none"> 1. Identify some substances found in protoplasm. (11) 2. Demonstrate electrolysis of water. (1) 3. Demonstrate selected activities of the cell membrane. (1) 4. Observe cytoplasmic streaming in elodea. (12) 5. Recognize characteristics of living matter in the slime mold. (11) 6. Construct a chart showing the structures of plant and animal cells that can be observed with the light microscope. (11) 	<p><u>CAREER CLUSTER</u></p> <p>A H C I D J E K G L M N</p> <p><u>ACTIVITY:</u></p> <ol style="list-style-type: none"> 1. Have students list the occupations that have similar performance patterns that relate to the subject matter area. 2. Have students bring some of the tools that are used in these occupations and explain their use to the class.

OUTLINE

DIVERSITY

I. Protists

II. Plants

III. Animals

SUGGESTED CURRICULUM ACTIVITIES

1. Plan a classroom museum. (16)
2. Determine the basic forms of protists found in a sample of pond water. (3)
3. Identify trees by using a dichotomous leaf key. (17 & 18)
4. Collect and compare wood samples of ten major trees. (17 & 18)
5. Prepare a phylum tree of the vertebrates. (10)
6. Collect representatives of the major insect orders. (13)
7. Discover clotting times of blood under different environmental conditions. (11)

CAREER INFORMATION

CAREER CLUSTER

- A J
- D L
- E M
- G N
- I

ACTIVITY:

Divide class into groups and prepare list and demonstrate only technician jobs associated with subject matter.

MICROBIOLOGIST

The microbiologist is the scientist who identifies, studies and experiments with microorganisms. Microbiologists carry out research on the causes, control and cure of diseases originating from destructive microorganisms, and on the culture and use of beneficial microorganisms. Microbiology is one of the fastest growing areas of biological science, and opportunities are expected to be excellent.

UNIT 4: STRUCTURE AND FUNCTION

CAREER INFORMATION

SUGGESTED CURRICULUM ACTIVITIES

OUTLINE

STRUCTURE AND FUNCTION

CAREER CLUSTER

I. Transport

A. Plants

1. Using the microscope, compare the cross sections of monocot stems, herbaceous dicot stems, and roots. (15)
2. Show that materials travel through a vascular system by immersing the plant in a dye solution. (1)

A H

B. Animals

3. Measure the transpiration rate in a laboratory setup under different environmental conditions. (3)
4. Centrifuge a sample of blood and observe the component layers. (19)
5. Make a blood smear and identify components of the blood. (1)
6. Determine what conditions affect circulation in the webbed feet of a frog. (1)

B J

C K

D L

E M

F N

G

ACTIVITY:

Students should develop a file of occupational information specifically related to subject matter area, where more than 2 years of advance study is required.

Guests may be invited to speak on careers related to subject matter fields.

7. Determine the effect of exercise on pulse rate. (19)

8. Make a collection of blood slides on various animals. (11)

9. Compare the heartbeat rates of daphnia under various conditions. (3)

10. Demonstrate photosynthesis and respiration by using colored ecosystems. (3)

OUTLINE	SUGGESTED CURRICULUM ACTIVITIES	CAREER INFORMATION
<p><u>STRUCTURE AND FUNCTION (Cont'd)</u></p>		
<p>II. Gas Exchange</p>		
<p>A. Photosynthesis</p>	<p>11. Test the effects, of various factors on the rate of photosynthesis. (8)</p> <p>12. Make a comparison of normal respiration rate with respiration rate immediately after exercise. (2)</p>	<p><u>MEDICAL ILLUSTRATOR</u></p> <p>Much of the medical illustrator's work consists of making drawings and paintings of normal and pathological body structures.</p>
<p>B. Respiration</p>	<p>13. Demonstrate fermentation by using yeasts. The rate of fermentation can also be obtained. (1)</p> <p>14. Show that germinating seeds need oxygen. (8)</p> <p>15. Measure carbon dioxide production in ponds by taking day and early morning samples. (8)</p>	<p>The person entering this field must have not only outstanding skill in the fine arts and keen powers of observation, but also a broad background of study in the biological sciences.</p>
<p>III: Metabolic Waste</p>	<p>16. Examine a sample of human urine for, pH, glucose, and specific gravity. (12)</p>	<p>Today there are approximately 175 medical illustrators in the U.S. About half of these are women. As a rule they are employed by large research and teaching medical centers. There are many job opportunities in this field. People with artistic ability, good training in science and the self-discipline necessary to undergo the rigorous training can achieve a highly satisfying and creative career.</p>
<p>IV. Control</p>		
<p>A. Hormones</p>		
<p>1. Plants</p>	<p>17. Demonstrate the role of the following growth substances on plants: Indoleacetic acid, Naphthaleneacetic acid, Indolebutyric acid, and Gibberellic acid. (9)</p>	
<p>2. Animals</p>	<p>18. Demonstrate the effect of adrenalin on daphnia. (3)</p>	

