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RESEARCH PRIORITIES IN TECHNICAL TEACHER EDUCATION, A PLANNING MODEL.

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THIS RESEARCH AND DEVELOPMENT MODEL WAS AN OUTGROWTH OF A TECHNICAL EDUCATION RESEARCH PLANNING CONFERENCE OF BUSINESS, INDUSTRY, GOVERNMENT AND EDUCATION REPRESENTATIVES TO IDENTIFY SOME OF THE CRITICAL PROBLEMS WHICH SEEM TO BE IMPEDING THE GROWTH OF TECHNICAL EDUCATION AND TO SUGGEST RESEARCH AND DEVELOPMENT PRIORITIES FOR A MORE UNIFIED NATIONAL RESEARCH EFFORT TOWARD SOLUTIONS. MANY OF THE NUMEROUS PROBLEMS IDENTIFIED FOCUSED ON THE AREA OF TECHNICAL TEACHER EDUCATION. AS A STRUCTURE FOR ANALYZING THE SYSTEM OF TECHNICAL TEACHER EDUCATION, FOUR OF ITS ASPECTS, THE ROLE, SELECTION AND RECRUITMENT, TRAINING PROGRAMS, AND EVALUATION OF TECHNICAL TEACHERS, WERE EXAMINED BY IDENTIFYING QUESTIONS RELEVANT TO PROBLEM SOLUTIONS AND REVIEWING THE LITERATURE PERTINENT TO THE QUESTIONS. SOME RESEARCH AND DEVELOPMENT ACTIVITIES CONSIDERED WORTHY OF STUDY WERE (1) IDENTIFYING FACTORS RELATED TO THE CAREER CHOICE OF TECHNICAL TEACHERS, (2) RECRUITING TECHNICAL TEACHERS FROM INDUSTRY, (3) DEVELOPING PROGRAMS TO MEET POTENTIAL TECHNICAL TEACHER TRAINING NEEDS, (4) DEVELOPING A TEACHING ASSOCIATE PROGRAM, (5) ANALYZING THE ACTIVITIES OF TECHNICAL TEACHERS, (6) DEVELOPING AN INSERVICE INTERNSHIP PROGRAM, (7) FORMING A COOPERATIVE WORK-EXPERIENCE TEAM, (8) USING VIDEO TAPE FOR INSERVICE TRAINING, (9) TESTING THE EFFECTIVENESS OF TEACHER PARTICIPATION IN PROFESSIONAL ACTIVITIES, AND (10) DETERMINING EMPLOYMENT CRITERIA FOR TECHNICAL EDUCATION TEACHERS. A BIBLIOGRAPHY OF THE LITERATURE REVIEWED AND ADDITIONAL REFERENCES ARE PROVIDED. (HC)

RESEARCH PRIORITIES IN TECHNICAL TEACHER EDUCATION:

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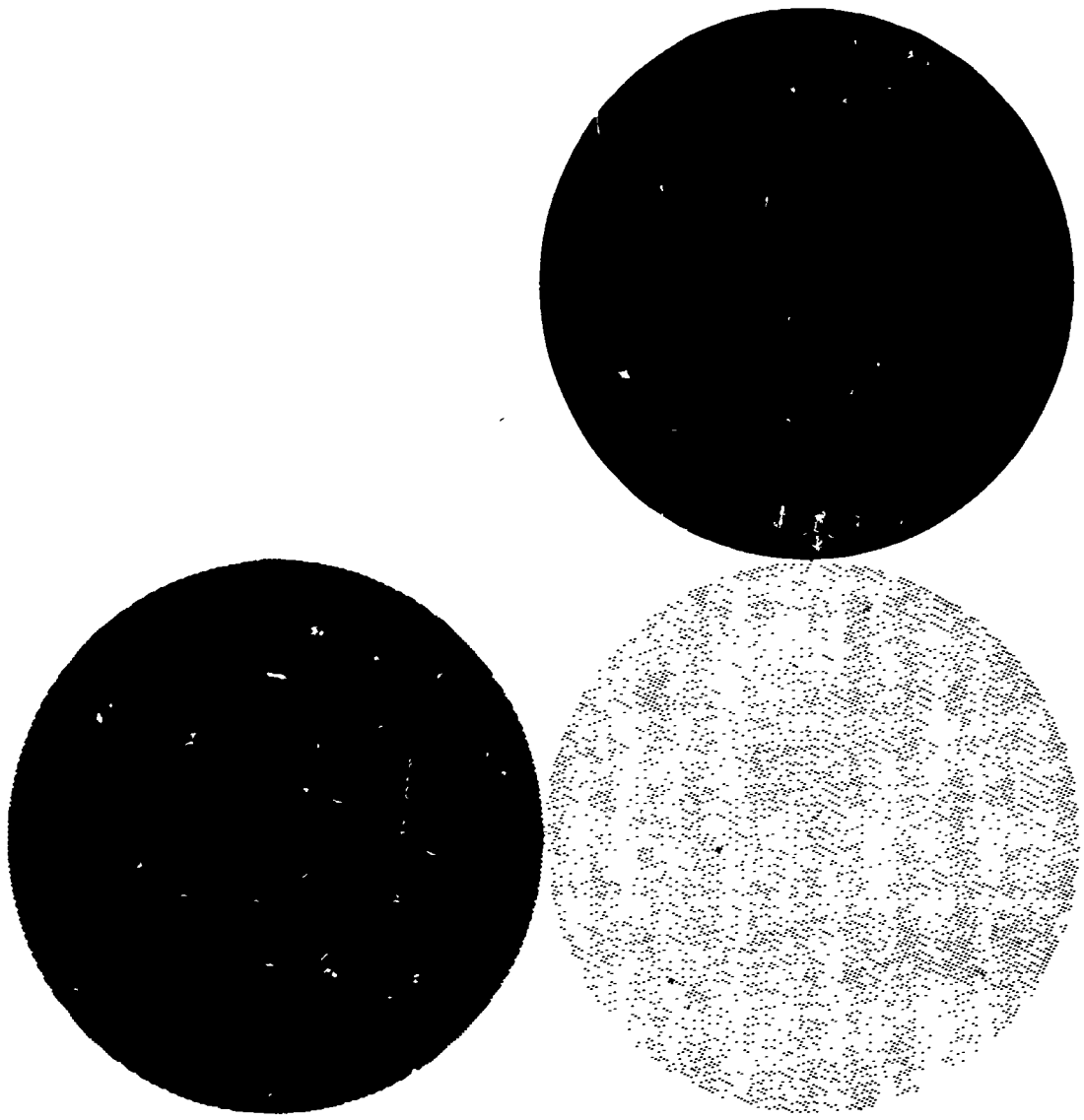

