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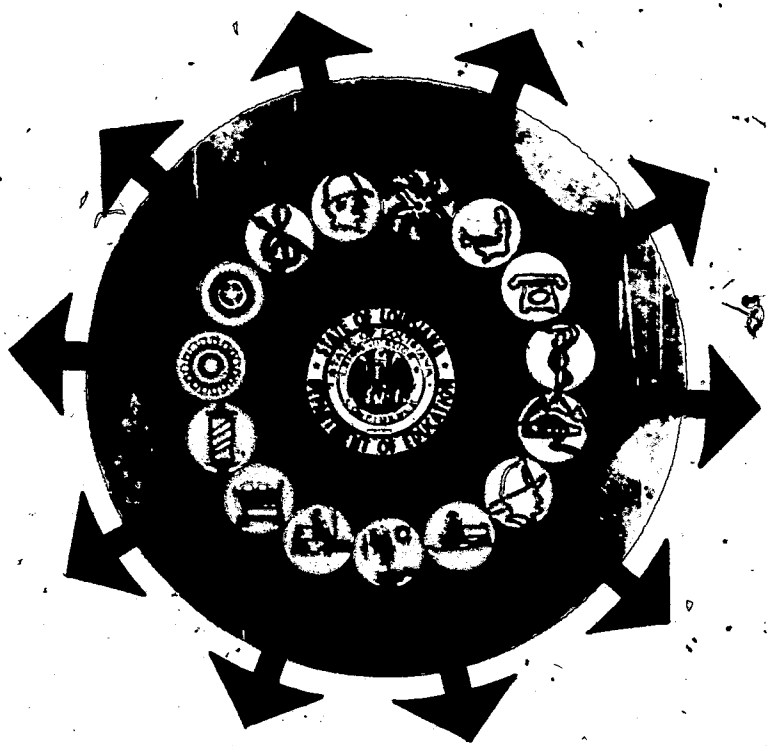
ABSTRACT

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)



CAREER EDUCATION RESOURCE GUIDE FOR BIOLOGY

WORKING DRAFT
1974

LOUIS J. MICHOT
STATE SUPERINTENDENT OF EDUCATION

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

I. CAREER AWARENESS: Recognition of the Adult World of Work-Early Awareness of Careers is the Prelude to Future Achievement (K-3)

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: (8-10)
Focusing career options on a few realistic possibilities

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: (9-12)
Acquiring skills, habits, and attitudes leading to competence

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
Hermatologist
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

OUTLINE	SUGGESTED CURRICULUM ACTIVITIES	CAREER INFORMATION
TOOLS OF THE SCIENTIST I. Microscope II. Measurement III. Laboratory Techniques	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 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.

OUTLINE	SUGGESTED CURRICULUM ACTIVITIES	CAREER INFORMATION
BASIS FOR LIFE I. Chemical Basis II. Physical Basis III. Life Characteristics	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)	CAREER CLUSTER A H C I D J E K G L M N ACTIVITY: 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	SUGGESTED CURRICULUM ACTIVITIES	CAREER INFORMATION
DIVERSITY I. Protists II. Plants III. Animals	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 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.

OUTLINE	SUGGESTED CURRICULUM ACTIVITIES	CAREER INFORMATION
STRUCTURE AND FUNCTION 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) 3. Measure the transpiration rate in a laboratory setup under different environmental conditions. (3) B. Animals 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) 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)	CAREER CLUSTER A H 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.

