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ABSTRACT

This publication is intended to provide a reference for teachers, counselors, and administrators in planning, administering and conducting vocational and technical programs in agribusiness, natural resources and environmental protection at the postsecondary level. The material is presented in sections, each with a list of selected references, as follows: general information for planning, the nature and structure for postsecondary programs, determining the scope and nature of the program, developing the curriculum, administrative responsibilities, planning for physical facilities and equipment, student recruitment, selection and retention, and student placement and followup. (SA)

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A Guide for Planning Post-Secondary Programs for Agribusiness, Natural Resources, and Environmental Protection Occupations

by
Gary F. Beasley

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PUBLICATIONS RELATED TO PLANNING AGRICULTURAL EDUCATION PROGRAMS

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1001 A Guide for Planning Instruction in Agricultural Education

1002 A Guide for Planning Instruction for Adults in Agricultural Education

1003 A Guide for Teaching Basic Agriculture

1004 A Guide for Teaching Agricultural Production

1005 A Guide for Teaching Agricultural Supplies/Services

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1010 A Guide for Teaching Forestry

1011 A Guide for Planning Post-Secondary Programs for Agribusiness, Natural Resources, and Environmental Protection Occupations

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FOREWORD

With the passage of the 1963 National Vocational Education Act and the 1968 Amendments to this Act, more and more attention has been focused on post-secondary vocational and technical education. The 1968 Amendments are very explicit in stating that funds appropriated could be used for setting up classes designed for preparing students on the secondary level to enter advanced study on the post-secondary level. It is here that many secondary school vocational programs have faltered. Moreover, there has been too little articulation of the vocational program from the secondary school level through the post-secondary level.

In 1964, Governor Paul Johnson, before a joint session of the Mississippi Legislature, called for a step-up in vocational-technical training. He stated that the best way to do this is by utilizing our state junior college system. In substance, the Governor was saying that post-secondary vocational-technical training centers should be established at each of the state junior colleges. Since 1967, each of the state's seventeen junior colleges has a post-secondary vocational-technical training center. It is ironical that none of these institutions have complete programs of training for post-secondary agribusiness, natural resources, and environmental protection occupations.

Perhaps the primary reason for this situation existing is that there have not been clear-cut guidelines for planning such programs on the post-secondary level. It is obvious that the leadership for the development of post-secondary programs for agribusiness and natural resources occupations has been negligent. At best, one could say that where such programs have been in operation on the post-secondary level, they have not been complete programs as envisioned by the framers of the legislation dealing with this subject. However, in some cases there have been very effective courses in such areas as livestock technology and agricultural mechanics. The chief deficiency has been an apparent lack of recognition that modern agribusiness requires personnel with highly developed technical skills. With the addition of a multitude of emerging occupations in natural resources and environmental protection, it is essential that planning and execution of programs in these areas be given a high priority for the post-secondary vocational-technical programs.

In this publication, the thrust is in the direction of purposeful planning for post-secondary programs in agribusiness, natural resources, and environmental protection occupations. Its contents should serve as a useful guide to personnel who are charged with the responsibility for planning and implementing such programs.

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TABLE OF CONTENTS

Foreword iii

Acknowledgments iv

Introduction 1

Statement of Purpose 1
Scope of the Publication 1

General Information for Planning a Post-Secondary Program for Agribusiness, Natural Resources, and Environmental Protection Occupations 2
Terminology 2
Importance of Planning 3
Approaches to Planning 4
Articulation in Planning 5

The Nature and Structure for Post-Secondary Programs 9

Identification of a Technician 9
Characteristics of a Technical Program 12
Goals and Objectives of the Technical Program 12

Determining the Scope and Nature of the Program 15

The Importance of the Occupational Study 15
Organizing and Conducting the Study 15
Instruments for the Study 17
Using Advisory Groups 31
Need for Continuing Study 32

Developing the Curriculum 34

General Philosophy of the Curriculum 34
Procedures in Curriculum Construction 35
Samples of Curriculum Outlines 36
Samples of Course Descriptions 42
Developing Instructional Content: Job Analysis 46
Providing Performance-Based Instruction 48
Laboratory Experiences 48
Supervised Experiences on the Job 48

Administrative Responsibilities for the Post-Secondary Program 52

State Leadership Responsibility 52
Responsibility of the Local Administration 52
Recruiting and Selecting Staff Members 52
In-Service Education for the Staff 55
Evaluation and Supervision of Instruction 56
Liaison with Business and Industry 57

Planning for Physical Facilities and Equipment 60

Basic Considerations in Providing Facilities and Equipment 60
Planning for Multiple Uses 61
Utilizing Industrial Facilities 62

Student Recruitment, Selection, and Retention 64

Student Recruitment 64
Advising and Selecting the Student 65
Student Retention 67
Remedial and Pretechnical Programs 67

Student Placement and Follow-up 70

Job Placement Services 70
Follow-up and Evaluation 71

Bibliography 79

Introduction

The basic function of leadership in educational programs of agribusiness, natural resources, and environmental protection is planning. Planning must be present to provide for goal setting, and there must be goal setting in order to provide direction and to permit continuous evaluation. Evaluation leads to reassessment and to decision making for continuing or modifying practices and goals. To establish an effective program and to keep a program productive, this cyclical process calls for effective planning.

Statement of Purpose

This publication is intended to provide a reference for teachers, counselors and administrators in planning, administering, and conducting vocational and technical programs in agribusiness, natural resources, and environmental protection at the post-secondary level. The publication is directed to those persons who have major responsibilities for developing new programs, as well as to those persons with similar planning responsibilities for existing programs, as they face the necessity of reexamining what exists, changing whatever requires modification, and expanding and extending the services which the programs were created to provide. Although the contents of the publication is applicable to vocational programs, emphasis is given to programs that prepare persons for jobs at the technical level.

Scope of the Publication

This publication contains information on the importance of planning and the processes involved in developing an effective plan of action. Effective program planning must focus on a sequential process of education. Thus, articulation between the secondary program, the post-secondary program, and higher levels of planned education is essential.

Attention is given to the organization and structure of post-secondary programs. Program characteristics and purposes are considered, as well as suggestions for determining program needs that direct the planning process.

To meet the needs of the student and the community, the appropriate curriculum must be provided. Procedures for curriculum construction, which take into account a job analysis and technological needs, are presented.

Information on administering the program is included. Consideration is given to leadership responsibilities, liaison with business and industry, and facility planning. In addition, recruitment, selection, retention, advisement, placement, and follow-up of students are considered.

General Information for Planning a Post-Secondary Program for Agribusiness, Natural Resources, and Environmental Protection Occupations

Terminology

Several terms and their definitions which are used in this publication are presented here.

Agribusiness Education — An organized instructional and experience program involving agricultural, environmental, and related subjects. Included is a combination of the agricultural production and management operations associated services; the manufacturing and distribution of agricultural equipment and supplies; the processing, storage, marketing, and distribution of food, fiber, and other agricultural commodities; the environmental protection and wise use of natural resources, including air, forest, water, soil, animal, marine, and plant life and recreational resources. It also involves associated education and research in all of the above areas.

Agricultural Occupation — An occupation involving knowledge and skills in agriculture. The primary agricultural instructional areas which serve for classifying agricultural occupations are agricultural production, agricultural supplies, agricultural mechanics, agricultural products, ornamental horticulture, agricultural resources, and forestry.

Agriculture — All of the services and activities involved in producing plants and animals and their products and in getting them to the consumer. The term includes the processes involved in maintaining the productivity of agricultural resources and the environment.

Environmental Protection — That part of environmental education concerned with the welfare of plants, animals, and natural resources which man is dependent upon for a livelihood.

Occupational Experience — Vocational instruction which is aimed at furthering the development of vocational competencies through actual employment as a source of learning. The on-the-job experiences are a means of gaining knowledge, as well as vehicles for applying and testing what has been learned in school. To help assure that this will be an educational experience, a training plan is employed under the supervision of an appropriate training sponsor.

Planning – The process of preparing a set of decisions directed toward achieving goals by optimal means for action in the future. Basically, planning is the process of choosing between alternatives to achieve desired goals.

Post-Secondary Vocational Education — Designed primarily for youth or adults who have completed or left high school and who are available for an organized program of study in preparation for entering the labor market. The term shall not be limited to vocational education at the level beyond grade 12 if the vocational education needs of the persons to be served require vocational education at a lower grade level.

Technical Education — The branch of education devoted to instruction and training in occupations above the craftsman or trade levels, but generally not professional in nature. Instruction may not be baccalaureate in content but is evaluated usually by credit criteria rather than by clock hours. The courses of study qualify persons for employment in paraprofessional positions and as technicians and production specialists.

Importance of Planning

There are four fundamental functions in managing an educational program. These are planning, organizing, actuating, and controlling. Planning is the fundamental function of the management process. Without activities determined by planning, there would be nothing to organize, no one to actuate, and no need to control.

Some questions with which one must deal when considering program planning are: (1) What do you see to be the nature of society ten to thirty years from now in terms of occupations in agribusiness, natural resources, and environmental protection? (2) What attributes and skills will people need to work in this society? (3) What kind of programs should be created to give people attibutes and skills to work in this society?

One of the continuing functions of leadership in programs of agribusiness education is the planning function. Programs must be planned upon the basis of demonstrated need. Public support for a new and growing program depends upon the ability of leaders to describe needed areas of service and to produce evidence to substantiate such needs. Agricultural and environmental leaders have a professional obligation to inform the public through proper administrative channels when aspectes of the program show diminishing need or effectiveness, and to make recommendations for change and modernization. Lack of planning usually results in a status quo program which becomes more and more inadequate as time goes on, and may eventually have to be completely reorganized or terminated.

The importance of planning is summarized below:

1. Planning forms the basis from which all future decisions and actions arise and enables the administrator and teacher to know what steps of action must be taken to achieve desired goals.
2. Planning helps one to determine patterns of proposed actions for the future.

3. Planning enables one to avoid the tendency to let things "run down" and to see things as they are, not as they might be.
4. Planning provides the link between a desired goal and its realization.
5. Planning recalls what components are needed, how to put them together, and the order of handling them.
6. Planning helps one to estimate the time, energy, money, manpower, and other resources that are needed to achieve goals.
7. Planning helps to minimize costs and to eliminate expensive, inconsistent, and out-of-place activities.
8. Planning gives hope and stimuli for better goals to be accomplished.

Approaches to Planning

The program planning process is a deliberate thought process. Planners must be able to project plans of two types — short-term and long-term. Sound planning of a program for agribusiness, natural resources, and environmental protection occupations will take account of both immediate needs and future developments and will provide for flexibility to adjust to both.

Given the supply and demand of skill training, rational planning must be undertaken within a systems framework. The central features of such planning include specifying objectives, formulating alternative strategies for accomplishing such goals, estimating the efficiency of each strategy, and establishing a feedback system to provide redirection of the program when needed.

Planning must be based upon reliable facts. The facts required for planning a post-secondary program are those which will show whether or not a need exists for such a program. If a need is established, data must be secured to determine what groups of people need to be served; for what occupations in agribusiness, natural resources, and environmental protection; and in what numbers. The procedure of fact finding is essentially the same whether a program is being introduced in a community which is without one, or whether an existing program is being expanded, extended, or modified. The raw materials of planning are facts. The fact finding process in determining program needs is discussed later.

A serious mistake is made when one develops plans for a program by relying largely upon his own experience and thinking and then attempts to "sell" his plan or have it ratified by those who will have to activate and support it. Early in the planning process, all persons who will later be affected by the plan should be brought in as participants so that they will recognize that they are real contributors to the process. All groups and levels of professional staff in the post-secondary institution and state-level staff must be involved. Also, the community must be involved as a whole and must be represented by its special interest groups. This involvement included spokesmen for business, industry, labor, and any other organizations dealing with employment, as well as community and state government leaders. The success of a program depends very much upon the extent to which the administrator of the program can establish himself as a respected leader in the judgment of all those groups and can secure their assistance in program planning and operation.

Articulation in Planning

Instructional articulation is essential for achieving an effective and efficient program; that is, the total agribusiness education program should be interrelated and interdependent in order to prevent needless repetition and bring about coordination. The aim of articulation is to facilitate the continuous and efficient education of students from one grade level to the next. As a student advances from one level to another, he should advance to a higher or more specific level of training.

Full articulation of agribusiness education will require coordination of curriculum planning and other activities between elementary, secondary, post-secondary, and higher education institutions, as well as within single districts. To be most effective, the process of articulated programming must begin at the upper level of administration. The educational board and the chief administrators must believe that articulation of programs is worthwhile. Likewise, individual districts and local education agencies must have the proper leadership to bring about an articulated program.

If a program of this kind is to be successful, someone who has the necessary authority to effect changes must be responsible for coordinating the activities. He must see that representatives of all segments and levels in the system have an opportunity to review curriculum materials and comment on their suitability.

A proposed model of an articulated program built upon the existing level of the student's experience and education is shown in Figure 1 and is presented for consideration. Under such an arrangement, post-secondary prerequisites can be established for previous vocational training at the secondary level. Coordinated planning of technical programs to advance vertical articulation should alleviate unnecessary duplication of instruction. However, remedial instruction must be provided to students with inadequate background, because the occupational objectives of the student must be paramount. The remedial instruction should be planned on an individual basis to insure adequate preparation of the student in the desired program.

Articulated and correlated curriculums at all levels of education are to the advantage of the student and the school system. A good arrangement is a curriculum which permits a student to reach successive stages leading to various employment levels and, at the same time, makes possible the continual progression to the next stage of education without undue difficulty or excessive loss of time. This arrangement can only be accomplished when it is actively developed through the cooperative efforts of administrative leaders of the schools serving the different levels of education.

Articulation is justified only if it maintains or improves the quality of education while it increases the efficiency with which education is provided. Agribusiness education programs must provide for continuing instruction to upgrade competencies and for new occupational skills. Such instruction should be designed to improve the occupational competency of the individual by taking into account his previous experience and education. Instruction at all levels should be designed to focus on the employability of the students.

ARTICULATION OF INSTRUCTION IN PROGRAMS FOR
AGRIBUSINESS, NATURAL RESOURCES, AND ENVIRONMENTAL PROTECTION OCCUPATIONS

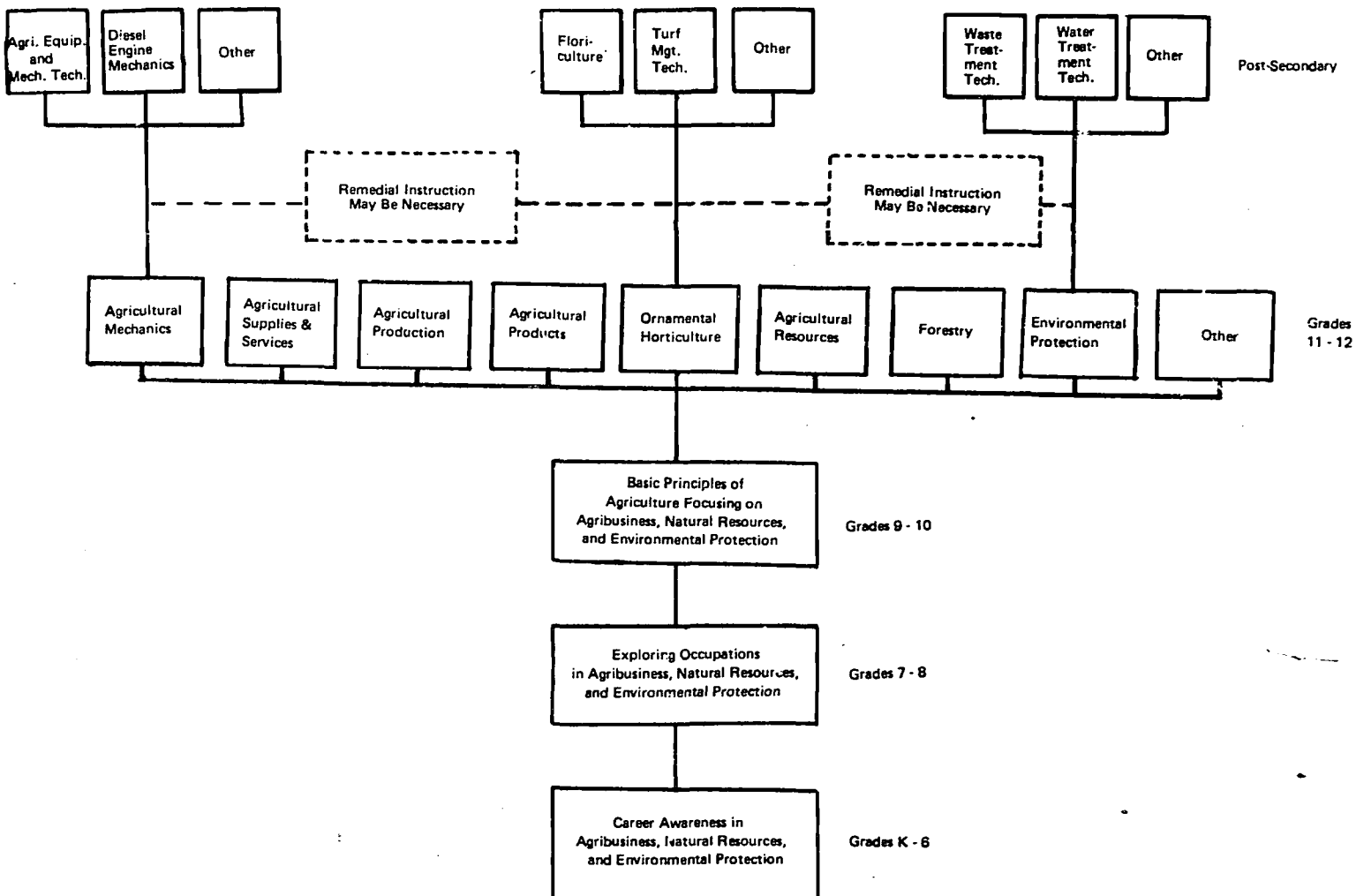

Figure 1

Suggested References

American Vocational Journal. Vol. 47, No. 6. September, 1972.