OUTLINE	SUGGESTED CURRICULUM ACTIVITIES	CAREER INFORMATION
<p><u>STRUCTURE AND FUNCTION</u>(Cont'd)</p> <p>Animals (Cont'd)</p> <p>B. Nerves</p>	<p>19. Prepare a chart on hormones. (21)</p> <p>20. Inject testosterone into female chicks to observe secondary male sex characteristics. (1)</p> <p>21. Map the areas of taste on the human tongue. (1)</p> <p>22. Demonstrate some reflex actions. (12)</p> <p>23. Study muscle contraction using a leg muscle of the frog. (12)</p>	<p><u>PLANT PATHOLOGIST</u></p> <p>Plant pathologists study, control and treat plant diseases caused by bacteria, viruses, nematodes, parasites and environmental factors. Most plant pathologists work in government agencies.</p>
<p>C. Behavior</p>	<p>24. Attempt to attract insects with colored light. (20)</p>	<p>Graduation from college is the minimum educational requirement for employment in the profession and the master of science is the minimum degree generally acceptable in research work.</p>
<p>V. Nutrition</p>	<p>25. Observe infant behavior. (20)</p>	<p>Job opportunities for plant pathologists are worldwide. For the person with a doctor's degree, opportunities in research and education are and will continue to be good.</p>
<p>A. Mineral Requirements</p>	<p>26. Demonstrate the role of <u>Rhizobium</u> in nitrogen fixation. (7)</p> <p>27. Observe the effects of mineral deficiencies on plants. (8)</p>	
<p>B. Enzymes and Vitamins</p>	<p>28. Make a study of the effects of factors on enzyme activity. (1)</p> <p>29. Conduct a test for Vitamin C. (1)</p>	

OUTLINE	SUGGESTED CURRICULUM ACTIVITIES	CAREER INFORMATION
<p><u>STRUCTURE AND FUNCTION (Cont'd)</u></p> <p>C. Digestion</p> <p>D. Synthesis</p> <p>VI. Supporting Structures</p>	<p>30. Study the effect of pH on the digestion of different types of foods. (2)</p> <p>31. Discover the role of pancreatin in digestion. (14)</p> <p>32. Observe the starch grains in several plants using the root cortexes. (21)</p> <p>33. Study slides of three types of muscle cells. (14)</p> <p>34. By using a human skeleton determine the locations and functions of the bones. (19)</p>	<p><u>BIOCHEMIST</u></p> <p>Most biochemists deal with chemistry of life-processes such as metabolism, digestion and growth. About three-fourths of all biochemists work in research. Some do basic research while others do applied research.</p> <p>Post-graduate education is very important for biochemists. Although it is possible for a person with a bachelor's degree to get a job in biochemistry, it is becoming increasingly difficult. It is estimated that more than 70% of all biochemists - a greater percentage than in any other field of chemistry - have a doctor's degree.</p> <p>In early 1967, there were approximately 10,500 biochemists in the U.S. Women made up 15% of the total number. It seems certain there will be an increased need for biochemists in the near future, since both industry and government are spending greater amounts of money on biochemical research.</p>