OUTLINE	SUGGESTED CURRICULUM ACTIVITIES	CAREER INFORMATION
STRUCTURE AND FUNCTION (Cont'd)		
II. Gas Exchange	11. Test the effects of various factors on the rate of photsynthesis. (8)	MEDICAL ILLUSTRATOR
A. Photosynthesis	12. Make a comparison of normal respiration rate with respiration rate immediately after exercise. (2)	Much of the medical illustrator's work consists of making drawings and paintings of normal and pathological body structures.
	13. Demonstrate fermentation by using yeasts. The rate of fermentation can also be obtained. (1)	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.
B. Respiration	14. Show that germinating seeds need oxygen. (8)	
	15. Measure carbon dioxide production in ponds by taking day and early morning samples. (8)	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.
III. Metabolic Waste	16. Examine a sample of human urine for pH, glucose, and specific gravity. (12)	
IV. Control		
A. Hormones		
1. Plants	17. Demonstrate the role of the following growth substances on plants: Indoleacetic acid, Naphthaleneacetic acid, Indolebutyric acid, and Gibberellic acid. (9)	
2. Animals	18. Demonstrate the effect of adrenalin on daphnia. (3)	

OUTLINE	SUGGESTED CURRICULUM ACTIVITIES	CAREER INFORMATION
STRUCTURE AND FUNCTION(Cont'd)		
Animals (Cont'd)	19. Prepare a chart on hormones. (21)	PLANT PATHOLOGIST
	20. Inject testosterone into female chicks to observe secondary male sex characteristics. (1)	Plant pathologists study, control and treat plant diseases caused by bacteria, viruses, nematodes, parasites and environmental factors. Most plant pathologists work in government agencies.
B. Nerves	21. Map the areas of taste on the human tongue. (1)	
	22. Demonstrate some reflex actions. (12)	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.
	23. Study muscle contraction using a leg muscle of the frog. (12)	
C. Behavior	24. Attempt to attract insects with colored light. (20)	
	25. Observe infant behavior. (20)	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.
V. Nutrition		
A. Mineral Requirements	26. Demonstrate the role of Rhizobium in nitrogen fixation. (7)	
	27. Observe the effects of mineral deficiencies on plants. (8)	
B. Enzymes and Vitamins	28. Make a study of the effects of factors on enzyme activity. (1)	
	29. Conduct a test for Vitamin C. (1)	

OUTLINE	SUGGESTED CURRICULUM ACTIVITIES	CAREER INFORMATION
STRUCTURE AND FUNCTION (Cont'd)		BIOCHEMIST
C. Digestion	30. Study the effect of pH on the digestion of different types of foods. (2)	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.
	31. Discover the role of pancreatin in digestion. (14)	
D. Synthesis	32. Observe the starch grains in several plants using the root cortexes. (21)	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.
VI. Supporting Structures	33. Study slides of three types of muscle cells. (14)	
	34. By using a human skeleton determine the locations and functions of the bones. (19)	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.

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

OUTLINE	SUGGESTED CURRICULUM ACTIVITIES	CAREER INFORMATION
CONTINUITY (Cont'd)		HISTOLOGIC TECHNICIAN
B. Sexual		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.
1. Cellular (Conjugation)	9. Make wet mounts from hay infusion or a culture to observe conjugation.(10)	
	10. From a pond or aquarium obtain spirosyra in order to observe conjugation.(15)	
2. Multicellular	11. Compare the life cycles of mosses, ferns, gymnosperms, and angiosperms.(15)	
	12. Compare the kinds of reproduction in invertebrates and vertebrates. (11)	NURSERYMAN
		The activities of a nurseryman include caring for the plants, selling, and marketing details.
II. Development		
A. Meiosis	13. Illustrate the process of meiosis by examining young Tradescantia anthers. (15)	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.
B. Mitosis	14. Observe mitosis in onion root tips by using the "squash" preparation and by prepared slides. (2)	
		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.

OUTLINE *	SUGGESTED CURRICULUM ACTIVITIES	CAREER INFORMATION
CONTINUITY (Cont'd) B. Mitosis (cont'd) 1. Plant a. Seed b. Fruit 2. Animal III. Genetics A. Mendel's Principles	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)	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
CONTINUITY (Cont'd)		
B. Genes and Chromosomes	23. Test a sex-linked character (white eye) in fruit flies. (6)	
	24. Use a "squash" preparation of the salivary glands of the fruit fly to observe the chromosomes. (6)	
C. Heredity and Environment	25. Make a case study of sickle cell anemia. (2)	
	26. Grow albino tobacco seeds under varying conditions. (20)	
D. Genetic Code	27. Design and construct a DNA and RNA molecule. (21)	
E. Population Genetics	28. Make a study of population genetics by determining the frequency of blood groups. (1)	
F. Mathematics of Genetics	29. Solve problems on probility. (2)	
	30. Calculate Chi-Square. (2)	
		GENETICIST 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. 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.
		HORTICULTURIST 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.