Bender, Ralph E. **Agricultural Occupations Program Development in Area Vocational Schools. Final Report.** Columbus, Ohio: Department of Agricultural Education, The Ohio State University, 1969.

Carpenter, Earl T., and Rodgers, John H. **Review and Synthesis of Research in Agricultural Education.** 2nd edition. Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1970.

Clary, Joseph R., and Woodin, Ralph J. **A Research Report of a Graduate Study: Guidelines for the Development of Training Programs for Agricultural Technicians.** Columbus, Ohio: Department of Agricultural Education, College of Agriculture and Home Economics, The Ohio State University, 1965.

Commission of Education in Agriculture and Natural Resources. **Agricultural Education for the Seventies and Beyond.** Washington, D. C.: American Vocational Association.

Daugherty, Ronald; Korb, Gus; and Smiley, James. **Proceedings of the National Seminar for State Directors of Community Junior Colleges, January 10-11, 1972.** Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1972.

Guidelines for Developing Programs in Agricultural Education for the 1970's. ED 051 391. Washington, D.C.: Division of Vocational and Technical Education, U.S. Office of Education, 1970.

Malinski, Joseph F. **Planning Techniques for Local Programs of Vocational Education.** Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1972.

Miller, Aaron J., and Gillie, Angelo C. **A Suggested Guide for Post-Secondary Vocational and Technical Education.** ED 047 083. Leadership Training Series No. 29. Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1970.

Payne, Albert V. **Administrative Factors and Actions in Initiating Two-Year Post High School Environmental Control Technology Programs: A Suggested Guide.** Utica, New York: Mohawk Valley Community College, 1972.

Sidney, Howard, ed. **Agricultural. Forestry, and Oceanographic Technicians.** Chicago, Illinois: J. G. Ferguson Publishing Company, 1969.

U. S. Office of Education. **Criteria for Technician Education: A Suggested Guide.** Washington, D. C.: United States Government Printing Office, 1968.

Wood, Herbert S. **A Study of Technical Education in California with Guidelines for the Development and Operation of Technical Education Programs in the Junior College.** Vol. XXVIII, No. 7. Sacramento, California: Bulletin of the California State Department of Education, 1959.

Young, Robert C.; Cline, William V.; and Miles, Benton E. **Vocational Education Planning: Manpower, Priorities, and Dollars.** Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1972.

The Nature and Structure for Post-Secondary Programs

Programs to prepare technicians are offered in several types of schools, including four-year colleges, technical institutes, area vocational and technical schools, and community or junior colleges. The types of programs needed depend to a great extent on the type of jobs available in agribusinesses and industries in the local area and state. However, employment opportunities in some technical jobs might impose a limitation of a program to one institution in a state for providing the kind of training needed for the job. Examples are veterinarian assistants and water treatment technicians.

A program for preparing technicians in agriculture and natural resources should not be any longer than necessary to technically prepare a worker with the knowledge, skills, and theory necessary for successful work performance. Typical programs will vary in length from a few weeks to two years. Hence, the requirements of the occupation should be the determining factor in establishing the length of a program for preparing technicians for a particular job.

Identification of a Technician

Any particular type of technician and the program required to educate him may be described in terms of what he does within the context of the level of ability prescribed. Technicians must have the following special abilities:[1]

1. Proficiency in using the scientific method of inquiry and observation and in the application of the basic principles, concepts, and laws of physics, chemistry, and the biological sciences pertinent to the individual's technological field.

2. An extensive knowledge of a field of specialization, with an understanding of the application of the underlying physical or biological sciences as they relate to the process or research activities that distinguish the particular agricultural or related technology. The degree of competency and the depth of understanding should be sufficient to allow the technician to establish effective rapport with managers, researchers, or engineers, and customers or workmen with whom he deals. Required are individual judgment, initiative, and resourcefulness in using techniques, procedures, handbook information, and recorded scientific data and clinical practice.

3. Communication skills that include the ability to record, analyze, interpret, and transmit facts and ideas orally, graphically, or in writing with complete

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[1]Adapted from U. S. Office of Education, **Occupational Criteria and Preparatory Curriculum Patterns in Technical Education Programs** (Washington, D. C.: Superintendent of Documents, United States Government Printing Office, 1965), pp. 5-6.

objectivity. The technician must keep abreast of new information pertinent to the technology. The technician must also be able to communicate easily with all persons involved in his work.

4. Ability to use mathematics as a tool in the development, definition, or quantification of phenomena or principles according to the requirements of the technology.

5. A thorough understanding and facility in using materials, processes, apparatus, procedures, equipment, methods, and techniques commonly used to perform the laboratory, field, or clinical work; and the capability to use them to provide the specialized services required in the technology.

While these special abilities are essential to all technicians, certain personal characteristics are also desirable. A technician must have some understanding of social and economic factors, a knowledge of the organization in which he works, and acceptable personal attitudes based on an understanding of person-to-person relationships.

In addition, every technician must be prepared to perform some combination of the activities listed below at the level defined in the foregoing special abilities. He must be able to:[2]

1. Apply knowledge of science and mathematics extensively in rendering direct technical assistance to physical and/or biological scientists, engineers, medical personnel, or agricultural personnel engaged in research, experimentation, processing, distribution, and production.

2. Design, develop, and plan modifications of new products, procedures, techniques, services, processes, and applications under the supervision of professional personnel in applied research, design, and development.

3. Plan, supervise, assist in installation, and inspect complex scientific apparatus, equipment, and control systems.

4. Advise regarding the operation, maintenance, and repair of complex apparatus and equipment with extensive control systems.

5. Plan production operations and services as a member of the management unit responsible for efficient use of manpower, materials, money, and equipment in mass production or personal service.

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[2]U. S. Office of Education, **Criteria for Technician Education: A Suggested Guide** (Washington, D.C.: Superintendent of Documents, United States Government Printing Office, 1968), pp. 4-5.

6. Advise, plan, and estimate costs as a field representative of a manufacturer or distributor of technical apparatus, equipment, services, and/or products.

7. Be responsible for the performance of tests of mechanical, hydraulic, pneumatic, electrical, or electronic components and systems in the physical sciences; and/or determine, measure, and make specialized preparations, tests, or analyses of substances in the physical, agricultural, biological, medical, or health-related sciences; and prepare appropriate technical reports covering such tests.

8. Prepare and interpret engineering or technical drawings and sketches, and write detailed specifications or procedures for work related to physical and/or biological sciences.

9. Select, compile, and use technical information from such references as engineering standards; handbooks; biological, agricultural, and health-related procedural outlines; and technical digests or research findings.

10. Analyze and interpret information obtained from precision-measuring and recording instruments and/or special procedures, determinations, and techniques, and make evaluations upon which technical decisions can be based.

11. Analyze and diagnose technical problems that involve independent decisions. Judgment requires substantive experience in the occupational field in addition to knowledge of scientific principles and technical know-how.

12. Deal with a variety of technical problems involving many factors and variables which require an understanding of several technical fields. This versatility is a characteristic that relates to breadth of applied scientific and technical understanding.

The combination of abilities and activities is criteria for defining both the type of technician and the educational program required to prepare him for job entry in his technical field. The technician uses one or more applied natural sciences, engineering social sciences, or business skills in performing his job. He usually does not require the level of training expected of a baccalaureate degree, but his performance and education are above that of a skilled worker. A technician in agribusiness, natural resources, and environmental protection occupations might be described as:

> . . . a worker located between the skilled worker and the professional in the job classification structure in his work performance and in his educational attainment. He possesses the skill and ability, working independently or with minimal supervision from a professional, to analyze and interpret information, diagnose problems, make decisions, and make practical application of theoretical knowledge in performing specific tasks in a specialized field in the production, processing, distribution, or marketing

of goods and services in agriculture. He must exercise cognitive skills primarily, but also he must be able to supervise and perform manipulative skills.[3]

Characteristics of a Technical Program

In post-secondary education for agribusiness, natural resources and environmental protection occupations, one must assume that the students will enter the world of work immediately upon completing the program and will not need further preparatory experience or classwork for job entry. An essential characteristic of the technical program is that it prepares a student for immediate entry into a certain job or job cluster. Program or curriculum planners must have sufficient firsthand and up-to-date knowledge of job entry requirements. To insure that relevant and realistic programs or curriculums are established and kept up-to-date, advisory committees of employers and employees in the job and job clusters need to be used.

All programs in agribusiness, natural resources, and environmental protection education at the technical level should require supervised, on-the-job occupational experience. Such a program means that each student will have a placement experience on the job in which he or she works with the close supervision of an experienced worker and with overall supervision of an instructor from the post-secondary institution. The placement experience must be planned so that the training program will meet the individual needs of the student in terms of occupational requirements. The placement experience should provide the student with a breadth of experiences necessary to learn to handle the various tasks required for successful employment.

The occupational experience at the post-secondary level is often provided through placing the student in an industry or firm on a full-time basis for a quarter, semester, or summer at a time. Such experience should be mandatory as a part of the technical program. Part-time placement in a job which permits the student to enroll in courses that meet regularly on campus is not often practiced, but would be desirable if the opportunity is provided.

Goals and Objectives of the Technical Program

The objective of programs for educating technicians in agribusiness, natural resources. and environmental protection is to provide a broadly based competency of sufficient depth in the field so that the graduate technician may be employed in one of

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[3]Commission on Education in Agriculture and Natural Resources, **Agricultural Education for the Seventies and Beyond** (Washington, D. C.: American Vocational Association, Undated), pp. 21-22.

a cluster of related work opportunities in his field. After a brief period of orientation to his particular duties in a job and with continued on-the-job study, he is able to advance to higher levels of employment.

The objective and duration of the program must be clearly stated and adhered to, and the sequence of courses must start at a requisite level. Since acquired competence for a job is the objective, proficiency examinations might provide a means for shortening the program for some students.

The program must be uncompromisingly directed toward employment objectives, and the goal of the program should clearly state that the program is not designed for transfer to baccalaureate programs. If the student changes his objective from a technician to a professional program, the credit allowed for transfer must rest on the policy of the senior institution.

The ultimate outcome of program planning depends upon the hierarchy of objectives of the program. One can teach many subjects without having a clear conception of his objectives; however, a clear statement of goals and objectives will usually result in more effective teaching. There are three main levels of objectives: (1) Broad, organizational objectives; (2) Program objectives in specific areas of work; and (3) Teaching or instructional objectives for a specific lesson to be taught. The objectives of the first level are rather broad, but serve to identify the audience and the general subject matter area under consideration. The objectives of the second level aid the teacher in identifying: (1) the specific audience, (2) the desired behavior to be developed as a result of the program, and (3) the specific content areas that will be taught. The third level of objectives is to develop teaching or instructional objectives for specific lessons. At this point, the teacher will need to be more specific about the audience, the content, and the desired behavior.[4]

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[4]Ralph E. Bender and others, **Adult Education in Agriculture** (Columbus, Ohio: Charles E. Merrill Publishing Company, 1972), pp.70-71.

Suggested References

American Vocational Journal. Vol. 47, No. 6. September, 1972.

Bender, Ralph E. **Agricultural Occupations Program Development in Area Vocational Schools. Final Report.** Columbus, Ohio: Department of Agricultural Education, The Ohio State University, 1969.

Carpenter, Earl T., and Rodgers, John H. **Review and Synthesis of Research in Agricultural Education.** 2nd edition. Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1970.

Clary, Joseph R., and Woodin, Ralph J. **A Research Report of a Graduate Study Guideline for the Development of Training Programs for Agricultural Technicians.** Columbus, Ohio: Department of Agricultural Education, College of Agriculture and Home Economics, The Ohio State University, 1965.

Guidelines for Developing Programs in Agricultural Education for the 1970's. ED 051 391. Washington, D.C.: Division of Vocational and Technical Education, U.S. Office of Education, 1970.

Malinski, Joseph F. **Planning Techniques for Local Programs of Vocational Education.** Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1972.

Miller, Aaron J., and Gillie, Angelo C. **A Suggested Guide for Post-Secondary Vocational and Technical Education.** ED 047 083. Leadership Training Series No. 29. Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1970.

Payne, Albert V. **Administrative Factors and Actions in Initiating Two-Year Post High School Environmental Control Technology Programs: A Suggested Guide.** Utica, New York: Mohawk Valley Community College, 1972.

Sidney, Howard, ed. **Agricultural, Forestry, and Oceanographic Technicians.** Chicago, Illinois: J. G. Ferguson Publishing Company, 1969.

U. S. Office of Education. **Criteria for Technician Education: A Suggested Guide.** Washington, D. C.: United States Government Printing Office, 1968.

Wood, Herbert S. **A Study of Technical Education in California with Guidelines for the Development and Operation of Technical Education Programs in the Junior College.** Vol. XXVIII, No. 7. Sacramento, California: Bulletin of the California State Department of Education, 1959.

Determining the Scope and Nature of the Program

Many factors must be considered by post-secondary administrators when establishing a technical program in their institutions. Extensive and dependable information and data upon which to base decisions concerning the program must be available. This information is usually obtained by means of an occupational study or survey, which is one of the most important activities in planning a post-secondary program.

The Importance of the Occupational Study

Information obtained from a survey can help to determine whether a program is justified or not. A major purpose of a study of this kind is to reveal the extent and nature of need. Such studies are valuable not only when moving into a new program, but also as a means for continuous planning and revision of established programs. The studies are designed to find the kinds and number of jobs in the community and the employment trends so that the annual need for new workers in various occupations can be estimated. Needs of the employed workers must be studied so that employment skills can be upgraded and updated.

The study can become a means for achieving community understanding and community approval of the steps necessary to create the programs to be proposed. The survey acts as a public relations device by involving many segments of the public. The effectiveness of the study will be in proportion to the amount of community involvement.

The survey will provide the information about possible on-the-job training stations that can be used to provide work experiences for the students. Work experience as a part of a post-secondary program in agricultural, natural resources, and environmental protection education is essential for job training.

Probably the most vital information to be obtained from the study is that of employment opportunities. Regardless of how great a program is, it is doomed for failure if the graduates are not provided meaningful and successful employment after completing the program. Do not begin or continue a program if the employment opportunities are not available.

Organizing and Conducting the Study

To be most effective, an occupational survey requires that proper techniques and methods be employed in collecting data. A general steering committee for the survey is a key element that can provide leadership and gain community cooperation. The steering committee helps to determine the broad, general policies to be followed throughout the survey. Also, the committee must see that appropriate action is initiated as a result of the study.

