TECHNICAL EDUCATION IN AGRICULTURE AND NATURAL RESOURCES

PANEL ON TWO-YEAR PROGRAMS
Commission on Education in Agriculture and Natural Resources
NATIONAL ACADEMY OF SCIENCES, Washington, D.C.
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PREFACE

The Panel on Two-Year Programs was formed by the Commission on Education in Agriculture and Natural Resources with two responsibilities: To review the status and trends in two-year post high school education programs and to identify problems and suggest solutions. In carrying out this assignment, the Panel turned its attention to a number of issues:

- Defining the roles and goals of the technical programs in agriculture and natural resources.
- Designing the most suitable curriculum.
- Defining the optimum preparation for faculty members in two-year colleges.
- Providing adequate inservice training programs.
- Avoiding excessive duplication in offerings among institutions in the same geographic area.
- Designing effective recruitment, counseling and placement programs.
- Building workable administrative structures.
- Obtaining adequate funding.
- Achieving adequate recognition, assistance and leadership from the four-year institutions.

The Commission itself had two major goals. The first was to foster improvement in the education of undergraduate and two-year students in the agricultural and natural resource fields by continually reviewing trends in education for undergraduate and technical majors; stimulating discussion and evaluation of undergraduate courses and curricula; and preparing recommendations for the development of academic programs in the future. The second was to assist in the development of the agricultural and natural resource aspects of general education. Its attention was directed primarily to course and curricular content, but it was also concerned with teaching materials, instructional technology, preservice and in-service faculty education and related matters.

This report is primarily directed to the attention of administrators and faculty in two-year programs, administrators and faculty in four-year colleges of agriculture and natural resources, departments of agricultural education, the staffs of federal, state and local education agencies, and employers in business and industry.

The Panel recognizes and appreciates the help of those who met with it on occasion or offered comments on earlier drafts of the report, including Charles Cameron of the Agricultural and Technical College at Alfred, New York; Howard Sidney, Agricultural and Technical College at Cobleskill, New York; Ralph Matthews, California Community Colleges; W. T. Mooney, El Camino College, California; and D. S. Metcalfe, University of Arizona, a member of the Commission.

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INTRODUCTION

The explosive growth of community colleges across the country, and the concurrent national emphasis on post-high school vocational and technical education, have great significance for agriculture and natural resources. Nearly 20,000 students are currently enrolled in agricultural and natural resource curricula in community colleges, technical institutes, area vocational schools, and two-year divisions of four-year colleges and universities – in more than 600 separate curricula, nearly 250 institutions, in 43 states.

Vocational programs – as distinguished from technical ones – represent an important segment of education in agriculture and natural resources, and provide an alternative to baccalaureate or technical programs for many students, but are not considered in detail here. Vocational training in agriculture and natural resources has, in the past, been offered primarily in high school. Recently, however, a number of post-high school vocational programs in agriculture and natural resources have been introduced. These programs typically last one year, but may range from less than six months to more than two years.

This report omits detailed consideration of college parallel programs, which usually extend two years but may last only one. Such programs, offered by community colleges and university centers, are rapidly becoming a dominant factor in higher education in agriculture and natural resources. In fact, largely because of transfers from community colleges and regional campuses, junior class enrollment in colleges of agriculture now exceeds that of sophomores.

ROLE AND STATUS OF THE TECHNICIAN

The term "technician" has no universally accepted definition, either as to level of training or kind of work. It is generally agreed that technicians have a certain amount of specialized education or training in science and technology. They occupy a position intermediate between that of the scientist, engineer or professional practitioner on the one hand, and the skilled or semi-skilled vocational worker on the other.

One definition of the agricultural technician is as follows:

"An agricultural technician is 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 applications 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 must be able to supervise and perform manipulative skills." [1]

In agriculture and natural resources, there has been relatively little effort to conceptualize the role of the technician, compared to the attention devoted to it in engineering, the physical sciences, and medicine. An exception is forestry, where the Federal Government and some states have established civil service positions for forestry technicians. The Society of American Foresters used these terms:

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[1] Report of a National Seminar on Agricultural Education, "Preparing Agricultural Technicians", The National Center for Advanced Study and Research in Agricultural Education, July 20-24, 1964, The Ohio State University.

"The forest technician differs from the semi-skilled worker (aide) in his knowledge of forestry theory and methods and from the forester in his more limited or specialized background and in his use of technical skills in support of forestry activities. The senior (advanced) forest technician occupies the area between the skilled forest worker and the forester at the end of the spectrum closest to the professional forester. The forest technician requires an education and training sufficient to enable him to understand the reasons for, and the purposes of, the operations for which he is responsible. He should understand technical terms and appreciate the professional point of view. The forest technician does not need either the depth or extent of scientific understanding required of a forester, but he does need a practical working knowledge of the same subject matter."[2]

Technicians and Status

A general attitude in our society is that the only truly educated college man is the one who has completed four years of work. It seems to matter not if this is an inferior experience for the particular student, the central idea is that it must be four years. As the AAAS Commission on Science Eduation says:

"Higher education, in general, has failed to accept technical education as a specialized part of its own structure – as it has accepted medical and engineering education, for example – and has not offered the full measure of cooperation that must exist if technical education is to be able fully to carry out its mission.

"A share of the confusion about the place of technical education in the educational system arises from the fact that there still is lack of understanding by many of the distinction between manual arts, vocational education, and technical education. Each has its unique and essential role in education, but their immediate objectives and characteristics are quite different.