UNIT 5: CONTINUITY

OUTLINE	SUGGESTED CURRICULUM ACTIVITIES	CAREER INFORMATION
<p><u>CONTINUITY</u></p> <p>I. Reproduction</p> <p>A. Asexual</p> <p>1. Cell Division</p> <p>2. Budding</p> <p>3. Spores</p> <p>4. Regeneration</p> <p>5. Grafting</p>	<p>1. Using oil immersion observe cell division of <u>Protococcus</u> or <u>Chlamydomonas</u>. (12)</p> <p>2. Observe budding in yeasts. (3)</p> <p>3. Grow moss protonemas from spores. (15)</p> <p>4. Grow fern prothalli from spores. (15)</p> <p>5. Use dry slime mold to grow the plasmodium. Let the plasmodium produce spores. (15)</p> <p>6. Make assorted cuts to determine the regeneration power of the planaria. (12)</p> <p>7. Put various parts of a plant on wet soil to see if it will regenerate. (3)</p> <p>8. Use several methods of grafting. (20)</p>	<p><u>CAREER CLUSTER</u></p> <p>A E</p> <p>B G</p> <p>C I</p> <p>M</p> <p><u>ACTIVITY:</u></p> <p>1. Have student make a study of careers where a knowledge of genetics would be helpful.</p> <p>2. Arrange a field trip to a farm and note the different job opportunities associated with agriculture.</p> <p>3. Have student research specific technician careers, report to the class and, if possible, do on-job observations.</p>

OUTLINE	SUGGESTED CURRICULUM ACTIVITIES	CAREER INFORMATION
<p><u>CONTINUITY (Cont'd)</u></p> <p>B. Sexual</p> <p>1. Cellular (Conjugation)</p> <p>2. Multicellular</p> <p>II. Development</p> <p>A. Meiosis</p> <p>B. Mitosis</p>	<p>9. Make wet mounts from hay infusion or a culture to observe conjugation. (10)</p> <p>10. From a pond or aquarium obtain spiro-syra in order to observe conjugation. (15)</p> <p>11. Compare the life cycles of mosses, ferns, gymnosperms, and angiosperms. (15)</p> <p>12. Compare the kinds of reproduction in invertebrates and vertebrates. (11)</p> <p>13. Illustrate the process of meiosis by examining young <u>Tradescantia</u> anthers. (15)</p> <p>14. Observe mitosis in onion root tips by using the "squash" preparation and by prepared slides. (2)</p>	<p><u>HISTOLOGIC TECHNICIAN</u></p> <p>Histologic technicians prepare tissue specimens for cutting and mounting and stain them to define essential features. They identify pathological conditions and report findings to a pathologist.</p> <p><u>NURSERYMAN</u></p> <p>The activities of a nurseryman include caring for the plants, selling, and marketing details. With a high school education it is possible to enter nursery work as a laborer, but advancement possibilities are strictly limited. The greatest opportunity exists for the individual who has had some post-high school vocational and technical horticultural training. A bachelor's degree is becoming increasingly important, especially for anyone who wants to operate his own business.</p> <p>The industry estimates there were about 10,000 commercial nurseries in 1970. They employ about 50,000 workers and all signs point to good years ahead for the nursery business.</p>

OUTLINE *

CONTINUITY (Cont'd)

B. Mitosis (cont'd)

1. Plant

a. Seed

b. Fruit

2. Animal

SUGGESTED CURRICULUM ACTIVITIES

15. Take selected samples of seeds and determine their percentages of germination and germination rate. (8)

16. Study the structure and classification of fruits. (11)

17. Acquaint the student with the fundamentals of embryonic development in the frog. (11)

18. Study the life history of daphnia. (21)

19. Establish a culture of mealworms and study the stages. (21)

20. Observe inheritable characteristics on students. (2)

21. Teach the techniques for handling fruit flies. (2)

22. Make a monohybrid cross using fruit flies to verify the laws of heredity. (6)

CAREER INFORMATION

WASTEWATER TREATMENT PLANT OPERATOR

Wastewater treatment plant operators control equipment and facilities to remove waste materials or render them harmless to human, animal, and fish life.