In making preliminary plans for a survey, certain information will be needed. Occupational statistics, figures on the number of workers and establishments, data on farms and agribusinesses, and other miscellaneous information should be collected. Data which may be used in developing a list of employers in agribusiness, natural resources, and environmental control occupations must be secured. The following list of suggested sources might be used:

Local: Chamber of Commerce
Employment Service Office
Telephone Directory
Retail Merchant's Association
Labor Organizations
City and County Directories
Utility Company Directories

State: Mississippi Agricultural and Industrial Board
Mississippi Economic Council
Mississippi State Employment Service
Mississippi Air-Water Pollution Board
Mississippi Game and Fish Commission
Soil Conservation Service
Mississippi Forestry Commission
Mississippi Licensing Boards
Mississippi Department of Agriculture and Commerce
Mississippi State Department of Education,
Vocational Education Division

National: United States Census Reports
Bureau of Labor Statistics
Occupational Outlook Handbook
United States Department of Commerce
Council on Environmental Quality
United States Department of Agriculture
United States Department of the Interior

Several methods may be used in collecting the data. These methods are: (1) mailed questionnaire, (2) personal interview, and (3) a combination of the above. The method of survey depends largely upon the size of the survey area and the funds and staff available. The questionnaire method is the least expensive way, but it is the least effective method because of misinterpretations of, and failures to complete questions on the part of the employer. The interview method is the most popular of the three, but it requires more time and effort. A combination of the questionnaire and the interview can often be used effectively. Interviewers can be used to contact persons who failed to return questionnaires; however, caution must be taken to exclude duplications.

Regardless of the method employed, representative working committees should always verify and evaluate data to guard against repetition and duplication. Verification and assessment of data will serve to eliminate misleading conclusions and will give a more complete and accurate picture of the occupational situation than can be obtained from statistical data only.

Drawing up and adhering to a definite time schedule is a most important task. The director should consider the extent of the survey and the amount of manpower at his disposal in planning a time schedule. The quicker the survey is completed, the more cooperative the community will be. However, the time period should not be so short that the interviewers feel hurried, because the outcome of the survey depends upon the accuracy with which they perform their duties in carrying out the study.

As the questionnaires or interview schedules are returned, they should be checked for partially completed or omitted answers before tabulations are made. Those having incomplete answers, omissions, or vague statements, should be returned to the employers with more specific instructions.

Instruments for the Study

In preparing for an occupational survey, those persons responsible for conducting the study will probably review a number of reports and forms used in other communities. One must remember that these instruments were developed for other situations and for specific purposes. Therefore, each local situation requires forms or instruments which will provide the desired data. The instruments should be designed to obtain the following information:

Types of jobs or positions

The number of past, present, and future employees

Opportunities for promotion

Prerequisites for employment

Potential employee characteristics

Description of job responsibilities

Pay scale for initial employment

Exhibit A is presented to provide persons who have planning responsibilities with some examples to use in developing instruments for delineating manpower requirements for various clusters in agribusiness, natural resources, and environmental protection occupations. A comprehensive and complete occupational needs survey helps to insure a technical program to meet manpower needs.

Regardless of the method used to collect data for planning a program in agribusiness and natural resources education, the information must be recorded in a manner to facilitate its use. Exhibit B is adapted from **A Guide for Planning Programs in Agricultural Education.**[5] The information that will be recorded on these sheets and Exhibit A can provide basic data for determining program priorities.

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[5]Working Committee on Agricultural Curriculum, **A Guide for Planning Programs in Agricultural Education** (Mississippi State, Mississippi: Mississippi State University, Curriculum Coordinating Unit for Vocational and Technical Education, 1972).

Exhibit A

EMPLOYMENT OPPORTUNITIES IN AGRICULTURAL PRODUCTION (01.01)

I. Company, Firm, or Agency

A. Name of Company or Farm _____

B. Address _____ Phone No. _____

_____

C. Name of Person Interviewed _____

D. Scope

_____ 1. Size of Farm _____ 2. Value of Land and Buildings _____ 3. Value of Products Sold

E. Major Enterprises (In the blank beside each number, specify the number of acres or head of each enterprise.)

_____ 1. Beef Cattle _____ 4. Soybeans _____ 7. Swine

_____ 2. Dairy Cattle _____ 5. Poultry _____ 8. Catfish

_____ 3. Cotton _____ 6. Vegetables _____ 9. _____

F. Major Equipment Used (Specify the number of each item.)

_____ 1. Tractor _____ 3. Cotton Picker _____ 5. Planting Equip.

_____ 2. Combines _____ 4. Farm Trucks _____ 6. Cultivating Equip.

II. Employees

A. Total Number of Employees (including owners) _____

B. Job Titles and Requirements for Initial Employment

Job Titles	No. Full-Time	No. Part-Time	Additional Workers Needed		Experience Required		Training Required	
			Now	Next Five Years	Yes	No	Yes	No
1. Farm Owner								
2. Farm Manager								
3. Agricultural Mechanic								
4. Equipment Operator								
5. Herdsman								
6.								
7.								

EMPLOYMENT OPPORTUNITIES IN AGRICULTURAL SUPPLIES/SERVICES (01.02)

I. Company, Firm, or Agency

A. Name of Company _____

B. Address _____ Phone No. _____

_____

C. Name of Person Interviewed _____

D. Major Areas of Business (Indicate by percentage the approximate scope of each area in relation to the total business.)

_____ 1. Agricultural Chemicals

_____ 2. Feeds

_____ 3. Seeds

_____ 4. Fertilizers

_____ 5. Equipment

_____ 6. Other (Specify) _____

II. Employees

A. Total Number of Employees (including owners) _____

B. Job Titles and Requirements for Initial Employment

Job Titles	No. Full-Time	No. Part-Time	Additional Workers Needed		Experience Required		Training Required	
			Now	Next Five Years	Yes	No	Yes	No
1. Manager								
2. Salesman								
3. Secretary								
4. Bookkeeper								
5. Utility Man								
6.								
7.								

EMPLOYMENT OPPORTUNITIES IN AGRICULTURAL MECHANICS (01.03)

I. Company, Firm, or Agency

A. Name of Company _____

B. Address _____ Phone No. _____

_____

C. Name of Person Interviewed _____

D. Main Function of Company – Sales _____ Service _____

E. Kind of Business

_____ 1. Agricultural Power and Machinery

_____ 2. Construction and Maintenance

_____ 3. Soil Management

_____ 4. Water Management

_____ 5. Ag. Electrification

_____ 6. Other (Specify) _____

II. Employees

A. Total Number of Employees (including owners) _____

B. Job Titles and Requirements for Initial Employment

Job Titles	No. Full-Time	No. Part-Time	Additional Workers Needed		Experience Required		Training Required	
			Now	Next Five Years	Yes	No	Yes	No
1. Sales Trainee and Salesman								
2. Shop Foreman and Assistant Shop Foreman								
3. Mechanic								
4. Mechanics Helper								
5. Parts Trainee								
6. Parts Man								
7. Set-Up and Delivery Man								
8. Utility Man								
9.								
10.								

EMPLOYMENT OPPORTUNITIES IN AGRICULTURAL PRODUCTS (01.04)

I. Company, Firm or Agency

A. Name of Company _____

B. Address _____ _____ Phone No. _____

_____

C. Name of Person Interviewed _____

D. Major Areas of Business

_____ 1. Food Products

_____ 2. Dairy Products

_____ 3. Nonfood Products

_____ 4. Inspection

_____ 5. Other (Specify) _____

II. Employees

A. Total Number of Employees (including owners) _____

B. Job Titles and Requirements for Initial Employment

Job Titles	No. Full-Time	No. Part-Time	Additional Workers Needed		Experience Required		Training Required	
			Now	Next Five Years	Yes	No	Yes	No
1. Manager								
2. Salesman								
3. Economist								
4. Inspector								
5. Utility Man								
6. Lab Technician								
7.								
8.								

EMPLOYMENT OPPORTUNITIES IN ORNAMENTAL HORTICULTURE (01.05)

I. Company, Firm, or Agency

A. Name of Company _____

B. Address _____ Phone No. _____

_____

C. Name of Person Interviewed _____

D. Major Areas of Business

_____ 1. Arboriculture (Shrubbery)

_____ 2. Floriculture (Flowers)

_____ 3. Landscaping

_____ 4. Nursery

_____ 5. Turf

_____ 6. Other (Specify) _____

II. Employees

A. Total Number of Employees (including owners) _____

B. Job Titles and Requirements for Initial Employment

Job Titles	No. Full-Time	No. Part-Time	Additional Workers Needed		Experience Required		Training Required	
			Now	Next Five Years	Yes	No	Yes	No
1. Manager								
2. Salesman								
3. Landscape Gardener								
4. Bookkeeper								
5. Utility Man								
6.								
7.								

EMPLOYMENT OPPORTUNITIES IN AGRICULTURAL RESOURCES (01.06)

I. Company, Firm, or Agency

A. Name of Company _____

B. Address _____ Phone No. _____

_____

C. Name of the Person Interviewed _____

D. Major Areas of Business

_____ 1. Soil

_____ 2. Wildlife (Game Farms and Hunting Areas)

_____ 3. Water

_____ 4. Fish (Recreational)

_____ 5. Other (Specify) _____

II. Employees

A. Total Number of Employees (including owners) _____

B. Job Titles and Requirements for Initial Employment

Job Titles	No. Full-Time	No. Part-Time	Additional Workers Needed		Experience Required		Training Required	
			Now	Next Five Years	Yes	No	Yes	No
1. Manager								
2. Biologist								
3. Warden								
4. Bookkeeper								
5. Utility Man								
6.								
7.								

EMPLOYMENT OPPORTUNITIES IN FORESTRY (01.07)

I. Company, Firm, or Agency

A. Name of Company _____

B. Address _____ Phone No. _____

_____

C. Name of Person Interviewed _____

D. Major Areas of Business

_____ 1. Production

_____ 2. Protection

_____ 3. Harvesting

_____ 4. Wood Utilization

_____ 5. Other (Specify) _____

II. Employees

A. Total Number of Employees (including owners) _____

B. Job Titles and Requirements for Initial Employment

Job Titles	No. Full-Time	No. Part-Time	Additional Workers Needed		Experience Required		Training Required	
			Now	Next Five Years	Yes	No	Yes	No
1. Mill Manager								
2. Supervisor								
3. Logger								
4. Forester								
5. Utility Man (Specify)								
6.								
7.								

EMPLOYMENT OPPORTUNITIES IN AGRICULTURE, OTHER (01.99)

I. Company, Firm, or Agency

A. Name of Company _____

B. Address _____ Phone No. _____

_____

C. Name of Person Interviewed _____

D. Major Areas of Business (Specify)

_____ 1. _____

_____ 2. _____

_____ 3. _____

_____ 4. _____

II. Employees

A. Total Number of Employees (including owners) _____

B. Job Titles and Requirements for Initial Employment

Job Titles	No. Full-Time	No. Part-Time	Additional Workers Needed		Experience Required		Training Required	
			Now	Next Five Years	Yes	No	Yes	No
1.								
2.								
3.								
4.								
5.								
6.								
7.								

Exhibit B

BASIC INFORMATION FOR PLANNING
A PROGRAM IN AGRIBUSINESS AND NATURAL RESOURCES EDUCATION

Overall Development of Community

Briefly describe the overall community in terms of development, occupational opportunities, and where people secure employment.

_____

_____

_____

_____

_____

_____

Agricultural Development of Community

01.01 Agricultural Production

1. Status of farming operations

Number of farms	_____	
Land in farms	_____	(acres)
Average size of farms	_____	(acres)
Value of land and buildings per farm	_____	(dollars)
Average value of products sold per farm	_____	(dollars)
Number of full-time farmers	_____	
Total number of farm workers	_____	

2. Production Enterprises in the Community

Enterprises	Number of Farms	Scope (number of acres or head)
Beef Cattle		
Dairy Cattle		
Cotton		
Soybeans		
Poultry		
Vegetables		
Swine		
Catfish		
Other (Specify)		

01.02 Agricultural Supplies/Services

Kind of Business	Number of Businesses	Number of Workers	Estimated Number of Replacement Workers Needed Annually
Agricultural Chemicals			
Feeds			
Seeds			
Fertilizers			
Other (Specify)			

01.03 Agricultural Mechanics

Kind of Business	Number of Businesses	Number of Workers	Estimated Number of Replacement Workers Needed Annually
Agricultural Power and Machinery			
Agricultural Construction and Maintenance			
Soil Management			
Water Management			
Agricultural Electrification			
Other (Specify)			

01.04 Agricultural Products (Processing, Inspection and Marketing)

Kind of Business	Number of Businesses	Number of Workers	Estimated Number of Replacement Workers Needed Annually
Food Products			
Dairy Products			
Nonfood Products			
Other (Specify)			

01.05 Ornamental Horticulture

Kind of Business	Number of Businesses	Number of Workers	Estimated Number of Replacement Workers Needed Annually
Arboriculture (Shrubbery)	_____	_____	_____
Floriculture (Flowers)	_____	_____	_____
Landscaping	_____	_____	_____
Nurseries	_____	_____	_____
Turf	_____	_____	_____
Other (Specify)			
_____	_____	_____	_____
_____	_____	_____	_____

01.06 Agricultural Resources (Conservation, Utilization, and Services)

Kind of Business	Number of Businesses	Number of Workers	Estimated Number of Replacement Workers Needed Annually
Soil	_____	_____	_____
Wildlife (Game Farms and Hunting Areas)	_____	_____	_____
Water	_____	_____	_____
Fish (Recreational)	_____	_____	_____
Other (Specify)			
_____	_____	_____	_____
_____	_____	_____	_____

01.07 Forestry

Kind of Business	Number of Businesses	Number of Workers	Estimated Number of Replacement Workers Needed Annually
Forest Production			
Forest Protection			
Logging			
Wood Utilization			
Other (Specify)			

01.99 Agriculture, Other — Specify

Kind of Business	Number of Businesses	Number of Workers	Estimated Number of Replacement Workers Needed Annually

The information provided through these forms can provide data relating to new positions and replacements through normal turnover; but employment opportunities in emerging occupations are not as easily identified, particularly for the more distant future. The danger that exists when an instrument of this type is used is that the person responding to it might not be able to provide accurate information about emerging occupations.

One of the most effective ways to determine the emerging need for a technical program is through using an advisory committee composed of interested and informed professionals. These people have an opportunity to check their individual opinions against the opinions of others and provide insight that cannot be obtained through a questionnaire. The advisory committee is described in further detail in the next section.

Using Advisory Groups

Most successful technical or post-secondary education programs are supported by and reap the benefits of advisory groups and special consultants. The support and assistance of the advisory group are invaluable in terms of planning, initiating, and providing public support for the program. Committee members usually are appointed for one to three years so that their duties will not be overloaded and so that other qualified and interested persons may serve.

Persons responsible for developing a new curriculum for technical programs need initially two kinds of information. They need to know the trend of job opportunities in specific fields for graduates of programs. Secondly, they need to know the skills and knowledge needed by a technician to perform in a particular technical field. Job opportunity trends can best be provided by persons involved with long-term planning in organizations likely to employ graduates of the program. These persons will primarily be executives in the higher levels of the administration. The information about skills and knowledge required in the work of graduates can best be obtained from people who are planning and supervising that particular kind of work. Both types of persons must be represented on the advisory group.

Since the advisory group will be a working committee, it should be composed of people who can make a direct contribution; and it should be limited to a size (usually 7 to 15) that makes possible active participation by all members. In order to give the advisory group the prestige that it requires, appointments should be made by the chief administrative officer of the institution with the approval of the governing board. Usually, terms of service on a committee end for only part of the group each year so that new, as well as experienced members, may serve together.

Since new and emerging fields, such as environmental protection occupations, provide little insight into future demands of technicians, an advisory group can provide the most reliable estimates of job opportunities. This information should be supplemented by reading material on the subject published in professional journals; by making contact with persons who are aware of manpower needs; and by contacting professional, technical, and governmental agencies.