"The scientific community is not fully aware of the function and academic requirements of technical education, nor that the assistance of scientists and engineers is urgently needed, particularly at the local level, in the development of technical curricula, the preparation of science and mathematics courses, and the initial preparation and continuing education of teachers in technical education programs."[3]

While some college faculty members share the prejudice toward four-year curricula the attitude is most tenaciously held by the nonacademic public, and particularly by the parents of high school students, who are looking forward to more education for their offspring. The four-year college degree has become a status symbol of unique importance, a view that had its beginning many decades ago when only the elite and affluent could afford to go to college, and "college" meant four years. Society tends to hold in high esteem those who can deal with abstract, theoretical ideas, and to downgrade those whose special aptitudes are technical and manipulative.

Our economy faces an increasing demand for workers with technical skills, and provides even higher monetary rewards for their services. It is quite possible, therefore, that technical competence also will become a measure of status and affluence, redressing the balance in attitude regarding the relative worth of four-year and less-than-four-year training.

Demand for Technicians

Technician occupations are growing rapidly and in recent years the employment of technicians has been increasing faster than that of the engineers and scientists they assist. This growth stems from the needs of an expanding and increasingly technical economy and a growing recognition of the importance of technicians – factors that have greatly intensified the demand.

The Bureau of Labor Statistics projects an increase of about 650,000 technicians over the 1963-75 period, a rise from the 845,000 employed in 1963 to about 1,495,000 needed in 1975.[4] The increase in requirements for life science technicians is expected to be the most rapid, 139 percent over the 1963-75 period. A large number of the technicians needed in field of agriculture and natural resources fall into this category.

It has been estimated that in addition to the technicians required to fill new positions, more than 15,000 will be needed each year to replace those who retire, die, or transfer to other occupations.

Underlying the increase in demand for technicians are the expansion of industry, continued growth in research and development expenditures, and increasing complexity of modern technology. Production methods are becoming ever more complicated, requiring technical knowledge of the product and its use. Product development itself is usually in charge of scientists and engineers who require assistance from technicians to make their work more efficient. While education is often discussed from the standpoint of the needs and desires of students, the basic drive is a reflection of the requirements of the economy and the opportunities it offers.

Supply of Technicians

Technical training is important not only to the employer, but to the many young persons who, unable or unwilling to undertake four-year college instruction, are interested in practical matters and capable of assuming formal study beyond high school. In the past, their alternatives have been limited: now, post high school vocational and technical programs provide opportunities for high school graduates to develop or enhance their employability.

Harris has stated: "Near the top of the list of major problems facing America is the education and training of youth for 'middle-manpower' occupations."[5] He goes on to say that not only must the job seeker be willing to work, but he must also be capable of doing some specific kind of work. Competence and skill of a generally high order is necessary. He feels that more than half of our high school graduates eventually will find their place in 'middle-manpower' jobs for which two-year college programs will be optimal preparation.

Today's enrollee in a baccalaureate program is often required to present high scholastic credentials from high school and must generally obtain good grades in college board examinations. Usually, he has had a greater depth of training in the physical sciences and mathematics, the biological sciences, the social sciences, and languages than the student who is not continuing on to a four-year college.

Baccalaureate programs in agriculture and natural resources place decreasing emphasis on vocational and technical education, and concentrate more on principles and theory in science and technology. The first two years of a baccalaureate program concentrate primarily on the basis sciences and humanities; familiarity with the particular subject matter of the professional degree does not occur until the third and fourth year. Still further, an increasing portion of the baccalaureate graduates continue for advanced degrees and are even less likely to enter practical, operational employment.

Technical Students

It should be recognized that students in two-year technical programs are in some ways similar to and in some ways different from students in four-year programs. This results from the self-generated sorting that takes place in any system where individuals may choose different paths for achieving self-satisfaction and monetary reward.

Two-year students have the same measure of interest and motivation as four-year students in pursuing their educational objectives. They possess the same personal qualities – ambition, a sense of responsibility, and the ability to motivate and get along with people. Perhaps more two-year students generally know how to get a job done because they have an inclination for the practical. They are not as adept in dealing with abstractions and theory, and in putting these in written terms. And because educational tests tend to favor the very aptitudes in which the practically oriented person is deficient, technical students generally show up less well in college board scores and academically rank lower in their high school class. The discerning educator recognizes these differences, but he does not consider them weaknesses, and considers two-year training a worthy educational goal for many young people.

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[2] Society of American Foresters, "Forest Technician Training Programs in the United States – A Progress Report". Journal of Forestry, Vol. 65 (7); 484-487. Washington, D.C., 1967.

[3] "Technical Education, A Growing Challenge in American Higher Education". A report by the Commission on Science Education of the AAAS. AAAS Publ. 68-14.

[4] Technician Education Yearbook, 1967.

[5] Harris, Norman C. "Meeting Educational Needs for the Middle Level of High School Graduates". School of Education Bulletin. University of Michigan, February, 1963.

Growth of Community Colleges and Technical Institutes

Most technical curricula are offered by community or junior colleges, and technical institutes. The numbers of these institutions, and their size, have been increasing rapidly, at a rate of about one a week.