Approximately 30,000 operators were working in 1970. About one-half of these were in the following eight states: California, Illinois, New York, Ohio, Texas, Pennsylvania, Florida, and New Jersey.

Entry jobs generally do not require specific training, and most operators learn their skills on the job.

Employment of operators is expected to rise rapidly through the 1970's mainly as a result of the construction of new treatment plants to process the increasing amount of domestic and industrial wastewater.

OUTLINE	SUGGESTED CURRICULUM ACTIVITIES	CAREER INFORMATION
<p><u>CONTINUITY</u> (Cont'd)</p> <p>B. Genes and Chromosomes</p> <p>C. Heredity and Environment</p> <p>D. Genetic Code</p> <p>E. Population Genetics</p> <p>F. Mathematics of Genetics</p>	<p>23. Test a sex-linked character (white eye) in fruit flies. (6)</p> <p>24. Use a "squash" preparation of the salivary glands of the fruit fly to observe the chromosomes. (6)</p> <p>25. Make a case study of sickle cell anemia. (2)</p> <p>26. Grow albino tobacco seeds under varying conditions. (20)</p> <p>27. Design and construct a DNA and RNA molecule. (21)</p> <p>28. Make a study of population genetics by determining the frequency of blood groups. (1)</p> <p>29. Solve problems on probability. (2)</p> <p>30. Calculate Chi-Square. (2)</p>	<p><u>GENETICIST</u></p> <p>Geneticists explore the origin, transmission and development of hereditary characteristics, and theoretical geneticists search for the mechanisms that determine inherited traits in plants, animals, or humans.</p> <p>An estimated 180,000 persons were employed in the life sciences in 1970. About 10% of them were women. Employment in the life sciences is expected to increase rapidly in the 1970's.</p> <p><u>HORTICULTURIST</u></p> <p>The horticulturist develops new and improved varieties of fruits, nuts, vegetables, flowers and shrubs. He tries to find better methods of breeding, growing, harvesting, storing and transporting horticultural crops. He usually specializes in a particular plant or particular technical problem such as plant breeding.</p>

OUTLINE

EVOLUTION

- I. Origin of Life
 - A. Biogenesis
 - B. Spontaneous Generation
- II. Early Theories of Evolution

A. Acquired Characteristics

B. Natural Selection

- 1. Malthus' Theory
- 2. Variations
- 3. Adaptations

III. Mutations

SUGGESTED CURRICULUM ACTIVITIES

- 1. Investigate the formation of coacervates. (1)
- 2. Disprove the theory of spontaneous generation by investigating the sources of bacterial growth. (2)
- 3. Disprove Lamarck's theory of "use and disuse" by clipping the wings off fruit-flies for several generations. (22)
- 4. Graph a population growth curve based on experimental results. (3)
- 5. Measure and graph variations of structures in large grasshoppers. (12)
- 6. Construct an "Invitation to Inquiry" to encourage student involvement. (20)
- 7. Expose seeds to X-ray and observe the seedlings. (20)
- 8. Irradiate fruit flies with X-ray and observe their progeny. (20)

CAREER INFORMATION

CAREER CLUSTER

- A I
- B J
- C L
- M

ACTIVITY:

- 1. Let students do special projects on careers of their interest.

PARASITOLOGIST

The parasitologist studies the characteristics, habits, and life cycles of animal parasites, such as protozoans, tapeworms, round-worms, liver flukes, mites, ticks, and parasitic insects, to determine the manner in which they attack humans and animals. He also investigates the modes of transmission from host to host as well as develops methods and agents with which to combat parasites or treat infections. The chief requirement for employment is a suitable educational background.