Need for Continuing Study

Technological and related changes occur too rapidly today to permit programs for agribusiness, natural resources, and environmental protection occupations to operate over a long period of time on the basis of a single study. Since a study or survey provides a look at the occupational status and needs of a community at a given time, provision must be made to meet changing needs. This means that educators must provide for continuing study. Educators need to make use of early warning systems which signal impending changes in occupational requirements, know when the changes have arrived, and make necessary modifications.

Programs cannot be planned entirely in terms of local employment needs. The present availability of transportation makes possible a wide area from which to get students, as well as provides a labor market that can be local, regional and national. Thus, regional and national, as well as local needs, should be taken into account when planning technical programs.

Suggested References

American Vocational Journal. Vol. 47, No. 6. September, 1972.

Carpenter, Earl T., and Rodgers, John H. **Review and Synthesis of Research in Agricultural Education.** 2nd edition. Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1970.

Center for Research and Leadership Development in Vocational and Technical Education. **Report of a National Seminar on Agricultural Education Preparing Agricultural Technicians.** Columbus, Ohio: The Ohio State University, 1964.

Clary, Joseph R., and Woodin, Ralph J. **A Research Report of a Graduate Study Guideline for the Development of Training Programs for Agricultural Technicians.** Columbus, Ohio: Department of Agricultural Education, College of Agriculture and Home Economics, The Ohio State University, 1965.

Guidelines for Developing Programs in Agricultural Education for the 1970's. ED 051 391. Washington, D.C.: Division of Vocational and Technical Education, U.S. Office of Education, 1970.

Malinski, Joseph F. **Planning Techniques for Local Programs of Vocational Education.** Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1972.

Miller, Aaron J., and Gillie, Angelo C. **A Suggested Guide for Post-Secondary Vocational and Technical Education.** ED 047 083. Leadership Training Series No. 29. Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1970.

Payne, Albert V. **Administrative Factors and Actions in Initiating Two-Year Post High School Environmental Control Technology Programs: A Suggested Guide.** Utica, New York: Mohawk Valley Community College, 1972.

Sidney, Howard, ed. **Agricultural, Forestry, and Oceanographic Technicians.** Chicago, Illinois: J. G. Ferguson Publishing Company, 1969.

U. S. Office of Education. **Criteria for Technician Education: A Suggested Guide.** Washington, D. C.: United States Government Printing Office, 1968.

Wood, Herbert S. **A Study of Technical Education in California with Guidelines for the Development and Operation of Technical Education Programs in the Junior College.** Vol. XXVIII, No. 7. Sacramento, California: Bulletin of the California State Department of Education, 1959.

Developing the Curriculum

After surveying the technical training needs for agribusiness, natural resources, and environmental protection occupations, decisions must be made concerning technical curriculums that should be established. A curriculum for preparing technicians is the organized program of study and experience designed to meet the specific requirements for job entry within a specified period of time. Each curriculum must be designed specifically to prepare one for a particular technology. Training for competence in an occupation must be the prime consideration in the construction and operation of the technical curriculum.

General Philosophy of the Curriculum

The objectives of the curriculum should be occupation-centered in a field of agribusiness or natural resources with occupational competencies included in the stated objectives. The objectives of the curriculum should be broadly based in terms of job-entry skills and knowledge in various cluster occupations. Representatives from the fields of agribusiness and natural resources should be involved with the curriculum construction. The nature, content, methods of instruction, and purposes of a technical curriculum must not follow a transfer curriculum in the same field.

Sometimes, faculties of post-secondary institutions desire that occupational or technical curriculums serve purposes not compatible with preparation for employment at the end of the training program. They may plan a two-year occupational curriculum in terms of the amount of transfer credit that a four-year institution may give rather than strictly in terms of job requirements upon completing the program. Such desire to have programs win status for transfer purposes and avoid undue loss of time to students who seek to transfer to four-year institutions is understandable. However, if this tendency is not resisted, technical or occupational curriculums that are terminal in nature may become so oriented toward four-year institutional requirements that they will not serve effectively for entry into the occupational field and therefore will cease to serve the best interests of the majority of students who do not transfer.

Thus, terminal curriculums that are technical or occupational in nature should be designed primarily as an end rather than a means to higher education. If some students have the ability and resources to continue to a four-year institution after completing the technical program, the four-year institution should have flexible enough requirements for admission to take into consideration the type and quality of the student's performance and allow for advanced standing.

The length of the program is a vital and limiting factor in developing the curriculum. The typical technician program can usually be accomplished over a period of time approximating two academic years with nine months each and the summer between the two 9-month sessions. The summer period between the two years is often required for special work, such as actual occupational experiences which may not be effectively provided in the school laboratory.

A total program of agribusiness, natural resources and environmental protection at the post-secondary level must be planned and coordinated across the various fields of specialty to help make an efficient program of instruction. That is, courses, such as plant science, soil science, and management, that are common in the specialty fields must be taught at times to allow for an adequate number of students to justify the courses. By bringing students together for courses of common interest through specialities, more efficient programs can be provided without sacrificing effectiveness.

In general, technical courses are those designed to teach the student basic skills, abilities, and familiarities that are needed for a specialization. Such courses should be specific to the point of preparing students for job entry. A broad enough range of knowledge and capability in the specialty area must be presented to permit the technician to enter upon graduation any of several different, but related, employment opportunities in his field. Specific skills and abilities must be developed after employment, since each job will have its own requirements and characteristics.

A well-balanced technical program must include a proper amount of non-technical courses. Technical education courses and general education courses are generally considered to be compatible, as well as complementary, in a well-balanced program. Also, technical-related courses, such as advertising, business management, and accounting, should be included in the curriculum.

Procedures in Curriculum Construction

Curriculum construction can be accomplished through several approaches. One approach is to obtain the services of a practitioner who has experience in the specialty field, appoint him to the position of department head, and make him solely responsible for the curriculum development. However, present will be the risk that the ultimate result will reflect a personal experience which may be limited and a lack of awareness of recent developments in the specialty field.

Another method that can be used is to delegate the responsibility for curriculum development to a faculty committee composed of persons who are knowledgeable in related-area specialties or technologies. When this method is used, the curriculum may be developed to reflect only the interests of the committee members.

A better approach to curriculum development involves a task force and an advisory committee. The administrator should create a task force composed of the dean and three or four faculty members who have experience in curriculum development and who are knowledgeable in the technology under development. The task force should be given the responsibility for developing the curriculum in cooperation with an appropriate advisory committee. The task force must be selected with great care. In designing a curriculum to attain the objectives developed in consultation with an advisory committee, the task force will have to consider:

1. The kind of learning experiences that are needed to support the objectives of the program.
2. The proper sequence of learning activities.

3. The amount and nature of general education.
4. The means by which general education (including language and communication, basic sciences, mathematics, and social sciences) and the technical specialty component can be related.
5. The nature and extent of laboratory and occupational experiences.
6. The blending of laboratory and occupational experiences with classroom experiences.[7]

Developing a curriculum must be viewed as an empirical process. The results of the initial effort must be subject to constant review and change. Some considerations to keep in mind at all stages of curriculum development and revision are student needs, job requirements, and technological needs which might require constant revision.

Samples of Curriculum Outlines

The following technical curriculum outlines are presented as examples of what types of curriculum might be developed.

FORESTRY TECHNOLOGY

First Semester Courses	Hours per week Class	Laboratory	Credit
Surveying	2	6	4
Communication Skills	3	0	3
Technical Mathematics	4	0	4
Botany	2	3	3
Dendrology	1	6	3
Agribusiness and Natural Resources Seminar	1	0	1
Total	13	15	18

[7]Albert V. Payne, **Administrative Factors and Actions in Initiating Two-Year Post High School Environmental Control Technology Programs: A Suggested Guide** (Utica, New York: Mohawk Valley Community College, 1972), p. 12.

Second Semester

Technical Reporting	2	3	3
Forest Measurement	1	6	3
Applied Silviculture	2	6	4
Soil Science	2	3	3
Technical Drawing	0	6	2
Business Management	2	3	3
Total	9	27	18

Summer Work Experience

On-the-Job Work Experience in the Forestry Field: Summer Program — 10-15 weeks duration at 40 hours per week.

	Hours per week		
Third Semester Courses	**Class**	**Laboratory**	**Credit**
Principles of Economics	3	0	3
Entomology and Plant Disease Control	2	3	3
Timber Harvesting	2	6	3
Advanced Forest Surveying	1	6	3
Outdoor Recreation	1	6	3
Wildlife Ecology	1	6	3
Total	10	27	18

Fourth Semester

Elements of Social Science	3	0	3
Forest Products Utilization	2	6	4
Forest and Wildlife Protection	2	6	4
Personnel Management	3	0	3
Photo-Interpretation	1	6	3
Total	11	18	17

Extended Field Trip

Regional Forest Practices and Utilization: Three weeks of concentrated field participation at the close of the second year, at 40 hours per week.

ORNAMENTAL HORTICULTURE TECHNOLOGY
FLORICULTURE OPTION

First Semester Courses	Hours per week Class	Laboratory	Credit
Technical Mathematics	4	0	4
Communication Skills	3	0	3
Botany	3	3	4
Principles of Horticulture	2	3	3
Chemistry	3	3	4
Agribusiness and Natural Resources Seminar	1	0	1
Total	16	9	19

Second Semester

Technical Reporting	2	3	3
Floriculture	2	3	3
Soil Science	2	3	3
Technical Drawing	0	6	2
Herbaceous Plants I	1	3	2
Woody Plants	2	3	3
Horticultural Soils and Science	2	3	3
Total	11	24	19

Summer Work Experience

On-the-Job Work Experience in Floriculture: Summer Program — 10-15 weeks duration at 40 hours per week.

Third Semester Courses	Hours per week Class	Laboratory	Credit
Principles of Economics	3	0	3
Entomology and Plant Disease Control	2	3	3
Floral Design	1	3	2
Greenhouse Operations I	2	3	3
Herbaceous Plants II	1	3	2
House and Conservatory Plants I	2	3	3
Plant Pathology	2	3	3
Total	13	18	19

Fourth Semester

Flower Shop	1	6	3
Greenhouse Operations II	2	3	3
House and Conservatory Plants II	2	3	3
Salesmanship	2	3	3
Business Organization and Management	3	0	3
Indoor Landscaping	1	3	2
Total	11	18	17

FARM MANAGEMENT TECHNOLOGY

First Semester Courses	Hours per week Class	Laboratory	Credit
Technical Mathematics	4	0	4
Communication Skills	3	0	3
Botany	3	3	4
Animal Science	2	3	3
Principles of Accounting	2	3	3
Agribusiness and Natural Resources Seminar	1	0	1
Total	15	9	18
Second Semester			
Technical Reporting	2	3	3
Soil Science	2	3	3
Business Management	2	3	3
Crop Production	2	3	3
Agricultural Power Mechanics	2	6	4
Beef Cattle Management	2	3	3
Total	12	21	19

Summer Work Experience

On-the-Job Work Experience in Farm Management: Summer Program — 10-15 weeks duration with a minimum of 40 hours per week.

Third Semester	Hours per week Class	Laboratory	Credit
Principles of Economics	3	0	3
Entomology and Plant Disease Control	2	3	3
Timber Management	2	3	3
Wildlife Ecology	1	6	3
Agricultural Fertilizers	2	3	3
Harvesting Equipment	2	3	3
Total	12	18	18
Fourth Semester			
Personnel Management	3	0	3
Advanced Accounting	2	3	3
Agricultural Marketing	2	3	3
Weed Control	2	3	3
Agricultural Chemical Equipment	2	3	3
Agricultural Tillage and Planting Equipment	2	3	3
Total	13	15	18

LIVESTOCK TECHNOLOGY

First Semester Courses	Hours per week Class	Laboratory	Credit
Technical Mathematics	4	0	4
Communication Skills	3	0	3
Botany	3	3	4
Animal Science	2	3	3
Principles of Accounting	2	3	3
Agribusiness and Natural Resources Seminar	1	0	1
Total	15	9	18

Second Semester

Technical Reporting	2	3	3
Soil Science	2	3	3
Business Management	2	3	3
Beef Cattle Management	2	3	3
Forage Production	2	3	3
Principles of Marketing	2	3	3
Total	12	18	18

Summer Work Experience

On-the-Job Work Experience in Livestock Technology: Summer Program — 10-15 weeks duration at 40 hours per week.

Third Semester	Hours per week Class	Laboratory	Credit
Principles of Economics	3	0	3
Entomology and Plant Disease Control	2	3	3
Pasture Production	2	3	3
Feeds and Feeding	2	3	3
Meats and Meat Processing	2	3	3
Livestock Types and Breeds	2	3	3
Total	13	15	18

Fourth Semester

Personnel Management	3	0	3
Advanced Accounting	2	3	3
Agricultural Marketing	2	3	3
Weed Control	2	3	3
Agricultural Chemical Equipment	2	3	3
Agricultural Tillage and Planting Equipment	2	3	3
Total	13	15	18

WATER TREATMENT TECHNOLOGY

First Semester Courses	Hours per week Class	Laboratory	Credit
Technical Mathematics	4	0	4
Communication Skills	3	0	3
Physics I	2	3	3
Biology	3	3	4
Principles of Accounting	2	3	3
Agribusiness and Natural Resources Seminar	1	0	1
Total	15	9	18
Second Semester			
Advanced Technical Mathematics	3	0	3
Technical Reporting	2	3	3
Business Management	2	3	3
Basic Hydraulics for Wastewater	2	3	3
Microbiology	2	3	3
Physics II	2	3	3
Total	13	15	18

Summer Work Experience

On-the-Job Work Experience in Water Treatment: Summer Program — 10-15 weeks duration at 40 hours per week.

Third Semester	Hours per week Class	Laboratory	Credit
Principles of Economics	3	0	3
Water Supply and Wastewater Control	2	3	3
Water Purification	2	3	3
Surveying	2	6	4
Chemistry	3	3	4
Total	12	15	17
Fourth Semester			
Personnel Management	3	0	3
Wastewater Treatment	3	3	4
Instrumentation and Controls	2	6	4
Contracts, Codes, and Cost Estimation	2	3	3
Industrial Governmental Organization	3	0	3
Total	13	12	17

Samples of Course Descriptions

Advanced Forest Surveying

A study of forest surveying providing a greater depth in the study of precision surveying techniques and in using precision instruments for plane surveying. Field practice is provided in precision taping; differential and profile leveling; measuring cross sections; and making plane table, transit, and transit-tape surveys.

Agricultural Fertilizers

A study of primary, secondary, and micro plant food nutrients; the values of commercial fertilizers, methods of fertilizer application, and time and rates of application.

Applied Silviculture

An introduction to the artificial reforestation, natural forestation, and silvicultural practices in the United States. Improvements of forest stands through the basic silvicultural practices of weeding, thinning, pruning, and various cutting techniques and the marking of stands prior to logging operations are studied. Laboratory and field exercises are emphasized.

Biology

This course is concerned with basic concepts of environmental biology. Such concepts as energy flow, ecological niche, environmental resistance and various factors contributing to the upset of such are taught.

Botany

An elementary classroom and laboratory study of the forms and living processes of seed plants. Included is a study of the structure and function of roots, stems, leaves, flowers, and seeds. Metabolic processes, responses to stimuli, and a study of plant heredity are included.

Business Management

A course which introduces the student to the fundamental principles and techniques of organization, management, and operation of a successful small business enterprise. It includes a study of the principles of inventory, accounting, selling, and other phases of management.

Chemistry

Selected fundamental concepts of chemistry and their practical application to the origin and control of air pollutants are studied in the first chemistry course. Experimental work stresses safety and accuracy in measurements and other

laboratory techniques required of the air pollution technologist. Lecture topics include the structure and properties of matter, periodic classification of the elements, chemical bonding, elementary stoichiometry, equilibria, solutions and colloids.

Communication Skills

This course is designed to increase competence in reading, writing, speaking, and understanding oral instructions.

Contracts, Codes, and Cost Estimation

A course designed to teach the methods and procedures of developing an engineering contract with code and cost limitations.

Dendrology

An elementary study of trees — their habitats and principal botanical features, forms, functions, and ecological relationships. The major commercially important forest trees of the region are examined in class and through extensive field and laboratory studies. Scientific classification of plants and identification of regional flora are emphasized. The content of this course is closely coordinated with Botany.

Forest Ecology

Methods of managing forests for multiple use objectives (wood, water, wildlife, forage, and recreation), with special emphasis on the recreational use of forest lands.