"The fastest expanding institutions of education in the United States are the community colleges, technical institutes, and post high school area vocational-technical schools. Approximately 78 two-year colleges were established in 1967. It is estimated that nearly 100 two-year community colleges will be established in 1968. It is anticipated the two-year community colleges will continue to expand to meet the needs of high school graduates and others for continuing education for changing and emerging technologies. Many area vocational-technical schools have been and are being established to provide post high school technical education."[6]

The comprehensive community colleges and technical schools ordinarly maintain an open-door admissions policy. These institutions offer post-high-school education for all individuals regardless of their intellectual level, interest, or physical skills. All applicants who are high school graduates or who have passed a high school equivalency test are usually admitted although some may not be admitted to technical programs.

Federal Legislation

Federal support for the establishment of technician programs, has been increasing. The need for educating highly skilled technicians was recognized and supported by Federal legislation under Title VIII of the National Defense Education Act of 1958. The primary purpose was to train skilled technicians required by national defense.

Other significant legislation in the support of technician training programs includes the Vocational Education Act and Higher Education Facilities Act of 1963, which authorized billions of dollars for the construction of facilities of public and non-profit private colleges and an Amendment to the Higher Education Act of 1965.

Goals of Technical Education

The primary objective of technician education is to produce a graduate competent to perform a technician-level task. Corollary to this, technician education should prepare students for jobs that actually exist. In other words, technician education should be job-oriented and market-oriented.

The technician must be capable of working and communicating directly with engineers, scientists, production personnel, and other managerial and professional persons, in his specialized area of work. He should also be an active, well-informed member of society.

The successful technical education graduate should be trained broadly enough to be able to select his field of preferred employment, within a job cluster. Any further training required by the employee would be in employee policies and procedures, and specific techniques used by the professional for whom he is working.

DEMAND FOR TECHNICIANS

For the last two decades the demand for professional employees at the four-year level has exceeded the supply. While the employment situation softened somewhat in 1970, the long-run outlook is good. The use of technicians to extend the influence of the professional workers appears to be a partial solution to this shortage.

While data relating specifically to agriculture, forestry and management of renewable natural resources are less complete than for technicians in certain other fields, the needs are apparent. Studies are being conducted to determine the areas of greatest need and the special curriculum requirements of various technical specialities. Demand for these technically trained graduates is increasing each year as more post-high school institutions initiate programs and as employers learn to appreciate what the technicians can do. But more liaison between schools and employers is needed to acquaint prospective employers with the capability and availability of graduates.

Change in the Agricultural Economy

Changes in modern agriculture have created a need for more technically trained employees. There will also be a need for competent people in many new areas of specialization created by advances in technology. The Bureau of Labor Statistics (9) states that while less than 5 percent of the total civilian labor force is employed on farms, the number of people who work in jobs closely related to agriculture has been growing – a number of these positions can be filled by persons with training at less than the baccalaureate level.[7]

Even with increased efficiency in output per worker, agriculture still employs six million farm workers. Furthermore, labor on the farm accounts for a small part of the entire agricultural labor requirements. According to the United States Department of Agriculture, six million people have jobs providing the supplies farmers use for production and farm living. Eight to ten million people have jobs storing, transporting, processing and merchandising the products of agriculture. In fact, three out of every ten jobs in private employment are related to agriculture.

Agriculture and natural resources, as do other fields, require much technical work between the vocational and the scientific professional levels. In the past, much of this technical work has been done by a combination of bachelors' degree holders, student candidates for bachelor degrees, or persons with only on-the-job experience.

Change in Baccalaureate Education

Baccalaureate courses in agriculture and natural resources have traditionally had a strong vocational orientation. This is less true now, custom having gradually given way to emphasis on developing an understanding of basic principles which cut across disciplines. The four-year graduates from modern curricula do not pursue a technician role.

Today, also, more baccalaureate students go directly to graduate work than did formerly. In some colleges the proportion already is 50 percent or more, leaving fewer students for the jobs traditionally open to four-year graduates. Those with a bachelor's degree who do take jobs are qualified to fill positions at the professional level requiring greater knowledge and responsiblity than formerly. All this change has left an employment gap in the agricultural and natural resource economy: the need, then is to provide educational programs to train persons to fill this void in manpower.

New Careers

In addition to the traditional occupations, new technical careers are on the horizon, for example, those evident in teaching and agricultural extension.

Many of the so-called professional jobs performed by such agricultural extension specialists as 4-H club leaders could be handled very effectively by a technician. In education, much could be done to increase the productivity of the professional by providing him technicians to do such routine work as preparing demonstration materials.

Closely allied to education is agricultural research. The use of technicians in carrying out the routine operations would materially increase the productivity of the professionals and reduce the over-all cost of a new discovery – a new variety, product or technique.

In veterinary medicine, technicians could handle a number of jobs under the supervision of the professional. For example, technicians could do routine vaccinations or pregnancy testing, and greatly enhance the productivity of the professional veterinarian.

Agriculture will no doubt be faced with more and more labor union negotiations. In California, for example, some of the large

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[6] "Methods of Teaching Agricultural Occupations in Community Colleges and Area Vocational School", Final Report, Project No. 8-0008, to Bureau of Research, USOE. August 1968. By Howard Sidney, Chairman, Division of Agriculture, Cobleskill Agricultural and Technical College, Cobleskill, New York.

[7] Occupational Outlook Handbook, Bureau of Labor Statistics, U.S. Department of Labor, Bulletin No. 1550, 1968-69 Edition, p. 792.

farms are now unionized. The area of labor-management relations could well be one where technically competent personnel will be required and where presently few, if any, are available.

Other areas where there may be need for technicians include intrastate inspection of meat or other agricultural products and range management technicians.