OUTLINE	SUGGESTED CURRICULUM ACTIVITIES	CAREER INFORMATION
EVOLUTION		CAREER CLUSTER
I. Origin of Life		A I
A. Biogenesis	1. Investigate the formation of coacervates. (1)	B J
B. Spontaneous Generation	2. Disprove the theory of spontaneous generation by investigating the sources of bacterial growth. (2)	C L
II. Early Theories of Evolution		M
A. Acquired Characteristics	3. Disprove Lamarck's theory of "use and disuse" by clipping the wings off fruit flies for several generations. (22)	ACTIVITY:
B. Natural Selection		1. Let students do special projects on careers of their interest.
1. Malthus' Theory	4. Graph a population growth curve based on experimental results. (3)	
2. Variations	5. Measure and graph variations of structures in large grasshoppers. (12)	PARASITOLOGIST
3. Adaptations	6. Construct an "Invitation to Inquiry" to encourage student involvement. (20)	The parasitologist studies the characteristics, habits, and life cycles of animal parasites, such as protozoans, tapeworms, roundworms, 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.
III. Mutations	7. Expose seeds to X-ray and observe the seedlings. (20)	
	8. Irradiate fruit flies with X-ray and observe their progeny. (20)	

OUTLINE	SUGGESTED CURRICULUM ACTIVITIES	CAREER INFORMATION
EVOLUTION (Cont'd)		LANDSCAPE ARCHITECT
IV. Evidences		Landscape architects design, plan and confer with clients; estimate costs; order materials; supervise progress of landscaping projects.
A. Fossils	9. Work hypothetical "half-life" problems. (20)	
B. Embryology	10. Compare the preserved embryos of vertebrates. (21)	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.
C. Hybrids	11. Make a list of hybrid plants and animals. (21)	
D. Vestigial Organs	12. Challenge students to think by using an "open-ended" discussion. (20)	
E. Geographical Isolation	13. Using partitioned petri dishes, grow microbes to determine if they migrate. (21)	

OUTLINE	SUGGESTED CURRICULUM ACTIVITIES	CAREER INFORMATION
ECOLOGICAL CONCEPTS I. Ecological Variables (Matter, energy, space, time and diversity)	1. Select two of the variables and test their individual effects on a test plot of plants. (3) 2. Establish the effects of various temperatures on a yeast culture or a bacterial culture. (3) 3. Determine the effects of density on population growth and organism size. (D=N/S) (3) 4. Determine by survey, the diversity organisms found on your school campus. (20) 5. Calculate the density of students within your school. (20 & 3) 6. Determine the number of field mice found in a selected test plot. (20) 7. Select a study plot, examine the natural biotic community, and determine as many interrelationships between species as possible. (5) 8. Make a study of the competition of at least two species. (3) 9. Make a comparative study of two habitats. (3)	**CAREER CLUSTER** A G B H C I D J E K F L M N **PEST CONTROL SERVICEMAN** 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.
II. Levels of Organization A. Population B. Community C. Ecosystem		

OUTLINE	SUGGESTED CURRICULUM ACTIVITIES	CAREER INFORMATION
ECOLOGICAL CONCEPTS (Cont'd) III. Applied Ecology A. Natural Resources B. Public Health C. Human Populations and Urbanization	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)	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.