Forest Measurement

A classroom and field study of the basic principles and skills required in timber measurements. Direct and indirect systems of measurement and volume computation, forest type mapping, and graphic reporting are studied and practiced.

Forest Products Utilization

A course which introduces the student to milling and subsequent utilization of forest products. The process of converting logs to lumber or other marketable products and by-products is studied. Air and kiln drying, lumber stacking, and yard layout are considered. Utilization of milling waste and the marketing of various forest products are studied. The laboratory and field work in this course includes field trips and practical application of the principles studied.

Industrial and Governmental Organizations

A study of the roles of labor and management in the development of American industry. Analysis is made of forces affecting labor supply, employment, and industrial relations in a democratic system of government.

Instrumentation and Controls

An elementary study of hydraulic, pneumatic, mechanical, electrical and electronic control systems and components. It includes a basic description, analysis, and explanation of operation of instruments and controls for water and wastewater plants. Typical performance characteristics, accuracy, and applications of instruments are studied.

Outdoor Recreation

A field oriented study of using forest resources for recreation. The course is business oriented and includes a study of the demand for outdoor recreation; kinds of recreational enterprises; use of campgrounds and sport areas; and the selecting, developing, managing, and merchandising of recreational enterprises.

Personnel Management

An introductory course in the basic principles of organization for effective personnel management. Selecting and training employees, planning and assigning work, discussing human relations involving motivation, maintaining morale, and observing special problems of forest technicians are elements of the course study. This course is coordinated with courses involving field operations to provide exercises in which students direct the efforts of their fellow students.

Photo-Interpretation

An introduction to the principles and practices of interpreting aerial forest photographs, with emphasis on forest typing, mapping, road reconnaissance, and inventory techniques. The use of aerial photographs to obtain such photogrammetric data as location, direction, area, and timber volume based on photomeasurement techniques is studied.

Physics I

The basic principles of mechanical and thermal physics and their applications are considered here. Laboratory exercises stress applications to actual situations.

Physics II

Electricity and magnetism, electronic instrumentation and work, and energy and power are covered. Principles stressed in lectures are reinforced in laboratory exercises designed to provide practical applications.

Soil Science

An elementary study of the basic principles of soils, soil management, and fertility. The geographical and geological formation and classification of soils in Mississippi are examined; and soil organisms, chemicals, conservation, and management are studied. The physical and chemical properties of soil are explored in laboratory exercises.

Surveying

An elementary course in the theory and basic principles of plane surveying emphasizing practical laboratory and field application in general surveying.

Technical Drawing

A beginning course for students who have had little or no previous experience in drafting. The principal objectives are to introduce a basic understanding of orthographic projection and freehand sketching; to help the student acquire the ability to understand detail and assemble working drawings; and to teach the student to produce clear, legible, and neat drafting work using current drafting tools and techniques. Topographic drawing and freehand lettering are stressed as requirements for map drafting and forest management activities.

Technical Mathematics

A course in basic algebraic concepts, radicals, and exponents, with an introduction to graphic and trigonometric functions of angles, particularly as they relate to the application of right triangles, indentities, and equations in forest surveying.

Technical Reporting

A study of effective ways of presenting information, with emphasis on the use of graphs, drawings, sketches, and outlines for various types of oral presentations and written reports.

Timber Harvesting

This course includes a study of regional forest harvesting practices, crew organization, planning the harvesting, skidding, loading, transportation methods, operational safety, and cost analysis. Practical experience is emphasized in the laboratory and field exercises.

Wastewater Treatment

This course is designed to familiarize the student with the elementary engineering aspects of design, operation, process control, and maintenance of wastewater treatment plants and facilities.

Water Purification

A study of basic principles of water purification, including aeration sedimentation, rapid sand filtration, chlorination, treatment chemicals, taste and odor control, bacteriological control, mineral control, design criteria, maintenance programs, and operational problems. New processes and recen developments are studied. Criteria, rules, regulations, forms, and records associated with the field are considered.

Wildlife Ecology

An introductory study of the principles of wildlife ecology and the conservation of wildlife resources, with emphasis on terrestrial communities. The field and laboratory experiences teach wildlife management techniques and how the wildlife population may conflict with forest use.

Wildlife Management

The science of managing waterfowl, furbearers, small game and big game for optimum sustained yield in the face of increasing outdoor recreational and environmental pressures.

Woody Plants

A detailed study of deciduous and evergreen trees, shrubs, and vines, their identification, growth habits, cultural requirements, and use in the landscape.

Developing Instructional Content: Job Analysis

Maintaining high quality instruction is the most important factor in the success of an educational program. Quality instruction requires continuous and careful attention by administrators and supervisors from the beginning of curriculum construction. Instructional patterns in all courses within the curriculum should be established before classes are organized, should be maintained or improved throughout the life of the program, and should be evaluated continuously.

Instruction content should be developed and evaluated by fusing acceptable criteria for judging the effectiveness of the program. Some of the criteria that should be considered are:

1. Adherence to the basic objectives of the curriculum and the technical program;
2. Carefully organized sequence of instruction provided through coordinated units and topics in the curriculum;
3. A problem-solving approach in presenting technical subjects;
4. Intelligent use of texts, audio-visuals, library, laboratory exercises, and work experience programs;
5. Maintenance of adequate and appropriate records of student progress; and
6. Provision for effective placement and advancement of the graduates in employment areas for which training was provided.

The most essential step in the development of a successful curriculum is the establishment of detailed and accurate training needs which must be used in designing course content. The course designer must determine the elements that go

into a particular course. One of the most tangible procedures is that of the job analysis. Job analysis is defined as:

> ... the process of determining, by observation and study, and reporting pertinent information relating to the nature of a specific job. It is the determination of the tasks which comprise the job and of the skills, knowledges, abilities and responsibilities required of the worker for successful performance and which differentiate the job from all others.[8]

Job facts are secured through job analysis to provide detailed information about what the worker's performance is to be in a particular job. This analysis becomes the core of determining the must-know items in the course content. Accurate assessment of job performance can be achieved only if it is based on accurate and complete job facts.

A job description or a word picture is necessary to bring into focus the duties, responsibilities, and relationships that constitute a given job or position. The job analysis is used to define continuing work assignments and a scope of responsibility.

Four methods are generally employed in a job analysis to discover the activities of a given position. These methods are introspection, interviewing, working on the job site, and the questionnaire. Typically, all of these methods are used in varying degrees.

The analysis may be made to determine the nature of each of the following job elements:

1. Duties and job operations.
2. Difficulties or errors involved in performance.
3. Method of performance.
4. Function of the job.
5. Skills involved in performance.
6. Attitudes or traits required in the job.

For detailed instructions about job analysis, see Vern C. Fryklund, **Occupational Analysis: Techniques and Procedures,** The Bruce Publishing Company, New York, 1970.

Administrators and supervisors who are responsible for planning the instructional program should make sure that the library contains ample and up-to-date technical books, manuals, and handbooks. Since textbooks cannot be expected to be adequate in keeping up with rapid changes in scientific and technical progress,

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[8]Charles C. Denova, **Establishing a Training Function,** (Englewood Cliffs, New Jersey: Educational Technology Publications, 1971).

current periodicals must be used to supplement them. The library should contain the microfiche collection of the Educational Resources Information Center (ERIC) which is available through the U. S. Office of Education.

Providing Performance-Based Instruction

Performance-based instruction must be provided to the technical student to give him the opportunity to apply scientific principles that he has been studying in order to increase his understanding of these principles and to help him acquire the skill and confidence needed in his work as a technician. Such performance-based instruction needs to be provided through laboratory experiences and supervised experiences on the job.

Laboratory Experiences

Curriculums in agribusiness and natural resources education cannot be meaningful without laboratory experiences. Most of the technical, technical-related, and basic courses should include regular laboratory exercise as an integral part of the instruction. The laboratory is a place to apply and test some of the knowledge obtained from lectures and theory in the classroom.

The laboratory tools and machines should be typical of those used in business and industry so that students will be moved one step closer to the attainment of job-entry skills. An obvious economic limitation is imposed when an institution attempts to create a series of duplicates. Rather than duplicating large and expensive equipment with industry, a technical program should use the community as the laboratory.

A typical technical curriculum provides a relatively large number of laboratory hours in the specialty courses during the first year, since the student can and should acquire introductory and elementary skills and knowledge of tools, processes, materials, and devices. The second year of laboratory time is usually greater than the first year because more technical courses are studied. Insufficient laboratory experiences produce graduates who are deficient in the capabilities necessary for success as technicians.

Supervised Experiences on the Job

A formalized arrangement for students to participate in an on-the-job occupational experience while enrolled in the program is a desirable part of an effective curriculum. This arrangement may be called by several terms, which include work experience, supervised experience, cooperative employment, or work-study. For purposes of this publication, the term occupational experience will be used.

The value of supervised occupational experiences cannot be overemphasized. Usually, students with occupational experience as a part of the technical curriculum enter full-time jobs as better technicians than those students who have not received the same opportunity for occupational experiences. Many of these students have the opportunity to continue with the employer as a full-time worker. The occupational

experience gives the student a firsthand look at the occupation for which he is training and helps him firm up career choices either by leaving the curriculum or by deciding to stay with the curriculum through graduation.

Occupational experiences are provided in several ways. The curriculum might be arranged by staggering two students working in a full-time job. The student might work after school hours in a related occupation for the occupational experience. As a requirement for graduation, the institution might require the student to complete a successful occupational experience endeavor through the summer between the two years of course work. In addition, the institution might require a successful experience on the job after course work has been completed before granting the degree.

Careful supervision by those responsible for the program in agribusiness, natural resources, and environmental protection must be provided throughout the occupational experiences of the student. Careful consideration must be given to the occupational experience station where students will be employed. Close supervision from the post-secondary institution and help from the employer will help the student gain a variety of relevant experiences. Time must be allotted for the faculty member to visit the training stations periodically and supervise the activities of the student.

Suggested References

Carpenter, Earl T., and Rodgers, John H. **Review and Synthesis of Research in Agricultural Education.** 2nd edition. Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1970.

Center for Research and Leadership Development in Vocational and Technical Education. **Report of a National Seminar on Agricultural Education Preparing Agricultural Technicians.** Columbus, Ohio: The Ohio State University, 1964.

Clary, Joseph R., and Woodin, Ralph J. **A Research Report of a Graduated Study Guideline for the Development of Training Programs for Agricultural Technicians.** Columbus, Ohio: Department of Agricultural Education, College of Agriculture and Home Economics, The Ohio State University, 1965.

Denova, Charles C. **Establishing a Training Function.** Englewood Cliffs, New Jersey: Educational Technology Publications, 1971.

Dopp, Joan, and Nicholson, Athylee. **Guidelines for Cooperative Vocational Education in the Community Colleges.** ED 061 440. Olympia, Washington: State Board for Community College Education.

Evans, Bennie N. **A Handbook for Coordinators of Cooperative Education.** State College, Mississippi: Curriculum Coordinating Unit for Vocational and Technical Education, Mississippi State University, 1971 (Revised edition).

Forest Technology — A Suggested 2-Year Post High School Curriculum. Washington, D. C.: United States Government Printing Office, 1968.

Fryklund, Vern C. **Occupational Analysis: Techniques and Procedures.** New York: The Bruce Publishing Company, 1970.

A Guide for Cooperative Vocational Education. Minneapolis, Minnesota: College of Education, Division of Vocational and Technical Education, University of Minnesota, 1969.

Guide to the Development of Vocational Education Programs and Services for the Disadvantaged. New York, New York: National Committee on Employment of Youth, under a grant from the U.S. Office of Education, 1969.

Guidelines for Developing Programs in Agricultural Education for the 1970's. ED 051 391. Washington, D.C.: Division of Vocational and Technical Education, U.S. Office of Education, 1970.

Manley, Fred W. **1968-69 Directory — Technical Education Curriculum in Agriculture and Natural Resources in the United States of America.** Raleigh, North Carolina: Occupational Research Unit, State Department of Public Instruction, 1969.

Mason, Ralph E., and Haines, Peter G. **Cooperative Occupational Education and Work Experience in the Curriculum.** Danville, Illinois: The Interstate Printers and Publishers, Inc., 1972.

Miller, Aaron J., and Gillie, Angelo C. **A Suggested Guide for Post-Secondary Vocational and Technical Education.** ED 047 083. Leadership Training Series No. 29. Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1970.

Natural Resources Technologies: A Suggested Post High School Program Development Guide. University Park, Pennsylvania: Pennsylvania State University, Department of Agricultural Education, 1971.

Payne, Albert V. **Administrative Factors and Actions in Initiating Two-Year Post High School Environmental Control Technology Programs: A Suggested Guide.** Utica, New York: Mohawk Valley Community College, 1972.

Sidney, Howard, ed. **Agricultural, Forestry, and Oceanographic Technicians.** Chicago, Illinois: J. G. Ferguson Publishing Company, 1969.

Sidney, Howard, **Methods of Teaching Agricultural Occupations in Community Colleges and Area Vocational Schools. Final Report.** ED 026 529. Cobleskill, New York: Agricultural and Technical College, New York State University, 1968.

Smith, Brandon B., and Moss, Jerome, Jr. **Process and Techniques of Vocational Curriculum Development.** ED 042 917. Minneapolis, Minnesota: Minnesota Research Coordinating Unit for Vocational Education, 1970.

U. S. Office of Education. **Criteria for Technician Education: A Suggested Guide.** Washington, D. C.: United States Government Printing Office, 1968.

U. S. Office of Education. **Occupational Criteria and Preparatory Curriculum Patterns in Technical Education Programs.** Washington, D. C.: Superintendent of Documents, United States Government Printing Office, 1968.

Wood, Herbert S. **A Study of Technical Education in California with Guidelines for the Development and Operation of Technical Education Programs in the Junior College.** Vol. XXVIII, No. 7. Sacramento, California: Bulletin of the California State Department of Education, 1959.

Working Committee on Agricultural Curriculum. **A Guide for Planning Programs in Agricultural Education.** State College, Mississippi: Curriculum Coordinating Unit, Mississippi State University, 1972.

Administrative Responsibilities for the Post-Secondary Program

The quality and effectiveness of a program in agribusiness, natural resources, and environmental protection at the post-secondary level are the responsibilities of the administration of the institution, as well as the state staff. The purpose of this section is to provide a summary of the responsibilities of the state staff and the local administration in conducting a technical program.

State Leadership Responsibility

The roles and functions of the state division in the technical program are quite diverse in coordinating and supervising technical programs. One of the first responsibilities of the state staff is to assist in establishing goals and objectives of the post-secondary programs. These goals and objectives become the basis for evaluating all factors relating to the program and its implementation, operation, and success. Statewide coordination of programs must be accomplished through the state staff, as well as the articulation between the secondary program of instruction, the post-secondary program, and other programs.

The state staff has the responsibility of performing, encouraging, and disseminating research activities and evaluation studies. Statewide studies to provide facts relating to areas in which programs are needed must be conducted. Local research studies must be encouraged to provide a basis for future directions of programs, as well as for assessing present program needs and results. Results of research studies must be disseminated to local institutions and other organizations with interests for programs in agribusiness, natural resources, and environmental protection.

The state staff must assume responsibility for providing services, such as program standards, certificating post-secondary teachers, consultant services, and fiscal auditing. Liaison with other state, local, and federal agencies must be accomplished. Also, the state staff must assume responsibility for planning and developing pilot projects, new curriculums, innovative activities, and immediate and long-term programs.

Responsibility of the Local Administration

Recruiting and Selecting Staff Members

Among many factors that determine the quality of the technical education program, probably the most critical and important factor is the staff of the program. Staff refers to all those persons who are involved in the instructional program. Included in the staff are department heads, instructors, laboratory assistants, counselors, and librarians.

To be most effective, staff members responsible for the technical program must have interests and capabilities which surpass their area of specialization. Each staff member must be well enough acquainted with the nature of the technology to teach toward the student's main interests and to relay pertinent examples and situations that communicate with students.

The educational qualifications of staff members require that they have a mastery of their subject which is greater than the subject content that they will be teaching. They must have knowledge and ability to use all appropriate materials, equipment, procedures, and techniques with the confident skill and adequacy required of the skilled technician. Usually, the instructional staff should be prepared in their subject specialty at a professional agricultural and biological science school. This staff should consistently demonstrate an understanding of and positive sympathy with the philosophy and objectives of technical education.