Rural America

The President's Task Force on Rural Development has described the role of technical education in meeting the employment and education needs of rural America in these terms:

"Estimates in 1960 placed underemployment in the Nation at 8.4 percent for rural nonfarm and at 26.0 percent for rural farm forces. This is equivalent to 1.5 million man-years annually that are not fully employed in producing wealth for the Nation to share. This is a wasteful loss – first to the underemployed who are not compensated for idle skills, and second, to each of us in society who cannot benefit from wealth that is not produced. Simply put, you cannot cut up a pie that hasn't been baked. Thus each of us has an economic interest in the education of other people wherever they are and whomever they are, regardless of race, class or place of residence.

"Educational programs should be developed to assure people living in the small cities, towns and on the farms of rural America of educational opportunities – including preschool, general education and vocational and occupational education that are comparable in quality and quantity to those provided others in our society.

"There is urgent need for work experience programs, subprofessional job training, adult education, broad vocational and technical training, retraining, testing, occupational counseling, community colleges and areawide special education, especially at an early age, for educationally underprivileged rural residents.

"Rural youth, particularly, are faced with the prospect of migration. To meet the needs of contemporary society, they need both a higher quality of general education and a wider offering of vocational education and technical education. The latter can be helped by more multidistrict area vocational and technical schools and by amending the Vocational Education Act to provide that Federal funds for vocational education be granted in lump sums to States, leaving it up to States and local school districts to allocate the funds among different types of vocational education."[8]

TECHNICAL EDUCATION PROGRAMS

Present Offerings

Technical education programs in agriculture and natural resources have grown rapidly in number and enrollment during the past several years. A study conducted by Fred Manley during 1967-69 indicates that significant growth occurred in just two years, from 1966-67 to 1968-69. Table I shows that enrollment increased 34% in both years, and the number of institutions offering programs grew by 39% and 23%.

California had the largest enrollment in 1968-69, followed by New York, Illinois and North Carolina. These four states enrolled 55% of all students that year.

The largest enrollment in 1967-68 was in agricultural business technology curricula, followed closely by those in ornamental horticulture technology. Table II shows enrollment by curriculum, and the number of institutions offering each type of program, for 1966-67, and 1967-68; data for 1968-69 were not available.

TABLE I

Enrollment, Institutions and States offering two-year technical education programs in Agriculture and Natural Resources, 1966-67, 1967-68, and 1968-69.

	1966-67	(% Change)	1967-68	(% Change)	1968-69
Enrollment	10,290	(+34%)	13,786	(+34%)	18,434
Number of Institutions Offering	142	(+39%)	197	(+23%)	243
Number of States Offering	35	(+ 6%)	37	(+16%)	43

Curriculum Organization and Content

Most of the institutions that offer technical programs also offer college parallel programs that give the students the first two years of a four-year baccalaureate program. The college parallel program has an objective that is different from the technical programs and consequently should differ in content.

Two-year college parallel programs, which prepare the student for transfer to a baccalaureate curriculum at the end of the second year, might well offer few if any technical subject matter courses in the first two years. Emphasis is usually on basic biological, physical, and social science courses.

If the student is to take his place in one of a closely related cluster of technical positions after two-years training, he must bring certain minimum preparation when he matriculates. If he is not prepared for a technical program, – but has the nature, ability and desire – he should be counseled to enter a "pretechnical" post high school program. Such a program, designed flexibly to meet the needs of the individual student, should in most instances be offered by the institution that offers the technical program.

Curriculum Content

The primary objective of a two-year technical program is to develop technical skill – to prepare the student for an occupation, or a "cluster" of closely-related jobs. Technical subject matter courses should be emphasized, and offered early in the

[8] "A New Life for the Country", The Report of the President's Task Force on Rural Development, U.S. Government Printing Office, March 1970.

TABLE II

Enrollment and number of institutions offering two-year Technical Programs in Agriculture and Natural Resources, By Curriculum

Curriculum	Enrollment			No. Institutions Offering		
	1966-7	1967-8	(%Change)	1966-7	1967-8	(%Change)
Agricultural Business Technology	2,702	3,688	(+32%)	102	137	(+34%)
Ornamental Horticulture Technology	1,935	3,495	(+29%)	74	85	(+15%)
Forestry and Resource Technology *	1,256	1,753	(+40%)	29	42	(+45%)
Agricultural Engineering Technology	1,051	1,669	(+59%)	43	66	(+53%)
Animal & Poultry Technology	1,420	1,593	(+12%)	46	47	(+ 2%)
Crop Technology **	789	1,004	(+27%)	32	40	(+25%)
Food Technology	399	531	(+33%)	17	19	(+12%)
Soil Technology	221	308	(+39%)	7	11	(+57%)
Other	594	608	(+ 2%)	14	17	(+21%)
Totals	10,367	13,759	(+33%)	364	464	(+24%)

* Includes forestry, wood utilization, fisheries and wildlife, and outdoor recreation technology.
** Includes agronomic and horticultural crops.

program. The following content guidelines are commended to the attention of those planning to develop technical curricula.[9]