OUTLINE	SUGGESTED CURRICULUM ACTIVITIES	CAREER INFORMATION
<p><u>EVOLUTION (Cont'd)</u></p> <p>IV. Evidences</p> <p>A. Fossils</p> <p>B. Embryology</p> <p>C. Hybrids</p> <p>D. Vestigial Organs</p> <p>E. Geographical Isolation</p>	<p>9. Work hypothetical "half-life" problems. (20)</p> <p>10. Compare the preserved embryos of vertebrates. (21)</p> <p>11. Make a list of hybrid plants and animals. (21)</p> <p>12. Challenge students to think by using an "open-ended" discussion. (20)</p> <p>13. Using partitioned petri dishes, grow microbes to determine if they migrate. (21)</p>	<p><u>LANDSCAPE ARCHITECT</u></p> <p>Landscape architects design, plan and confer with clients; estimate costs; order materials; supervise progress of landscaping projects.</p> <p>As a profession, landscape architecture is just beginning to be fully recognized as an important contributor to our environment and increased emphasis on environmental planning means greater opportunities for professionals or technicians in this area.</p>

UNIT 7: ECOLOGICAL CONCEPTS

OUTLINE	SUGGESTED CURRICULUM ACTIVITIES	CAREER INFORMATION
<p><u>ECOLOGICAL CONCEPTS</u></p> <p>I. Ecological Variables (Matter, energy, space, time and diversity)</p> <p>II. Levels of Organization</p> <p>A. Population</p> <p>B. Community</p> <p>C. Ecosystem</p>	<ol style="list-style-type: none"> Select two of the variables and test their individual effects on a test plot of plants. (3) Establish the effects of various temperatures on a yeast culture or a bacterial culture. (3) Determine the effects of density on population growth and organism size. (D=N/S) (3) Determine by survey, the diversity organisms found on your school campus. (20) Calculate the Density of students with in your school. (20 & 3) Determine the number of field mice found in a selected test plot. (20) Select a study plot, examine the natural biotic community, and determine as many interrelationships between species as possible. (5) Make a study of the competition of at least two species. (3) Make a comparative study of two habitats. (3) 	<p><u>CAREER CLUSTER</u></p> <p>A G</p> <p>B H</p> <p>C I</p> <p>D J</p> <p>E K</p> <p>F L</p> <p>M</p> <p>N</p> <p><u>PEST CONTROL SERVICEMAN</u></p> <p>Most of their work is concerned with inspection and prevention in pest control. A high school education is preferred by most employers and some pest control companies now seek college graduates with degrees in entomology. Because the pest control servicemen are an important part of the continuing program of public health, there is a constant demand for services and personnel. According to industry sources, about 40,000 persons are employed in pest control duties.</p>

CAREER INFORMATION

SUGGESTED CURRICULUM ACTIVITIES

OUTLINE

ECOLOGICAL CONCEPTS (Cont'd)

III. Applied Ecology

A. Natural Resources

B. Public Health

C. Human Populations and Urbanization

ACTIVITY:

Let interested student contact state agencies, such as Wildlife, and Fisheries, Forestry, Agriculture, Health Services, Soil Conservation Service and other environmental agencies, to determine various careers associated with the agencies.

Student may also do part-time work or summer employment with some of the agencies.

10. Survey your local community and parish, identify the natural resources, and map their locations. (20)

11. Determine by library research the role of ecology as applied to the control and eradication of malaria. (20)

12. Debate the pros and cons on the use of herbicides and/or pesticides. (20)

13. Determine the existing environmental problems of your community and determine ways of solving the problems. (20)

STATE ADOPTED TEXTBOOKS
BIOLOGY
1973

LOW LEVEL

Allyn and Bacon, Inc.
Weinberg, ACTION BIOLOGY, 1974

Guide

Following are individual units from above text designed for use in mini-course (Paper):

Action Biology: Keeping Alive
Action Biology: Reproduction
Action Biology: Children and Ancestors

Action Biology: Food
Action Biology: The Invisible World

Action Biology: Ecology
Action Biology: Doing Their Thing

✓ Harcourt Brace Jovanovich, Inc.

Morholt et al., BIOLOGY: PATTERNS IN THE ENVIRONMENT, 1972

Manual

Holt, Rinehart and Winston, Inc.

BSCS, BIOLOGICAL SCIENCE: PATTERNS AND PROCESSING, 1966

Teacher's Edition

Prentice-Hall, Inc.