The occupational experience qualifications are important for all the instructional staff members. Occupational experience recent enough to provide a feel for the current practice and need in the specialty field should be mandatory. The duration of the employment in the field of specialty should be sufficient for the staff members to have developed the skills and judgments expected by technicians in agribusiness, natural resources, and environmental occupations. This employment duration is usually two to five years which might be a part of the staff member's professional education.

The library staff must be considered as an integral part of the instructional staff. Formal preparation in a teaching field is considered as an advantage, since the library staff will recognize that service to the instructional staff and the students is the main function of the library. Experience in a technical library is excellent in preparing the library staff because it involves assisting the users of the library in technical matters.

The most important personal qualification of the instructional staff members should be their teaching ability. They must have a desire to teach students to become competent technicians and to be enthusiastic in their work. Completion of a formal teacher education program would be very desirable in the staff member's professional preparation. One of the better paths of preparation for the instructional staff is graduation from a technology program, suitable employment experience, and continuous education to the baccalaureate level and beyond. This kind of preparation is vital in providing teachers with applied technology, as well as with educational preparation.

There are various sources from which to recruit staff members. A significant source may be the college or university that will have instructors without doctorates who might be looking for a challenging position in a specialty field. If staff members are to be recruited from industry, the advisory committee could help in establishing contacts with possible candidates and assessing their qualifications. If instructors are lacking all the desired qualifications, a person with a reasonably good background might be provided the opportunities for professional development either by taking courses in another institution or through practical experience obtained through summer employment in the field of specialty.

When seeking staff members to fill positions in the institution, a job description inventory for the various positions should be written and used as a basis for selecting a particular staff member. The job description inventory will furnish the administration, as well as the prospective employee, with a summarized version of the expectations and duties of the position. The following outline is presented as a guide in developing the job description inventory.

OUTLINE FOR A JOB DESCRIPTION INVENTORY

I. Identification

- A. Date job or position description was made
- B. Name of the institution
- C. Title of the position
- D. Percent of time allocated to the responsibilities of this particular position (i.e., 50% of time on a 12-month basis)
- E. Sphere of Operation (i.e., The district as a whole, continuing education, technical education, etc.)
- F. Brief history of the position
  1. When initiated
  2. Changes made since position was initiated
  3. Length of time present incumbent has held position

II. Rationale for the position

- A. Purposes and objectives of the position
- B. Broad functions of the position (list in priority of importance)
- C. Specific relationships of this position to other like positions in the system

III. Actual duties and activities of the position as presently conceived and operated

- A. Summary of major duties, performances, functions, and activities for which incumbent is held accountable
- B. Scheduling of duties, functions, performances and activities
  1. Once a year, annual (list)
  2. Monthly (list)
  3. Weekly (list)
- C. A typical daily schedule (hourly or in blocks of time)

IV. Skills involved and required in the position

- A. Technical skills required
  1. (Examples: Supervisory skills, technical or specialized knowledge, auditing, evaluation of credentials, interview skills, etc.)
- B. Conceptual skills required
  1. (Examples: Judgments to be made, problems encountered, expectations in the position to furnish new ideas and innovations, and special accountabilities expected by the holder of the position.) Other requirements in the position calling for conceptual skills
- C. Human relations skills required in the position
  1. (Examples: Public relations skills, appraising the work of others, disciplinary actions, solving morale problems, role of person in the school system's grievance procedure, etc.)
- D. Training and experience deemed desirable for the person holding the position
- E. Certification requirements

V. Relationship of this position to other positions in the institution.

- A. Person to whom incumbent reports
- B. List of positions with which the incumbent has a coordinating relationship
- C. List of persons and positions reporting directly to the incumbent

VI. Evaluation and appraisal

A. Explanation of expectations for this position to incumbent
B. Person who carries out performance evaluation or appraisal
C. Regularity of formal performance appraisal
D. Procedure of evaluation or appraisal

VII. Results and expectations from the successful operation and function of the position (list)

A. (Examples: Editing, publishing, and distribution of materials)
B. Management of institution's endeavors (farm, laboratories, etc.)

In-Service Education for the Staff

A problem of growing concern in post-secondary education is that of improving the occupational competency of the staff. Staff members must keep their knowledge and skills in the specialty field current with the changes in techniques, equipment, applications, and special services. Instructional staff members must constantly study their teaching techniques and keep abreast with innovations in teaching. The administration must provide the opportunity and encourage staff members to engage in activities that will maintain an awareness of current and future developments in their field of specialization.

One way to provide this opportunity is to have the institution subsidize membership in technical and related societies and to make institutional facilities available for society meetings. Students and staff members can gain a great deal by coming into frequent contact with society members who are working in their fields of specialization and through these contacts develop an understanding of the practical applications of the technology with which they are concerned. The society members will in turn develop an understanding of the technical program and can assist the institution with recruiting interested and qualified students, providing financial support for students with limited means, and placing graduates in satisfactory employment.

The administration can encourage staff members to attend regional and national conferences of technical societies and organizations. Travel budgets that can be used for such purposes should be provided.

Sabbatical leave or other grants of time should be provided to the staff for improving occupational competencies, as well as teaching competencies. Keeping up-to-date with the skills and knowledge expected of the technician requires intimate contact with employers and practitioners in their current operations. Employment experience to update teachers is desirable, but sometimes difficult to arrange. Beasley and Smiley[9] summarized various approaches for providing this occupational

[9]Gary Beasley and James Smiley, **Occupational Experience for Vocational Education Teachers: A Handbook for Teacher Educators** (Columbus, Ohio: ERIC Clearinghouse on Vocational and Technical Education, The Ohio State University, 1971).

experience and presented guidelines for developing such opportunities. This publication should provide the opportunity for the administration to review several possibilities for helping the staff member gain occupational experience.

Special institutes or summer workshops can be attended by staff members to update their teaching abilities. Stipends and other financial assistance should be provided to help finance such teacher education programs. The instructional staff members should be motivated and encouraged to serve as consultants in their fields of specialization which would promote professional development.

Evaluation and Supervision of Instruction

Since the administration and organization of an institution is present to facilitate and enhance the instruction, the main purpose for evaluation and supervision of personnel is to improve that instruction. If an organization is to achieve its goals, evaluation of personnel is essential. This evaluation must include evaluation involving administrators and a self-evaluation process. The purpose of evaluation should be for performance improvement and should not be done solely as a means of promotion or as a way to increase salaries as is too often the case.

The evaluation procedure should be viewed as a cooperative effort between the staff member and the administrator. Participation by the teacher or other employee would insure a better means of understanding results of the evaluation. No amount of time spent working cooperatively would be wasted because this activity is providing criteria for successful teaching in the classroom.

The evaluation should focus both on strengths and weaknesses. If the teacher is just evaluated for the purpose of showing weaknesses in teaching, the process may be given a negative response on the part of the teacher and thereby result in poorer behavior. If strong points are brought out and the teacher is commended, the weaknesses can be pointed out with greater acceptance on the part of the teacher.

The administrator must understand his role in evaluation. If the administrator is weak in some areas of evaluation, he should seek help from others. Certainly, the assistance he secures ought to be from individuals in whom the person being evaluated can have confidence. Consultant services should be used in developing a sound program for the process. The use of evaluating instruments could be used, as well as professional judgment.

It is imperative that the confirmation of behavior be identified as essential for the accomplishment of the institution's goals. Equally essential is that such behavior be firmly established as being present. The evaluation should focus on a certain element in the teaching process and not be complex in nature. If the evaluation can be understood by all parties involved, the evaluation will be more apt to be successful. Such evaluation should be guided by a written plan in carrying out the process of evaluation.

Changes in goals or methods of achieving goals necessarily impose upon the administrator the task of determining the capability of the staff to meet the attendant

responsibilities that are the products of change. Too often, necessary changes in goals and methods are rejected because there is an implicit assumption that staff retraining would be too expensive. A good evaluation system would provide for a good comprehensive in-service education program. If the personnel employed fail to have or acquire the skills, attitudes, and knowledge essential to the accomplishment of their goals, the organization is doomed for failure.

In summary, the following guidelines should be used in directing the evaluation and supervision of instruction:

1. The supervision procedures and staff appraisal procedures should be based on written policy.
2. Staff member participation should be guaranteed.
3. The procedures should be comprehensive in providing for in-service education, school-community relations, and board policy.
4. The evaluation should focus on strengths, as well as weaknesses.
5. Professional judgment, as well as instruments, should be used.
6. The process of evaluation and supervision should be tailored to the size and the resources of the institution.
7. Consultant services should be used in developing a sound program.
8. The staff improvement process should be kept in simple terms, not complex in nature.

Liaison with Business and Industry

The planning and development of a technical program must be a cooperative effort between the post-secondary institution and business and industry. While a close relationship with business and industry is important in initiating a technical program, the institution must also continue this relationship with employing groups throughout the duration of the life of the program. To enhance this relationship between the institution and business and industry, the following steps should be taken by the administration.

First, the institution should establish a contact in the technical program to provide for coordination functions with business and industry. The contact would be the key person in charge of liaison activities of the technical program. Adequate time should be provided for the person to carry on a planned program of coordination. He must be thoroughly familiar with the jobs and processes in the organizations, offices, and businesses employing persons in agribusiness, natural resources and environmental protection occupations and must be familiar with all phases of the technical program. The person in charge of coordination should be active in a job placement and follow-up program of the graduates. Through close contact with the instructional program and business and industrial practices, the coordinator can keep the institution informed about needed program changes, as well as provide assistance with curriculum improvement, teaching materials, and consultant services. The person can be a key man in developing and assisting with an occupational experience program for the students during the training period.

The advisory committee could be considered the second possible means for providing liaison with business and industry. The advisory committee is very important to cordial and continuing productive relationships between the institution and business and industry. To keep the committee active and effective, the group's membership should include management, labor, personnel officers, and supervisory personnel.

A third step in providing for effective liaison is to provide for needed consultations with industrialists. Key persons in employing businesses and industries should be invited to consult with the administration of the institution regarding the technical program, future business and industrial needs, new developments, equipment, facilities, and sources and training of instructors. The more people acquainted with the technical program, the higher its status in the community and the more effective the institution becomes.

Finally, the institution and business and industry should cooperatively support professional organizations. Many members of professional organizations are willing and ready to serve on advisory committees and provide consultant functions on an individual basis. Professional organizations with memberships from the technical program and business and industry enhance working relationships for mutual benefits.

Suggested References

Beasley, Gary, and Smiley, James. **Occupational Experience for Vocational Education Teachers: A Handbook for Teacher Educators.** Columbus, Ohio: ERIC Clearinghouse on Vocational and Technical Education, The Ohio State University, 1971.

Center for Research and Leadership Development in Vocational and Technical Education. **Report of a National Seminar on Agricultural Education Preparing Agricultural Technicians.** Columbus, Ohio: The Ohio State University, 1964.

Clary, Joseph R., and Woodin, Ralph J. **A Research Report of a Graduated Study Guideline for the Development of Training Programs for Agricultural Technicians.** Columbus, Ohio: Department of Agricultural Education, College of Agriculture and Home Economics, The Ohio State University, 1965.

A Guide to the Development of Vocational Education Programs and Services for the Disadvantaged. New York, New York: National Committee on Employment of Youth, under a grant from the U.S. Office of Education, 1969.

Guidelines for Developing Programs in Agricultural Education for the 1970's. ED 051 391. Washington, D.C.: Division of Vocational and Technical Education, U.S. Office of Education, 1970.

Miller, Aaron J., and Gillie, Angelo C. **A Suggested Guide for Post-Secondary Vocational and Technical Education.** ED 047 083. Leadership Training Series No. 29. Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1970.

Payne, Albert V. **Administrative Factors and Actions in Initiating Two-Year Post High School Environmental Control Technology Programs: A Suggested Guide.** Utica, New York: Mohawk Valley Community College, 1972.

Sidney, Howard, ed. **Agricultural, Forestry, and Oceanographic Technicians.** Chicago, Illinois: J. G. Ferguson Publishing Company, 1969.

Sidney, Howard, **Methods of Teaching Agricultural Occupations in Community Colleges and Area Vocational Schools. Final Report.** ED 026 529. Cobleskill, New York: Agricultural and Technical College, New York State University, 1968.

U. S. Office of Education. **Criteria for Technician Education: A Suggested Guide.** Washington, D. C.: United States Government Printing Office, 1968.

Wood, Herbert S. **A Study of Technical Education in California with Guidelines for the Development and Operation of Technical Education Programs in the Junior College.** Vol. XXVIII, No. 7. Sacramento, California: Bulletin of the California State Department of Education, 1959.

Planning for Physical Facilities and Equipment

The physical facilities must be suitable and adequate for the technical program in agribusiness, natural resources and environmental protection, and should be comparable to the standards of other programs within the institution. Some programs require extensive and highly specialized facilities and laboratories, such as the nursery areas and greenhouses for ornamental horticulture, the barns and feeding facilities for livestock technology, the farm area for crop production or agricultural equipment technologies, and the timber management area for forestry technology. This section of the publication is intended to serve as a reference in focusing on various considerations in planning for the facilities and equipment to serve the technical program.

Basic Considerations in Providing Facilities and Equipment

The technical program must be reviewed to analyze essential information on which to base planning decisions regarding the facilities and equipment. The following questions are presented to guide in analyzing the various needs.

1. What are the business and industrial needs, interests, and potentials?
2. What are the objectives and goals of the technical program?
3. What are the opportunities available for the technical program?
4. What physical facilities are available at the p-esent?
5. Can any present facilities be used or efficiently adapted?
6. What are the present employment opportunities and what does the future hold?
7. What types of business enterprises are presently in operation?
8. What is the potential for expansion and diversification of businesses and industries in the area?
9. What are the facility needs in regard to immediate and long-term aspects of the technology? How can this planning be coordinated for optimum results?
10. What are the student or employee interests, aims, objectives, and potentials?
11. How many students are to be accomodated?
12. How are the facilities to be financed? What local, state, federal, and industrial funds are available for financing the technical program?

When planning and establishing the facilities for the technical education program, the following checklist of steps can be used to insure an efficient plan of action.[10]

_____ 1. Survey and analyze occupational opportunities, training skills needed, and student interests.

[10]William W. Chase, Johnny W. Browne, and Michael Russo, **Basic Planning Guide for Vocational and Technical Education Facilities** (Washington, D.C.: United States Government Printing Office, 1966).

_____ 2. Consult with state directors of vocational education and educational plant services.

_____ 3. Establish a local educational agency having administrative control and direction of a technical education program.

_____ 4. Submit plans to state agencies in accordance with established rules and regulations.

_____ 5. Select an educational consultant, legal counsel, architect, and other professional advisors.

_____ 6. Develop educational specifications.

_____ 7. Plan a finance program, including capital outlay and current operating expenses.

_____ 8. Select and acquire a site.

_____ 9. Develop and approve preliminary and final architectural drawings, specifications, and other contract documents.

_____ 10. Plan site development and landscaping.

_____ 11. Prepare specifications on furniture and equipment needs.

_____ 12. Secure construction bids, award contracts, and erect the building in conformance with the official plans.

_____ 13. Purchase and install furniture and equipment.

_____ 14. Accept and occupy the completed building.

Classrooms and demonstration rooms should be equipped with teaching aids and supplies that are appropriate for the technical field of specialty. Traditional arrangements may not include the type of facility that is needed. In establishing new and revising existing programs, the present practices and equipment used in business and industry must be considered. Laboratories and equipment for technical programs must meet high standards of quality since the attainment of the program objectives and goals is dependent upon a valid laboratory experience, a broad experience in the specialty area, and an intensive and practical occupational experience.

Planning for Multiple Uses

A well-rounded and balanced program in a technical specialty requires a building that will provide for more than the daytime group. Employed adults and youths who enroll in part-time or short courses must be considered in planning the facilities. The training and retraining of displaced workers and underemployed persons require attention. The facilities must be planned through considering year-round use, as well as daytime and evening hours.

If the facilities are to be shared with classes of students with objectives different from the particular field of specialty, the facilities should not be compromised for either group; and their use by each group should be scheduled separately. The variety and quality of equipment and facilities are usually more important than quantity in establishing the technical program.