- The curriculum must give the student competence in the following:
  - Proficiency in the use of 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.
  - Facility with mathematics
  - A thorough understanding and facility in use of the 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.
  - 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 engineering, health, agricultural, or industrial processing or research activities that distinguish the technology of the field
  - Communication skills that include the ability to record, analyze, interpret, and transmit facts and ideas orally, graphically, or in writing with complete objectivity; and to continuously locate and master new information pertinent to the technology.
- The curriculum must contribute to the development of certain personal characteristics that are desirable and in some measure necessary. As employees and as citizens, technicians must have some understanding of social and economic factors, a knowledge of the organization of society in general and their employer's organization in particular, and acceptable personal attitudes based on an understanding of person-to-person relationships.
- The curriculum must provide a broadly based competency in a field of applied science of sufficient depth that the graduate technician may be employed in one of a cluster of related work opportunities in his field. Upon employment, a brief period of orientation to his particular duties in the employer's organization, together with continued on-the-job study, permits him to advance to higher levels of productivity and increased responsibility.
- The curriculum must be of "college level and intensity", providing the special knowledge, skills, competencies, and experience needed for beginning employment, within a period of about two years.
- The curriculum has no predetermined implication as to transferability to a baccalaureate or a professional curriculum, but it does not preclude a student's continuation toward such an objective.
- The curriculum should clearly be described in terms readily recognizable by students, school, staff, parents, employers, legislators, other educational institutions, and the public-at-large. As a curriculum, it should be described in terms of semester, trimester, or quarter hours. Credit awarded for lectures, laboratories, and shop periods should be equivalent to that generally accepted at the college level.
- The curricular description should specifically state the particular type of technician being educated; and that the program is designed to prepare the student for employment as a technician in a clearly defined cluster of present and reasonably predictable future employment opportunities.
- The curriculum will contain courses that are usually grouped under the following classifications: (1) basic science, (2) mathematics, (3) technical specialty, (4) communications, and (5) social studies.
- The curriculum will have a carefully coordinated grouping of courses that are arranged to blend smoothly from one into the next and not a loose collection of courses taken at random and independently of one another. In addition, specialized technical courses are to be introduced at the beginning term, and relatively large numbers of laboratory hours occur during the first year.
- The curriculum will allow a period of time for work experience that is carefully planned, closely supervised, and evaluated.
- The curriculum will be under continuous evaluation not only by the faculty and administration of the institution, but by an advisory committee composed of representative employers and others.
- The curriculum should be assisted in achieving its objectives by using a student organization that allows for leadership, attitudinal, and personal development.
- The curriculum should lead to a formal certification of accomplishment, such as the awarding of an associate degree, and the student's progress should be recorded and available as a formal transcript of college accomplishment.
- The curriculum should have competent and enthusiastic teaching staff, laboratories equipped with apparatus representative of those used by the most up-to-date employers, a good library, adequate classrooms, and an administrative direction sincerely dedicated to quality occupational education.

Work Experience

Supervised work experience in the student's field of study can be a valuable part of the total learning experience. In the work phase of the training, students can see the practical application of their classroom training. Since most of the students come into technical programs directly out of high school, the supervised work experience helps them make a smooth transition to the world of work. This work experience should be supervised, should carry credits, and should be interspersed with classroom instruction.

Work experience in industry has other benefits. It will make the industry more aware of the program and thereby help in recruiting, graduate placement and in securing support for technical programs. Work with industry will also contribute to the professional growth of the teachers and coordinators.

Degree Awarded

Traditionally, community colleges have granted an Associate in Arts degree to their graduates, a degree that ordinarily carries with it the connotation that the recipient is prepared to matriculate with junior standing at a four-year institution. The trend now appears to be toward offering a different kind of degree to students who complete two-year technical programs. Many of the older community colleges seem to feel that in order to earn an Associate in Arts degree, the student must have credit for most of the general education courses required in the first two years of a baccalaureate program.

Several community colleges across the nation are now awarding an Associate in Science degree or an Associate in Applied Science in technical areas. These students are graduated along with those who have earned an Associate in Arts degree, the only difference being that they are prepared to embark on a technical career. The technical schools generally offer the Associate of Science or Associate of Applied Science degree. It is a type of degree that appears desirable, and could also be offered by the four-year institution where appropriate.

FACULTY

Pre-Service Preparation

Teachers in two-year technical training programs should have the basic qualifications required in any other type of education program, augmented by work experience. This unique combination is difficult to obtain in requisite numbers today.

The most important characteristics of teachers in technical programs is that they be qualified in the subject matter they teach, which means at least an undergraduate major or equivalent – many institutions require a masters degree or equivalent. This latter would appear to be desirable, although not absolutely essential.

Leaders in agricultural education have long believed in training generalists, but the time to reverse this trend is long overdue. The cause of technical education will be furthered if the emphasis shifts to training specialists. As S. S. Sutherland put it: "There will be a complete disappearance of the undergraduate major in agricultural education. Teacher candidates will be selected from specialized majors in agriculture allowing on-the-job completion of the academic requirements for teaching."[10]

The work experience required of new faculty members may be waived in some areas of instruction, but should be mandatory for coordinators and teachers in the technical specialty courses. It should be recent and of sufficient duration to give the instructor an accurate picture of the requirements of a technician in the particular field of work, and it should be updated through sabbatical leaves.

The teacher in technical programs is most successful if he has a sincere desire to teach, a natural enthusiasm for his subject, and ability to work with and counsel students.

Utilization

Since qualified teachers are in short supply, the tendency has been to assign one teacher to several courses – often in unrelated subjects. It is completely unrealistic to expect an individual to be competent in several subject matter areas.