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
Teacher's Supplement
Plant Growth and Development, 1963
Teacher's Supplement
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.
Morrison, 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)
Guide

STATE ADOPTED TEXTBOOKS
ENVIRONMENTAL
1973

AVERAGE

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)
- A Guide to the Study of Freshwater 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.
Kormondy, CONCEPTS OF ECOLOGY, 1969

Webster Division - McGraw-Hill Book Co.
Engineering Concepts Curriculum Project, THE MAN MADE WORLD, 1971
Manual

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Bugeleisen, J. F. Careers and Opportunities in Commercial Art. E. P. Dutton & Co. Inc., 201 Park Avenue, South, New York, New York.

National Vocational Guidance Association
Current Career Information, 1607 New Hamshire Avenue, N.W. Washington, D.C. 1969.
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Diebold, John. Automation. D. Van Nostrand.

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Feingold, S. Norman, and Sol Swerdloff. Occupation and Careers. McGraw-Hill Co. Webster Division. #20358, 1969.

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Holland, John L. The Psychology of Vocational Choice. Blaisdell, 1966.

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Menninger, William C. Understanding Yourself. Science Research Associates, Chicago, Illinois.

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_____ Planning My Future: The Foundation, American Guidance Service, Publishers Building, Circle Pines, Minnesota, 55014, 1961.

_____ Planning Your Future: The Foundation, American Guidance Service, Publishers Building, Circles Pines, Minnesota, 55014, 1961.

_____ Toward Adult Living: The Foundation, American Guidance Service, Publishers Building, Circles Pines, Minnesota, 55014, 1961.

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Pollouck, Phillip. Career and Opportunities in Science; A Survey of All Fields. E. P. Dutton & Co. Inc., 201 Park Avenue, South, New York, New York.

Science Research Associates. Role Playing Methods in the Classroom. Chicago, Illinois.

Smick, Davis. Your Personality, Your Job. Science Research Associates, Chicago, Illinois.

Splaver, Sarah. Your Career If You're Not Going To Challenge. Julion Nessner, New York, New York 1966.

United States Department of Labor. Occupational Outlook Handbook.

United States Department of Labor. Occupational Outlook Quarterlies.

Wortham, James C. What Employers Want. Science Research Associates, Chicago, Illinois.

CAREER KITS

"Career Kit," Science Research Associates, Chicago, Illinois.

"Career" Key Largo, Florida 33540.

"Chronicles Guidance Publications," Noravia, New York, 13118.

"Career Monographs," Institute of Research, Chicago, Illinois.

1. BSCS, Molecules to Man (Blue Version). Houghton Mifflin Company, 1963.

2. BSCS, Biological Sciences and Inquiry Into Life (Yellow Version). Harcourt Brace Jovanovich, Inc., 1963.

3. BSCS, High School Biology (Green Version). Rand McNally, 1963.

4. BSCS, Special Materials (Patterns and Processes). Holt, Rinehart and Winston, Inc., 1963.

5. BSCS Block, Field Ecology. D. C. Heath and Company, 1969.

6. BSCS Block, Genetics Continuity. D. C. Heath and Company, 1968.

7. BSCS Block, Life in the Soil. D. C. Heath and Company, 1965.

8. BSCS Block, Plant Growth and Development. D. C. Heath and Company, 1963.

9. BSCS Block, Regulation in Plants by Hormones. D. C. Heath and Company, 1964.

10. Natural History of Plants and Animals. Olsen and others. National Press Company, Palo Alto, California. 1966.

11. Laboratory Investigations in Biology. Otto and others. Holt, Rinehart and Winston, Inc., 1967.

12. Laboratory Investigations in Biology. Green and others. Silver Burdett, 1974.

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15. Manual of Biology, Parts 1 and 2. Marsland. Holt, Rinehart and Winston, Inc., 1964

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17. Leaf Key to Commercial Trees in Louisiana. Louisiana Cooperative Extension Service, 1972.

18. Commercial Trees of Louisiana, Bulletin #10, 4th Edition. Louisiana Forestry Commission, 1964.

19. Anatomy and Physiology. Kimer. Macmillan Company, 1962.

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21. Varied Texts.

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