A PLANNING MODEL

THE CENTER FOR VOCATIONAL
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THE OHIO STATE UNIVERSITY
980 KINNEAR RD.
COLUMBUS, OHIO 43212

The Center for Vocational and Technical Education has been established as an independent unit on The Ohio State University campus with a grant from the Division of Adult and Vocational Research, U. S. Office of Education. It serves a catalytic role in establishing a consortium to focus on relevant problems in vocational and technical education. The Center is comprehensive in its commitment and responsibility, multidisciplinary in its approach, and interinstitutional in its program.

The major objectives of The Center follow:

1. To provide continuing reappraisal of the role and function of vocational and technical education in our democratic society;

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3. To encourage the development of research to improve vocational and technical education in institutions of higher education and other appropriate settings;

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5. To upgrade vocational education leadership (state supervisors, teacher educators, research specialists, and others) through an advanced study and in-service education program;

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7. To provide educational opportunities for individuals contemplating foreign assignments and for leaders from other countries responsible for leadership in vocational and technical education.

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RESEARCH PRIORITIES IN TECHNICAL TEACHER EDUCATION: A PLANNING MODEL

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PREFACE

This document represents an effort in analyzing the general area of technical education to provide a framework for further inspection of specific facets within this educational system. From such an examination, insights may be gained into specific areas of needed research and development activities that relate to technical teacher education. It is anticipated that this document will serve to structure, clarify, and, hopefully, "trigger" new research and development efforts related to this critical area of teacher education.

Recognition for the preparation of this document is due Dr. Aaron J. Miller, Specialist in Technical Education at The Center, and to Mr. James G. Bennett, Research Associate, who provided assistance in its preparation. We are also grateful to Drs. Calvin J. Cotrell, James W. Hensel, and Edward J. Morrison, Specialists at The Center for Vocational and Technical Education, and to Mr. Robert M. Knoebel, Assistant Director, Bureau of Community Colleges, Pennsylvania, for their review of the manuscript.

Robert E. Taylor, Director
The Center for Vocational
and Technical Education

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CHAPTER I

DEVELOPMENT OF THE MODEL

BACKGROUND OF THE DOCUMENT

This research and development model is an outgrowth of a technical education research planning conference held at The Center for Vocational and Technical Education in January, 1967.[1] At this conference, representatives from business, industry, government, and education met to identify some of the critical problems which seemed to be impeding the growth of technical education and to suggest research and development priorities for a more unified national research effort toward problem solutions.

While a number of problems relating to the field of technical education were identified by the conference participants, many of these problems seemed to focus on the area of technical teacher education. Therefore, this report attempts to provide a logical follow-up of the technical teacher education process and by raising pertinent questions about that process. In addition, it attempts to review some of the significant research and development activities that have taken place in technical teacher education, and to provide suggestions for further investigations.

The term "technical education," as used in this document, refers to a program of planned and integrated classroom and laboratory experiences designed to prepare a technician for entry into a cluster of jobs in some field of technology. These curricula are generally of post-high school level and are based on the knowledge of science and/or mathematics associated with that field of technology. Therefore, technical teacher education refers to the process of training teachers to instruct at this level of occupational education.