Teachers in technical programs should be given sufficient support personnel – secretarial help, laboratory technicians, and

[9] Adapted (by Fred W. Manley) from "Criteria for Technician Education – A Suggested Guide", U.S. Department of Health, Education, and Welfare, November, 1968. EPC, Catalog FS 5.280:80056. Wash.: 1968.

[10] Sutherland, S.S., "Vocational Agriculture – 1975", American Vocational Journal, March 1967, p. 64.

teaching assistants – to relieve them of the routine work that can be performed as well or better by others. Not only does it save money to hire support personnel for the extraneous teaching details, but it helps attract and retain good teachers.

In-Service Education

Institutions should provide opportunities for the professional improvement of its teachers and travel allowances to support their attendance at professional and trade meetings.

Recruitment

There simply are not enough qualified teachers available to staff all of the technical education programs now in operation and little prospect that the situation will improve. Programs are being added at a faster rate than teachers can be trained.

While technically qualified people who would like to get into teaching are available in business and industry, many lack formal training in teaching methods. Perhaps some system of internship training could be provided to replace the normal teacher certification process.

Still more individuals in business would be willing to teach on a part-time basis, but, again they do not have the formal training in teaching methods. Some do not need it, but most would profit from in-service training in lesson planning and methods of instruction. This is not an insurmountable problem, but it will take effort and dollars to solve.

Another method of securing teachers is to raise the pay scale to a level where people will be attracted to this occupation. Business and industry have generally been able to outbid educational institutions for the top people.

ADMINISTRATION AND FINANCING

Number and Location of Programs

National need for technicians will not insure the success of a particular training program. The final test of an educational program at any level is the employability of its graduates and their ability to progress in the work for which they have been trained. Graduates of technical training programs must have a clear advantage over those who are not if the value of the program is to be demonstrated.

Two principles appear self evident: (1) the need for technicians must be identified by geographic areas, and (2) the training offered must be of sufficient depth and intensity to insure that the graduates can fill the need.

The first stems from the fact that there is something less than perfect mobility of workers in the United States and there must be employment opportunities for graduates within a reasonable distance of the educational institution. In assessing need, one may be overly impressed, for example, by a report showing that a certain number of technicians are needed per year in a given occupation in a given area. But if investigation shows that the starting wage will be only about $1.50 per hour, it is quite clear why the industry in question will need the same number again next year – those trained this year will have moved into more lucrative jobs.

In many states there has been a serious lack of planning in regard to the needs for and location of technical education programs. It requires a minimum of five years and many thousands of dollars to start a program and graduate the first two classes. It should be recognized that there is a time lag in getting a program publicized and accepted, and that while poor quality programs cost nearly as much as good ones, they lead to disappointed employers, disillusioned students and unhappy parents.

It appears that a single state agency should be given the responsibility for overall planning, its responsibilities to: (1) Providing assistance in the determination of the need for technicians in the various occupational areas, (2) Making recommendations as to number and type of programs required to meet this need, and (3) Determining the geographic locations best suited to specific training programs.

Type of Institution

Successful technical training programs are currently being offered in four-year colleges and universities, junior colleges, community colleges and technical institutes. The success or failure of technical programs depends upon factors other than the type of institution offering the program. As a group, each of the above types of educational institutions has certain inherent advantages and limitations. Some of the more obvious are noted below.

Four-Year Colleges of Agriculture and Natural Resources

Advantages and disadvantages:

- Technical programs can utilize the physical facilities already on campus – agricultural laboratory facilities, greenhouses, and herds of livestock – that are expensive to duplicate.
- There are more specialists available which means that one staff member need not try to handle a number of subjects.
- A wider variety of technical programs can be offered due to the availability of staff and facilities.
- If, however, a four-year institution is limited in terms of space or budget – as many are – technical programs can be added only in competition with other programs and tend to be neglected.
- Some faculty members may well feel that technical programs are a lower form of instruction and seek what to them are the more prestigious baccalaureate and graduate courses.
- Technical students may feel they are second-rate citizens if in a university environment.
- Research activity may encroach on teaching time and on student counseling effort.

Community or Junior Colleges and Other Two-Year Degree-Granting Instutions

Advantages and Disadvantages:

- Because a higher percentage of students are in two-year curriculums, there is less tendency to differentiate among students and programs.
- Because they are primarily teaching institutions, the faculty is committed to teaching as such, not diverted into research and extension.
- Students can often receive technical education within easy commuting distance of their homes.
- On the other hand, a given staff member may be asked to teach several courses, even though different competencies are required.
- Two-year institutions may also be limited as to the physical facilities necessary.
- Two-year institutions may have difficulty hiring qualified staff members.

Technical Institutes

Advantages and disadvantages:

- The entire faculty and student body are devoted to occupational education with a single educational objective.
- The commonness of purpose promotes good relations among students and faculty, but the institute may find it difficult to attract and hold qualified faculty.
- Too often institutions of this type tend to spread their faculty too thinly with the result that instruction is not of sufficient depth or intensity to prepare the students adequately for technical jobs.

Initiating a New Program

Institutions should work with industry to verify that there is a genuine demand for the graduates of particular training programs before they are initiated. To project demand is not as difficult as seems at first glance. Interviewing a few – five to fifteen – of the recognized leaders in the industry being studied may yield more valid results than would a statistical sample of all prospective employers.[11] An advisory committee can be very useful in determining an industry's employment needs.