Once a building is constructed, it is likely to be in use for many years. Yet, the kinds and nature of the occupations which are taught will undergo change. The completely flexible building may be impossible to design, but certain arrangements of the original structure can increase the ease with which a program change can be accomodated. One way to arrange the building is to use as few interior partitions as possible and no partitions of a permanent type. Buildings must be designed to serve various student needs. Facilities for females must be provided, as well as ample facilities for adults and youths.

Utilizing Industrial Facilities

Providing the facilities and equipment for a technical program is expensive. However, a program should almost never be started unless the buildings, land, greenhouses, work stations, and major equipment can be provided. There is no substitute for providing adequate facilities on the premises of the local educational institution. When limited facilities and equipment are present at the institution, avenues must be sought to provide for adequate experiences for the students in a technical program.

If a forestry technology program lacks a suitable experimental forest for providing experiences to students, industrial facilities may be utilized. Major paper companies may cooperate by leasing a part of their forests to the institution for a return in managing and upkeep by the technical program. Such arrangements will provide for better relationships between the institution's technical program and employing companies of program graduates. Also, the opportunity for a better occupational experience program for students will be enhanced.

Such arrangements might be appropriate for other technical programs. Nurseries for ornamental horticulture programs might be cooperatively developed with local businesses. Agricultural equipment technology programs might acquire equipment through leasing agricultural machinery from local dealers or companies.

Suggested References

Chase, William W.; Browne, Johnny W.; and Russo, Michael. **Basic Planning Guide for Vocational and Technical Education Facilities.** Washington, D.C.: Department of Health, Education, and Welfare, 1966. Welfare, 1966.

Collins, Walter E., and Farnsworth, Wilbur M. **A Guide for Planning Facilities for Occupational Preparation Programs in Laboratory Animal Science Technology.** Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1969.

Guidelines for Developing Programs in Agricultural Education for the 1970's. ED 051 391. Washington, D.C.: Division of Vocational and Technical Education, U.S. Office of Education, 1970.

Meckley, Richard F.; Valentine, Ivan E.; and McCoy, Zane. **A Guide to Systematic Planning for Vocational and Technical Education Facilities.** Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1968.

Miller, Aaron J., and Gillie, Angelo C. **A Suggested Guide for Post-Secondary Vocational and Technical Education.** ED 047 083. Leadership Training Series No. 29. Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1970.

Payne, Albert V. **Administrative Factors and Actions in Initiating Two-Year Post High School Environmental Control Technology Programs: A Suggested Guide.** Utica, New York: Mohawk Valley Community College, 1972.

Sidney, Howard, ed. **Agricultural, Forestry, and Oceanographic Technicians.** Chicago, Illinois: J. G. Ferguson Publishing Company, 1969.

U. S. Office of Education. **Criteria for Technician Education: A Suggested Guide.** Washington, D. C.: United States Government Printing Office, 1968.

Wood, Herbert S. **A Study of Technical Education in California with Guidelines for the Development and Operation of Technical Education Programs in the Junior College.** Vol. XXVIII, No. 7. Sacramento, California: Bulletin of the California State Department of Education, 1959.

Student Recruitment, Selection, and Retention

Enrolling qualified and adequately prepared students and graduating these students with skills needed for successful employment cannot be overemphasized. If too few students are enrolled, an uneconomical program results; and the door is opened for poor morale in staff members and students. The enrolling of a majority of inadequately prepared students will require the instructional staff to lower the level of instruction, and thereby a lower quality program results. A few unprepared students in a high level program will result in failure for these students. Provision for adequately prepared enrollees of the technical program must be made so that students will stick with the program and exhibit a healthy attitude toward it. The student exiting from the technical program with needed occupational skills and with praise of the program from which he graduates is a necessity for program success.

Student Recruitment

The recruitment of students is a continuing problem for many technical programs in agribusiness and natural resources. The need for enrolling a sufficient number of adequately prepared students is of particular importance in developing new technical programs. Expanding job opportunities for women in fields related to agriculture and natural resources should be publicized. Efforts must be made to recruit qualified female students as actively as male students. The growing number of opportunities in urban areas should be similarly publicized, and the recruitment should focus on cities, as well as rural areas from which most students in agribusiness have traditionally come. Institutions that are well-established and well-known have to make a considerable effort in publicity and recruitment when they wish to attract students to a new technical program.

Various recruiting and publicity techniques have been used to attract students to technical programs. The following list is presented to provide possible alternative that may be used by those persons responsible for recruiting students to programs for agribusiness and natural resources occupations.

1. Develop attractive brochures and descriptive advertising materials for mail use.
2. Work with high school teachers and counselors (i.e., invite them to the institution or campus for demonstrations and workshops).
3. Sponsor "career days" for potential students.
4. Develop a joint cooperative arrangement between the institution and employers. (This strategy provides a continuing liaison between the educational institution and the consumer of its product, the student.)
5. Use various news media and present news and human interest stories about the institution — its program, and its graduates.
6. Maintain a "speakers' bureau" that provides speakers with well illustrated and interesting promotional talks for community groups and service organizations.

7. Have staff members meet occasionally with secondary school teachers of agribusiness and natural resources and with 4-H, FFA, and Environmental Protection Groups.

As soon as a firm decision has been made to offer a program in a technical specialty, prepare an attractive brochure or publication which contains a description of the curriculum, career opportunities related to the program, and information about registration. Such a brochure must be an official, complete, clear, and factual description of the program. Contents should include: (1) the procedure for applying for admission and the prerequisites for entry; (2) the program cost to students in detail and all related financial arrangements and assistance available; (3) the program's duration and content described as a curriculum showing sequence of courses and options (if any); (4) regulations for students of the program; (5) housing arrangements; (6) associate degree or certificate awarded on graduation; (7) what advantages the student may expect from having completed the program; (8) faculty and all related staff responsible for the program; (9) a statement of the identity and organization of the institution; (10) how long the institution has provided the program, and the status of the program's recognition by evaluative bodies and other important recognition; (11) a statement that the objective is to prepare for gainful employment as a skilled technician and not primarily for transfer toward a baccalaureate or professional program; (12) a description of the employment opportunities for which the program prepares the student; and (13) other pertinent information which would fully inform prospective students, their parents, their prospective employers, or the public-at-large. Copies of the brochure should be widely distributed well in advance of registration time.

One effective way to publicize a new technology program and at the same time to obtain an estimate of prospective students is to conduct a survey among high school students in the immediate area served by the institution. The admissions office of the institution should be responsible for conducting the survey and analyzing the data obtained. The questionnaire should be simple in design, with not more than twenty questions that focus on the student's interest, graduation date, areas of preparation and background, concern for the specialty area, possibility of enrolling in such a program, and the ability of the student.

Adequate staff funds to perform necessary recruiting activities and related services must be provided by the administration of the institution. The instructional staff members are usually involved with student recruitment, but they must not be depended upon exclusively for recruitment unless released time from other duties is provided.

Advising and Selecting the Student

Guidance and counseling services should be available to the students throughout the time in which they are enrolled in the program and especially during the selection process. Personal concerns of students are often just as important to them as their academic concerns. The vocational counseling function is probably the most important part of a good counseling and guidance program. A good guidance and counseling program should focus on three concerns of the students: the personal or psychological, the vocational, and the educational.

Counselors should assist students with their problems of personal relationships, attitudes, and financial concerns. The counselor must be acquainted with the student, his curriculum, his career objectives, and his instructors. The counselor must be prepared to help students with student work programs, scholarships, loans, other financial matters, health services, selective service obligations, housing, student activities, and other similar important matters. Professional counselors must be a part of the staff because a student will come to the counselor with more confidence knowing that the facts he reveals about himself will not influence his grades or his status in the institution. A counseling center is, or should be, a place where all information obtained through the counseling process is kept confidential.

The purpose of the vocational counseling aspect of the program is to provide the student with more information about himself so that he can make the best possible career decision. The counselor must assist the student in assessing his interests, aptitudes, abilities, personality, and achievements through personal contact, test scores, high school grades, avocational information, and reports by former teachers. If the counselor is to be seriously involved in assisting the student in the process of making career decisions, the counselor must keep alert to the specific requirements of each career field. He must work closely with the placement office of the institution and the local employment agencies.

The process of matching students with appropriate curriculums is essential if the needs of the majority of students are to be met. The key ingredients for matching students with the appropriate curriculum are:

1. An active recruitment program for qualified students;
2. An effective counseling program and an occupational guidance program with capacity for administering appropriate tests and measurements;
3. Remedial courses and pretechnical program sequences that may be used when necessary to develop minimum competencies in beginning students; and
4. Flexibility in the institutional structure that will allow the design and installation of new curriculums when needed and requested by minimum size groups for purposes of building occupational competencies.

A personal interview is recommended for all applicants. The evidence of interest and readiness may be determined best by interviewing. Occupational experience can be discussed. Also, provision is made for determining characteristics of the student that cannot be established in applications.

To provide support for the personal counseling of students and vocational guidance, the educational process will be enhanced by a strong faculty-advisement system. The faculty advisor should be a person on the staff in the area in which the student is studying. The faculty advisor will know the curriculum and will be better able to assist the student in selecting courses and options. Approximately twenty to twenty-five students would be considered a maximum number to whom a faculty member can pay careful attention.

In summary, effective guidance and counseling services should constantly be available to students in adjusting to the transition of the program involving problem solving. A student should be advised to assess his educational objectives if the program does not meet his individual needs. Arrangements to guide him to a different program must be made without prejudicing his future. A good professional counseling service, a strong vocational guidance program, and an effective faculty advisement program will contribute to a productive and successful technical program for agribusiness and natural resources occupations.

Student Retention

Student retention is highly related to student recruitment. A student recruitment program is meaningless if the retention rate is low. One of the important criteria by which the success of a technology program can be measured is by the number of students graduating as compared to the number who entered the program. An effective and successful program that meets the needs and interests of students and that keeps abreast with current developments in industry is the key to recruiting and graduating students of a technical program. In addition, various activities for students have proven to be effective in student retention. Some of these activities are presented in the following paragraphs.

The facilities of the institution should be introduced to new students as soon as feasible. Organized field trips should be provided early in the program so that students can see technicians on the job. Such tours provide motivation and enlighten students as to why certain subject matter is important.

A departmental or specialty student organization will help bring students with common interests together. Student organizations will help in bringing students in closer contact with industry by providing opportunities for employers to participate in programs and present talks at meetings. Employers and interested organizations can contribute to awards programs for students or recognize other outstanding accomplishments of students. Student memberships in technical societies or student chapters of societies can be sponsored to provide for experience and growth in the technical field.

Remedial and Pretechnical Programs

One mission of the junior or community college is to identify high school graduates or dropouts who have not had a good high school experience in terms of grades but who have potential ability that has not been developed. If institutions have such a mission policy of identifying and recruiting these students, programs for helping them to make up deficiencies must be provided. Students with academic deficiencies must be helped to meet requirements for entering a technical program. The standards for entering the technical program must not be lowered to the level of the student's ability.

One probable reason for deficiencies of students is that they may not have been motivated in their high school program. Therefore, every possible effort must be given to develop their interests and desires for acquiring the knowledge and skills that

a technician needs for performing successfully on the job. Meaningful and challenging laboratory experiences within the ability of the student early in the program would facilitate such interests.

Organized pretechnical programs to provide the elementary courses necessary for entering a high quality technical curriculum should be provided in the institution which teaches the technical program. This institution can best design and provide preparatory programs so specific needs of the student can be met and can become a part of the student's program objectives. The post-secondary institution can better provide the remedial program because the facilities, teaching capability or incentive, and understanding of the purposes of the technical program may not be available in the secondary school.

Students selected for the pretechnical programs should show promise and be moderately well prepared. These programs are designed to fill gaps and strengthen the student's preparation and are not designed to provide basic preparation. Sometimes, these remedial courses are provided in the evening or summer so that students who cannot afford to go longer than two years in a technical program can get the needed preparation within their own time frame.

Suggested References

Guidelines for Developing Programs in Agricultural Education for the 1970's. ED 051 391. Washington, D.C.: Division of Vocational and Technical Education, U.S. Office of Education, 1970.

McCraken, J. David. **Targeted Communications for Instituting Vocational Placement and Follow-up. Final Report and Appendixes A-C.** ED 061 451. Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1972.

McCracken, J. David, and others. **Targeted Communications for Instituting Vocational Placement and Follow-up. Interim Report.** ED 061 454. Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1971.

Miller, Aaro J., and Gillie, Angelo C. **A Suggested Guide for Post-Secondary Vocational and Technical Education.** ED 047 083. Leadership Training Series No. 29. Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1970.

Payne, Albert V. **Administrative Factors and Actions in Initiating Two-Year Post High School Environmental Control Technology Programs: A Suggested Guide.** Utica, New York: Mohawk Valley Community College, 1972.

Sidney, Howard, ed. **Agricultural, Forestry, and Oceanographic Technicians.** Chicago, Illinois: J. G. Ferguson Publishing Company, 1969.

U. S. Office of Education. **Criteria for Technician Education: A Suggested Guide.** Washington, D. C.: United States Government Printing Office, 1968.

U. S. Office of Education, Department of Health, Education, and Welfare. **Pretechnical Post High School Programs: A Suggested Guide.** Catalog No. FS 5.280:80049. Washington: Superintendent of Documents, United States Government Printing Office, 1967.

Wood, Herbert S. **A Study of Technical Education in California with Guidelines for the Development and Operation of Technical Education Programs in the Junior College.** Vol. XXVIII, No. 7. Sacramento, California: Bulletin of the California State Department of Education, 1959.

Student Placement and Follow-Up

The ultimate test of the quality of a technical program is the job placement and advancement of students in occupations related to their training. Placing students in productive occupations and following them in their careers to obtain information from them and their employers are viable ways to assess educational programs and experiences of the students in the programs. Follow-up of students provides evaluative data for adjustment and improvement of instructional programs. Placement and follow-up of students are separate functions; each has different objectives, procedures, and personnel responsibilities. However, these aspects of a technical program are complementary and should be combined for optimum results.

Job Placement Services

Job placement may be defined as the process of assisting students in finding a productive role in the work force upon leaving the educational institution. Generally, this means full-time work, but part-time employment may be involved, depending upon student desired and closely related reasons. This process must include early leavers, as well as program graduates. These early leavers have special difficulties in finding work and usually require special help from job placement services.

The size of the technical program or institution, availability of guidance personnel, and the administrative procedures determine the way in which the placement program will serve the total institutional program. Regardless of the administrative structure or the number of personnel involved, the following principles have been developed through a review of the literature; existing job placement programs; and discussions with employers, teacher educators, local school personnel, school board members, and state agency workers.[11]

1. A single office should be identified as a central clearinghouse of job information for the entire institution or district. All information about job openings, job descriptions, salary, employee benefits, applicants, and persons placed should be available. Employers, students, and staff members should find the centralized office convenient, efficient, and responsible.

2. Job placement services should serve all technical and vocational students who seek full-time employment and, in special cases, part-time employment. Graduates and early leavers should be served.

3. Job placement services and procedures should coordinate with cooperative work-experience programs and work-study programs. All programs involving close contact with employers should be coordinated to avoid duplication and confusion.

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[11]J. David McCracken. **Targeted Communications for Instituting Vocational Placement and Follow-up** (Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1972).

4. Close working relationships between the job placement coordinator and employers should be established. All steps in the job placement process from job solicitation to hiring require a close working relationship with employers.

5. The job placement function requires a person with special qualifications. Among these qualifications are the following: experience in business and industry, knowledge and understanding of current labor laws and fair employment practices, and occupational guidance training. The job placement function deserves and needs full-time attention.

Exhibit C may be used by students in preparing to find a job through the job placement office. The form should be completed by all students in the program. The job placement coordinator can use the form in referring students to prospective employers, as well as in responding to requests from employers for the graduates.

Follow-Up and Evaluation

The purpose of evaluating an educational program is primarily for the improvement of instruction; and the resulting improvement is for the student, the product itself. The improvement of the student is particularly important in the technical field of training because the graduate moves into employment in which his knowledge and skills are immediately tested. The best test of a technical program's effectiveness is the graduate's success on the job, both in entering and advancing to more responsible positions. The success of the graduates from a technical program is an extremely important factor in building and maintaining a reputable program.