Wong-Dolmatz, IDEAS AND INVESTIGATIONS IN SCIENCE: BIOLOGY, 1971

Manual

Laboratory Data Book

AVERAGE

Allyn and Bacon, Inc.
Weinberg, BIOLOGY: AN INQUIRY INTO THE NATURE OF LIFE, 1971

Teacher's Edition
Laboratory Manual
Manual

Alpha Biology Transparencies
(Cells (15 units totaling 48 transparencies and overlays), 1970
Microbiology (15 units totaling 32 transparencies and overlays), 1970
Molecular Biology (14 units totaling 41 transparencies and overlays), 1971

Genetics (15 units totaling 38 transparencies and overlays), 1972

American Book Company

Schwartz-Troost, PATTERNS OF LIFE, 1972
Biology Investigations (Student Laboratory)

Guide for Text

and Student Laboratory

Harcourt Brace Jovanovich, Inc.

BSCS, BIOLOGICAL SCIENCE: AN INQUIRY INTO LIFE, 3rd Edition, 1973
Manual

AVERAGE

D. C. Heath and Company
BSCS, BSCS LABORATORY BLOCKS
 Animal Behavior, 1968
 Teacher's Supplement
 Animal Growth and Development, 1968
 Teacher's Supplement
 The Complementarity of Structure and
 Functions, 1969
 Teacher's Supplement
 Evolution, 1968
 Teacher's Supplement
 Field Ecology, 1969
 Teacher's Supplement
 Genetic Continuity, 1968
 Teacher's Supplement
 Life in the Soil, 1965
 Teacher's Supplement
 Microbes: Their Growth, Nutrition, and
 Interaction, 1968
 Teacher's Supplement
 The Molecular Basis of Metabolism,
 1968
 Teacher's Supplement
 Physiological Adaptation, 1967
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 Plant Growth and Development, 1963
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 Regulation in Plants by Hormones, 1964
 Teacher's Supplement

Houghton Mifflin Company
BSCS, BIOLOGICAL SCIENCE: MOLECULES TO
 MAN, 1973
 Guide

AVERAGE

Charles E. Merrill Publishing Division
of Bell & Howell Company
 Oram et al., BIOLOGY: LIVING SYSTEMS, 1973
 Teacher's Edition
 Laboratory Biology: Investigating
 Living Systems
 Teacher's Edition
 Probing Levels of Life: A Laboratory
 Manual
 Teacher's Edition
Rand McNally and Company
BSCS, BIOLOGICAL SCIENCE: AN ECOLOGICAL
APPROACH, 3rd Edition, 1973 (BSCS Green
 Version)
 Teacher's Edition
 BSCS Single Topic Inquiry Films
Silver Burdett Division - General
Learning Corporation
Smallwood-Green, BIOLOGY, 1974
 Teacher's Edition
 Non-Consumable Laboratory Guide, 1974
 Student's Record Book (Laboratory
 Manual), 1974
 Teacher's Edition

ADVANCED

Addison-Wesley Publishing Company, Inc.
Baker-Allen, THE STUDY OF BIOLOGY, 2nd
Edition, 1971

Guide

Student Guide

CRM Books

BIOLOGY: AN APPRECIATION OF LIFE, 1972
Guide

Holt, Rinehart and Winston, Inc.
Marrison, HUMAN PHYSIOLOGY, 1972

Teacher's Edition

Experiments in Physiology

Prentice-Hall, Inc.

BSCS: BIOLOGICAL SCIENCE: INTERACTION OF
EXPERIMENTS AND IDEAS, 2nd Edition, 1970
(BSCS 2nd Course)

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Addison-Wesley Publishing Company, Inc.
McCombs-Rosa, WHAT'S ECOLOGY, 1973
Guide

Prentice-Hall, Inc.
Andrews et al., CONTOURS: STUDIES OF THE
ENVIRONMENT SERIES (Cloth)
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Ecology, 1972
A Guide to the Study of Environmental
Pollution, 1972
A Guide to the Study of Soil Ecology,
1973
A Guide to the Study of Terrestrial
Ecology, 1973

ADVANCED

Prentice-Hall, Inc.
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CAREER

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