In theory, a genuine demand for graduates and a high quality curriculum built upon this demand should insure the success of technical programs. Unfortunately this is not always sufficient, for students must be attracted to the program in sufficient number to keep cost per student at a reasonable level. Enrollments are very difficult to forecast – it is fairly clear that in many occupational areas enrollments do not build up automatically when a new program is available. Data from other institutions with similar programs already in operation can be helpful in estimating enrollments and it is essential to budget funds for promotion activities when starting a new program.

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[11] "Policy and Administrative Decisions Needed when Introducing Vocational and Technical Education in Agriculture for Off-Farm Occupations", Center For Research and Leadership Development in Technical Education, Columbus, Ohio, August, 1965, p. 11.

It is difficult to set minimum projected enrollments that warrant starting a new training program, but it should be at least 125.[12] Adding a new occupational area to an already established technical training program can be safely undertaken with far smaller projected enrollments – as low as 20 to 25.

One method used by institutions to insure adequate patronage of a new program is to group several career specialties into one broad program – for example, agricultural business. The danger here is the possibility that the graduates will not have the technical skills and competencies required of them by their prospective employers.

Administration

The tools that administrators have to work with and the atmosphere under which they operate are keys to the success or failure of a technical program.

The administrator of a technical division should have rank and salary equal to that of his colleagues in other phases of education. Too often overall administrators of colleges and universities look upon this type of training as a stepchild, an attitude that is reflected in budgets, promotions and in all decisions affecting the technical programs.

Organization The commonest arrangement is to place the administrative responsibilities for technical programs with a department head or dean. This can work well if all levels of administration are dedicated to the philosophy of technical education, but if anywhere in the higher echelon there are those who do not believe in technical education, any system will fail.

Budgets Technical education divisions or departments should have separate budgets and the administrative head should at least share in decisions on the allocation of funds, for he is in the best position to evaluate the relative importance of building, staff and equipment needs.

Industry Cooperation An industry advisory committee can be very helpful to an administrator of technical programs. It can contribute in a number of ways: (1) assist school officials assess the need for training in specific areas; (2) help develop curricula; (3) assist in identifying firms to be used in the work phase of cooperative programs; (4) assist in graduate placement; (5) help with recruitment; (6) help secure financial support for technical programs; (7) evaluate new ideas and techniques proposed by the instructional staff.

An advisory board should not make the decisions itself, but administrators can make wiser decisions if good advice is available from outside the institution itself.

Cooperation should benefit industry also. Administrators, coordinators, and teachers can be very helpful to industry. They can offer valuable assistance as ex officio members of trade association board of directors, members of industry educational committees, instructors in industry-sponsored training meetings and in adult education activities. Working with industry is an excellent way for coordinators and teachers to keep up-to-date. The value of working with industry should be recognized and a part of the coordinator's time allocated for this purpose.

Financing

To provide quality programs an institution must have adequate facilities and equipment; a competent staff; and administrators who believe in technical education. Technical education programs are expensive, often more costly than the first two years of baccalaureate programs. The decision to start a new program should be made only after realistic estimates of costs and revenue have been made for at least five years into the future.

It is the joint responsibility of local school officials, state departments of public instruction, and agencies of the federal government to insure that the taxpayers' dollars are spent in such a manner as to insure a quality education for the maximum number of individuals at the least possible cost.

Estimating Costs Factors that should be considered in estimating the cost of a new program include:

- Building, equipment and staff.
- Existing courses, if any, that can be utilized.
- Administrative, clerical and overhead costs.
- Projected enrollments.

The Department of Health, Education and Welfare has sponsored the preparation of curriculum guides in a number of training areas that can be valuable to local school administrators in estimating costs. In most cases, the curriculum guides contain a rather detailed list of equipment, the type of facilities needed and recommended course outlines.

Sources of Funds The major sources of funds to support technical education programs are state and federal appropriations, student tuition and local governmental revenues. Private foundations have also given financial assistance in selected cases.

In a study of technical training programs in Washington State Neil Snepp reported that capital costs were usually provided by both state and local funds. Sixty percent of the institutions surveyed received over one-half of capital outlay from state appropriations, only ten percent used federal funds for capital expenditure. Operating expenses were met by a combination of state and local funds, plus student tuition. The commonest pattern of financing was one-third from each source, the next most common was one-half from tuition and local funds and one-half from state appropriations. Federal funds have been available under the Vocational Education Act of 1963 as amended and under other Federal Acts. In many cases these funds are available on a matching basis. State departments of Education are the best source of information on current funding for technical education.

Programs have also been funded by private foundations and by industries, in the latter case by supplying equipment, teaching aids and part-time service of employees. There is a time lag in most financing schemes, which must be taken into account.

Accreditation

Institutional accreditation by a recognized regional accrediting organization is useful and should be sought by all post high school and collegiate institutions. Criteria used by the accrediting agency should be studied early in the development of a new program.

Specific accreditation of individual curricula in agriculture and natural resources is not advisable. However, non-enforceable guidelines and the assistance provided by appropriate organizations is helpful.

Student Recruitment, Selection and Admission, Counseling and Career Placement

Recruitment

Enrollment in technical programs is growing rapidly; apparently some recruitment efforts have paid off. But enrollment in many curricula is small and those involved with technical programs should study recruitment methods that have been used successfully.

One of the principal problems in recruitment of students has been a lack of public information. Parents and counselors not only need to be more aware of the job opportunities but of the respectability of technical programs. The latter, particularly, is a major issue for the post-secondary advisory, for to some students and parents there is something less than ideal about a technical education – this despite the fact that this technical education has proven highly desirable, structurally sound and economically feasible. The student must be made aware of the importance of technical support to the scientist and professional, and of the worth of technical education.