A record of placement of students is necessary for improving the technical program, as well as for use in public relations counseling and promotional activities of the institution. A letter of inquiry and a questionnaire should be sent to employers of the students. Exhibit D may be used in an inquiry to the employers about graduates of the technical program.

To obtain the required information for conducting student follow-ups, the institution must have complete mailing addresses of students leaving the institution. When leaving the institution, a student should be required to leave such pertinent information for follow-up programs. Exhibit E is presented as an example to follow in obtaining future mailing addresses of students.

Exhibit C

JOB APPLICATION FORM

Name Last First Middle	Social Sec. No.	Date of Birth
Address	Phone No.	Institution
Technical Program	Expected date of graduation	

List Scholastic Honors: _____

What are your hobbies and interests? _____

In what types of businesses have you been employed? _____

Are you under a doctor's care? _____

What serious illnesses, operations, or accidents have you had? _____

References

Name	Address
1.	
2.	
3.	

Write a paragraph about your future employment and educational plans.

_____
Signature

Exhibit D

SAMPLE RETURN POSTCARD INQUIRY TO EMPLOYERS

_____ Institution
Office of Coordinator of Placement

Dear Employer:

The Placement Office desires to know how well the employee whose name appears on the opposite side of this card is adjusting to his job. Information called for on this form, as well as your comments, will aid staff members in better preparation of students for employment.

Your cooperation in providing us with the information called for on this card, and in mailing it at your earliest convenience, is greatly appreciated. All information will be treated confidentially.

Thank you,

_____
Coordinator of Placement

Reply side of above postcard.

Name _____ Date of Referral _____

Company _____ Job Title _____

Is he (she) still working for your firm? YES_____ NO _____
If not, give date of termination _____ and reason _____
_____

Was he (she) adequately trained for the job? YES _____ NO _____
Comment _____

Is progress on the job Good_____ Average _____ Poor _____
Does this individual with his technical training have any advantages in promotion or upgrading? YES _____ NO_____
Additional comments:_____
_____

Signature _____

Exhibit E

STUDENT EXIT FORM

No.____

Check one:
Early leaver ____
Graduate ____

Section I (Please print.)

1. Student's name _____
   Last First Middle Initial

2. Mailing address next October 15
   Street City State Zip Code

3. Address of parent or guardian
   Street City State Zip Code

Section II

Check to indicate program in which enrolled.

____ Agribusiness and Natural Resources
____ Distribution
____ Home Economics
____ Environmental Control
____ Health
____ Office
____ Technical
____ Trade and Industry

Section III

Sex of graduate

____ Male
____ Female

Comments:

Various follow-up techniques have been used in getting returns from graduates and early leavers. The following suggestions might be used to enhance the rate of response in the follow-up procedure:

1. Make the questionnaire brief and to the point.
2. Keep directions brief, clear, and distinct.
3. Include a self-addressed, return envelope.
4. Use a stamped envelope rather than a business reply envelope.
5. Include a personalized accompanying letter.
6. Include official sponsorship by a party respected by the potential respondent.
7. Consider the time of mailing the questionnaire (day of week and time of year).
8. Offer a summary of the final report.
9. Contain a deadline date for returning.

The first step in conducting the follow-up procedure is to make and print the follow-up instrument. Exhibit F may be used as an example to secure the needed evaluative information.

Exhibit F

SAMPLE QUESTIONNAIRE

FOLLOW-UP STUDY OF VOCATIONAL-TECHNICAL GRADUATES

1. Name _____
   Last First
2. Mailing address _____
   _____
3. Are you in full-time Military Service? ..... YES ____
   NO ____
   If you answered "yes" to Question 3 — stop — ignore the remaining questions and simply mail this form.
4. Are you enrolled in school full-time? ..... YES ____
   NO ____
5. Are you unemployed and seeking work? ..... YES ____
   NO ____
6. Are you unemployed and <u>not</u> seeking work? ..... YES ____
   NO ____
7. Are you employed part-time and not attending school? ..... YES ____
   NO ____
8. If employed full-time, check the statement below which best describes your employment:
   a. Full-time in occupation for which you were trained _____
   b. Full-time in occupation related to your training _____
   c. Part-time in occupation related to your training _____
9. Please list your civic leadership activities. _____
   _____
   _____
10. What additional training should have been provided in your technical program?
11. Additional comments:

The second step is to orient the students with the follow-up procedure before they leave the institution. This orientation program is a good place to obtain the future mailing addresses of students as previously mentioned with the "Student Exit Form." For best results, use a small group of students in the orientation program and indicate when the questionnaire will be sent to them after graduation. The person in charge of the orientation program should achieve the objectives of the orientation if the following steps are used:

1. Explain the exact purposes of the follow-up procedure which include:
   a. To meet state and federal requirements.
   b. To check the value of the training program.
   c. To aid in curriculum development.
2. Share past follow-up information with students and give illustrations of how this has resulted in changes in the curriculum.
3. Explain the importance of each individual response.
4. Review instruments and point out the relationship between questions asked and the objectives of the follow-up procedure.
5. Help students to see that returning the questionnaire is a path to personal goals, such as:
   a. To improve the placement service.
   b. To contribute to their permanent institutional records.
   c. To help develop a better program for future students and enhance the image of the institution.
6. Instruct students in the accurate completion of the "Student Exit Form."
7. Involve students through discussion.

The next step is to mail the questionnaire at the proper time. The fall of the year (October) is usually a good time to find prospective respondents and get a good report on their employment status.

The final step is to compile the data and make the necessary reports. The most important part of the procedure is to use the resulting information for improving the instruction and ultimately the technical program.

Suggested References

Guidelines for Developing Programs in Agricultural Education for the 1970's. ED 051 391. Washington, D.C.: Division of Vocational and Technical Education, U.S. Office of Education, 1970.

McCracken, J. David, and others. **Targeted Communications for Instituting Vocational Placement and Follow-up. Interim Report.** ED 061 454. Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1971.

McCraken, J. David. **Targeted Communications for Instituting Vocational Placement and Follow-up. Final Report and Appendixes A-C.** ED 061 451. Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1972.

Miller, Aaron J., and Gillie, Angelo C. **A Suggested Guide for Post-Secondary Vocational and Technical Education.** ED 047 083. Leadership Training Series No. 29. Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1970.

Payne, Albert V. **Administrative Factors and Actions in Initiating Two-Year Post High School Environmental Control Technology Programs: A Suggested Guide. Utica, New York: Mohawk Valley Community College, 1972.**

Sidney, Howard, ed. **Agricultural, Forestry, and Oceanographic Technicians.** Chicago, Illinois: J. G. Ferguson Publishing Company, 1969.

U. S. Office of Education. **Criteria for Technician Education: A Suggested Guide.** Washington, D. C.: United States Government Printing Office, 1968.

Wood, Herbert S. **A Study of Technical Education in California with Guidelines for the Development and Operation of Technical Education Programs in the Junior College.** Vol. XXVIII, No. 7. Sacramento, California: Bulletin of the California State Department of Education, 1959.

Bibliography

Adams, Dewey Allen. **Review and Synthesis of Research Concerning Adult Vocational and Technical Education.** Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1972.

Adapted from U.S. Office of Education. **Occupational Criteria and Preparatory Curriculum Patterns in Technical Education Programs.** Washington, D.C.: Superintendent of Documents, United States Government Printing Office, 1965.

Allen, Thomas R., Jr. **Job Placement Coordinator's Handbook.** ED 060 211. Huntington, West Virginia: West Virginia Department of Vocational-Technical Education, Marshall University, 1972.

American Vocational Association. **Transitions in Agricultural Education Focusing on Agribusiness and Natural Resources Occupations.** Washington, D. C.: American Vocational Association, (n.d.).

American Vocational Journal. Vol. 47, No. 6. September, 1972.

Beasley, Gary, and Smiley, James. **Occupational Experience for Vocational Education Teachers: A Handbook for Teacher Educators.** Columbus, Ohio: ERIC Clearinghouse on Vocational and Technical Education, The Ohio State University, 1971.

Bender, Ralph E. **Agricultural Occupations Program Development in Area Vocational Schools. Final Report.** Columbus, Ohio: Department of Agricultural Education, The Ohio State University, 1969.

Bender, Ralph E., and others. **Adult Education in Agriculture.** Columbus, Ohio: Charles E. Merrill Publishing Company, 1972.

Carpenter, Earl T., and Rodgers, John H. **Review and Synthesis of Research in Agricultural Education.** VT 010 881. 2nd edition. Columbus, Ohio: ERIC Clearinghouse on Vocational and Technical Education, The Center for Vocational and Technical Education, The Ohio State University, June, 1970.

Center for Research and Leadership Development in Vocational and Technical Education. **Report of a National Seminar on Agricultural Education Preparing Agricultural Technicians.** Columbus, Ohio: The Ohio State University, 1964.

Chase, William W.; Brown, Johnny W.; and Russo, Michael. **Basic Planning Guide for Vocational and Technical Educational Facilities.** Washington, D.C.: Department of Health, Education, and Welfare, 1966.

Clary, Joseph R., and Woodin, Ralph J. **A Research Report of a Graduated Study Guidelines for the Development of Training Programs for Agricultural Technicians.** Columbus, Ohio: Department of Agricultural Education, College of Agriculture and Home Economics, The Ohio State University, 1965.

Collins, Walter E., and Farnsworth, Wilbur M. **A Guide for Planning Facilities for Occupational Preparation Programs in Laboratory Animal Science Technology.** Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1969.

Commission on Education in Agriculture and Natural Resources. **Agricultural Education for the Seventies and Beyond.** Washington, D.C.: American Vocational Association.

Community College Vocational Cooperative Education: Exemplary Project in Vocational Education Conducted Under Part D. of Public Law 90576. First Annual Report. ED 058 880. Costa Mesa, California: San Mateo Junior College District, California, 1971.

Daugherty, Ronald; Korb, Gus; and Smiley, James. **Proceedings of the National Seminar for State Directors of Community Junior Colleges, January 10-11, 1972.** Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1972.

Denova, Charles C. **Establishing a Training Function.** Englewood Cliffs, New Jersey: Educational Technology Publications, 1971.

Dopp, Joan, and Nicholson, Athylee. **Guidelines for Cooperative Vocational Education in the Community Colleges.** ED 061 440. Olympia, Washington: State Board for Community College Education.

Evans, Bennie N. **A Handbook for Coordinators of Cooperative Education.** State College, Mississippi: Curriculum Coordinating Unit for Vocational and Technical Education, Mississippi State University, 1971 (Revised edition).

Forest Technology — A Suggested 2-Year Post High School Curriculum. Washington, D. C.: United States Government Printing Office, 1968.

Fryklund, Vern C. **Occupational Analysis: Techniques and Procedures.** New York: The Bruce Publishing Company, 1970.

A Guide for Cooperative Vocational Education. Minneapolis, Minnesota: College of Education, Division of Vocational and Technical Education, University of Minnesota, 1969.

A Guide to the Development of Vocational Education Programs and Services for the Disadvantaged. New York, New York: National Committee on Employment for Youth, Under a grant from the United States Office of Education, 1969.

Guidelines for Developing Programs in Agricultural Education for the 1970's. ED 051 391. Washington, D.C.: Division of Vocational and Technical Education, U.S. Office of Education, 1970.

A Handbook *of* Suggested Techniques for Conducting Community Occupational Surveys and Follow-up Studies. Community Surveys. State College, Mississippi: Industrial Education Department, Mississippi State College, 1953.

Harris, Norman C. "Identifying New and Emerging Occupations," **Occupations and Education: Leaders in the Field Speak Out.** American Association of Junior Colleges, and Center for Vocational and Technical Education, The Ohio State University, 1969.

Heady, Earl O., and others. **Manpower Requirements and Demand in Agriculture by Regions and Nationally, with Estimation of Vocational Training and Educational Needs and Productivity.** ED 016 979. Ames, Iowa: Iowa State University, 1966.

Iverson, Maynard J., and Bender, Ralph E. **Guidelines for the Development of Student Organizations Associated with Agricultural Programs at Two-Year, Post-Secondary Educational Institutions in the United States. Research Report.** ED 054 380. Columbus, Ohio: Department of Agricultural Education, The Ohio State University, 1971.

Malinski, Joseph F. **Planning Techniques for Local Programs of Vocational Education.** Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1972.

Manley, Fred W. **1968-69 Directory — Technical Education Curriculum in Agriculture and Natural Resources in the United States of America.** Raleigh, North Carolina: Occupational Research Unit, State Department of Public Instruction, 1969.

Mason, Ralph E., and Haines, Peter G. **Cooperative Occupational Education and Work Experience in the Curriculum.** Danville, Illinois: The Interstate Printers and Publishers, Inc., 1972.

McCracken, J. David. **Targeted Communications for Instituting Vocational Placement and Follow-up. Final Report and Appendixes A-C.** ED 061 451. Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1972.

McCracken, J. David, and others. **Targeted Communications for Instituting Vocational Placement and Follow-up. Interim Report.** ED 061 454. Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1971.

Meckley, Richard F.; Valentine, Ivan E.; and McCoy, Zane. **A Guide to Systematic Planning for Vocational and Technical Education Facilities.** Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1968.

Miller, Aaron J., and Gillie, Angelo C. **A Suggested Guide for Post-Secondary Vocational and Technical Education.** ED 047 083. Leadership Training Series No. 29. Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1970.

Natural Resources Technologies: A Suggested Post High School Program Development Guide. University Park, Pennsylvania: Pennsylvania State University, Department of Agricultural Education, 1971.

Payne, Albert V. **Administrative Factors and Actions in Initiating Two-Year Post High School Environmental Control Technology Programs: A Suggested Guide.** Utica, New York: Mohawk Valley Community College, 1972.

Sidney, Howard, ed. **Agricultural, Forestry, and Oceanographic Technicians.** Chicago, Illinois: J. G. Ferguson Publishing Company, 1969.

Sidney, Howard, **Methods of Teaching Agricultural Occupations in Community Colleges and Area Vocational Schools. Final Report.** ED 026 529. Cobleskill, New York: Agricultural and Technical College, New York State University, 1968.

Smith, Brandon B., and Moss, Jerome, Jr. **Process and Techniques of Vocational Curriculum Development.** ED 042 917. Minneapolis, Minnesota: Minnesota Research Coordinating Unit for Vocational Education, 1970.

U. S. Employment Service. **Handbook on Employment & Security Job Market Research Methods: Area Skill Survey.** Washington, D.C.: United States Government Printing Office. 1965.

U. S. Office of Education. **Criteria for Technician Education: A Suggested Guide.** Washington, D. C.: United States Government Printing Office, 1968.

U. S. Office of Education, Department of Health, Education, and Welfare. **Pretechnical Post High School Programs: A Suggested Guide.** Catalog No. FS 5.280:80049. Washington: Superintendent of Documents, United States Government Printing Office, 1967.

U. S. Office of Education. **Occupational Criteria and Preparatory Curriculum Patterns in Technical Education Programs.** Washington, D. C.: Superintendent of Documents, United States Government Printing Office, 1965.

U. S. Senate Committee on Labor and Public Welfare. **The Environmental Quality Education Act.** Recommending passage of H.R. 18260. Report No. 91-1164, Calendar No. 1181, 91st Congress, 2nd Session, September 9, 1970. Washington: United States Government Printing Office, 1970.

Western Electric Corporation. "A Topical Outline and Selected References on Applied Science and Environmental Management." Prepared for Western Electric Seminar on environmental control. San Francisco: Available from Dr. Lynton K. Caldwell, Indiana University, Bloomington, Indiana, February 16-18, 1970.

Wood, Herbert S. **A Study of Technical Education in California with Guidelines for the Development and Operation of Technical Education Programs in the Junior College.** Vol. XXVIII, No. 7. Sacramento, California: Bulletin of the California State Department of Education, 1959.

Working Committee on Agricultural Curriculum. **A Guide for Planning Programs in Agricultural Education.** State College, Mississippi: Curriculum Coordinating Unit, Mississippi State University, 1972.

Young, Robert C.; Cline, William V.; and Miles, Benton E. **Vocational Education Planning: Manpower, Priorities, and Dollars.** Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1972.