The cooperation of public and private agencies and businesses in publishing and distributing career information should be sought. Schools offering technical programs should sponsor career days for counselors, parents and students in junior and senior high schools. Attractive brochures may be prepared and sent to high school counselors. Other media that may be utilized effectively are: News releases, films or slides, television or radio programs, and speakers from education or industry.

One of the better methods of recruiting is through word-of-

[12] Snepp, Neil, "Agricultural Programs in Community Colleges", Agricultural Education Magazine, March 1966, p. 197.

mouth by graduates of the program who are gainfully employed, but experience shows that it takes three to five years for effective communication of this type to take place.

In addition to directing students to the technical program as an appropriate alternative to the bachelor's program, recruiting should be aimed at those students who might otherwise terminate their education at the high school level.

Finally, the recruiting program should emphasize that many occupational areas in agriculture and national resources offer opportunity for young women as well as young men.

Selection and Admission

The ultimate objective of the technical program is to produce high quality graduates. Therefore, it is important that there be a measure of student selection.

Selection and admission standards and policies should be tailored to students entering college parallel curricula and vocational programs.

Standardized achievement tests are available and may be used as part of the selection process. Raw scores, which can be converted to percentile ranks on national norms, generally give a pretty good indication of verbal and mathematical ability. Testing of potential technical students should however be designed to measure more than academic ability. It should include a measure of interest, mechanical ability and other special talents.

A high school transcript should be required of all students, and should be taken into account.

Students desiring to enter a technical program should have a high school diploma and have completed the equivalent of at least two years of mathematics, and one of science, or the equivalent. From among those meeting these requirements it may be desirable to further select students on such criteria as aptitude for technical training in general, aptitude and motivation for a particular curriculum, academic standing in high school and academic test scores, and seriousness of purpose.

For those students who have not completed the equivalent of the above-recommended courses, a pre-technical program, up to a year in length, is advisable. This program also helps to establish a reserve "pool" of qualified students for subsequent technical classes. In addition to science and mathematics, a pre-technical program should offer courses in communication skills, primarily to improve proficiency in reading and mechanics of English.

A personal interview can be a vital part of the selection program, to determine the prospective student's seriousness of purpose and motivation. If a prospective student has been away from high school and has been working full-time for a substantial period, it is wise also to obtain a letter from his employer that assesses his maturity, seriousness and work habits.

In any event, if unqualified students are admitted, the level of instruction is lowered, or the failure rate is high, which is an inefficient use of both student and instructor time. If quality of instruction is compromised, then graduates will fail to perform well later in technical positions, and students and employers will become disillusioned.

Counseling

A need for counseling continues after students are admitted – in addition to a regular institutional counseling service, students should have access to their agricultural and natural resources instructors. In many cases, the students feel a closer relationship with the classroom teacher than with the professional counselor. The counseling program should give special attention to girls who enroll in technical programs, and whose employment poses special problems and who need help in setting realistic goals.

An orientation program, before or soon after school starts, is desirable to help new students adjust to the college environment. The program can include such things as campus tours and talks by administrators and student personnel staff regarding campus rules and policies. Library orientation to acquaint students with the facilities and their use is worthwhile.

Placement

Schools offering technical programs should establish a placement service for students. Job placement may be of three types: Part-time school year, during the summer, or full-time upon completion of the program. The jobs should fit the occupational objective of the student.

Placement may be through school placement offices or by the department of agriculture and natural resources. Prospective employers should be encouraged to call the school when they need help.

Faculty should also be prepared to make recommendations as to placement at appropriate meetings of advisory committees or technical societies. The initial placement of graduates on jobs is important and will determine whether that employer will later seek additional graduates from the school. A good placement record helps motivate current students and attract new ones.

The final phase of the counseling and placement service should consist of periodic follow-up of graduates. Follow-up may be by formal questionnaire or by informal visits with employers and graduates. An effort should be made to see how former students have progressed on the job and to discover any problems they may have encountered. Follow-up studies help locate weaknesses in the program and are a valuable tool for curriculum evaluation and improvement or change. Information gained from follow-up studies is also valuable for counseling and job orientation of entering students.

Responsibilities of Four-Year Colleges and Universities

Prejudices in higher education against technical education must be overcome. Administrators and faculties of institutions of higher learning must evaluate their own educational policies in terms of providing two-year technical education. The institution must define its role – if it includes technical education, then there must be administrative and faculty support for the notion that two-year education is a worthy endeavor from the standpoint of the individual and of service to the industries of the state. Without this philosophy behind it, two-year educational programs will not have the financial support and teacher dedication that they need. The situation is apt to be gravest at those institutions that offer both four-year and less-than-four-year programs, because interaction among students, among faculty members, and between student and faculty may encourage, however unjustifiably, the concept of an educational hierarchy.

The Propensity to Administer—The Saga of the Department Chairman

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During the past several years the **NACTA JOURNAL** has devoted its March issue to administrative problems and the administrator. Several noteworthy articles have been published concerning the role of the administrator and the accomplishments of colleges and departments relating to this role. In reviewing these articles I find two theses which seem to have universal acceptance when related to the department administrator – particularly to the department chairman – as an individual. First, administering a department only diminishes the competence of the man in his field. As he devotes more and more time to administrative functions, he probably becomes less and less qualified to return to the classroom or