The collective thinking and suggestions of a group of outstanding teacher educators and researchers (see appendix) was used in the development of this model and in the structuring of suggested research and development activities. It is hoped that these suggestions will provide the reader with insights into on-going research and development activities and stimulate ideas for new efforts in some of the identified areas of critical need.

A SYSTEMS APPROACH TO THE PROBLEM

The total technical teacher training system must be viewed if critical sub-problem areas are to be identified. Through this systems approach--that is, viewing the input to the process, the output of the process, and the various steps in between--a better view is obtained of the relationships of various problem facets and how they impinge upon the total system.

A systems approach to technical teacher education may be graphically represented by the flow chart in Figure 1. In this flow chart, the process of

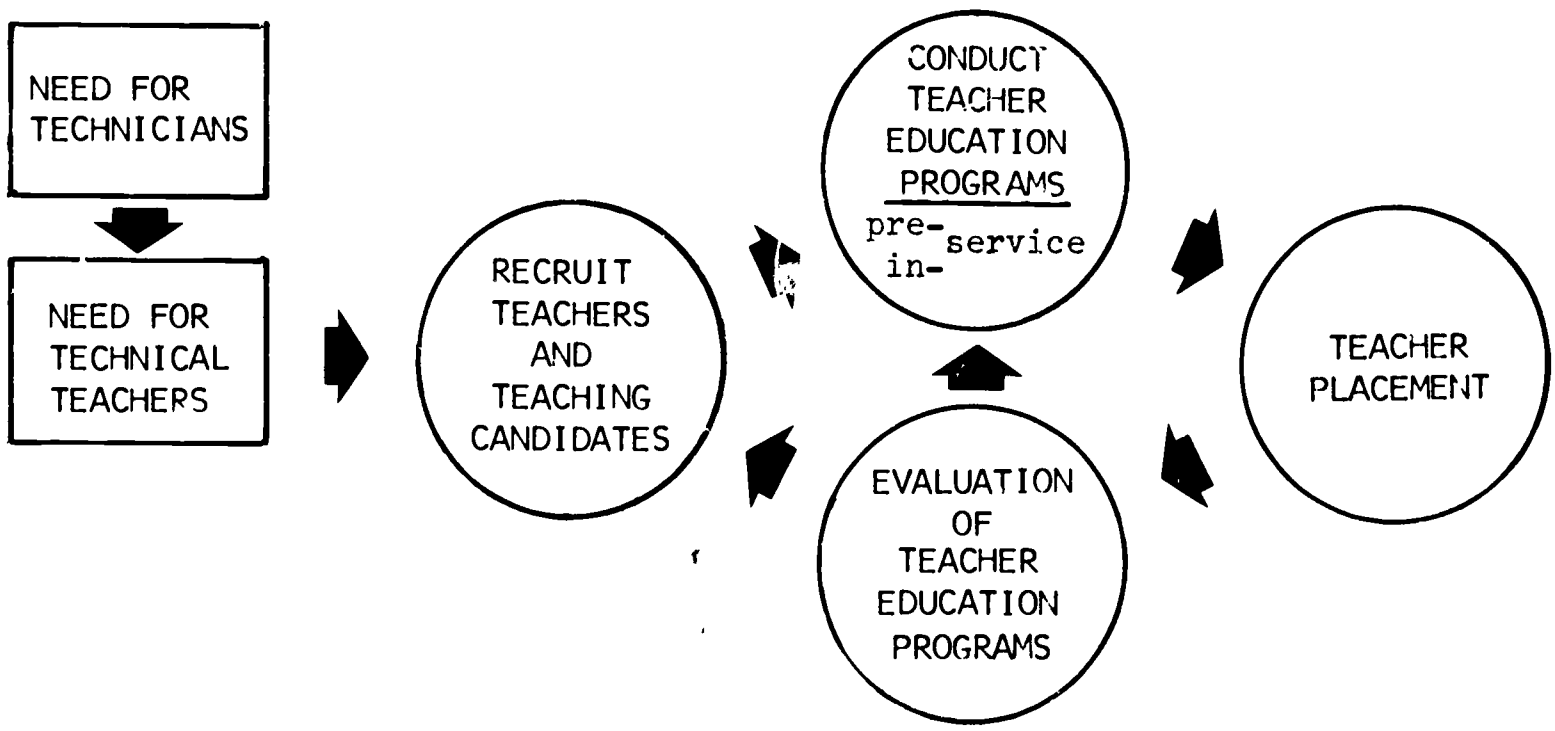

Figure 1.

technical teacher education is represented by four major steps as follows:

1. recruiting trained teachers or teaching candidates for entry into the teacher education program.

2. the planning and implementation of appropriate teacher education programs and activities that satisfy the needs of the trainees. These programs include both pre-service activities for teaching candidates and in-service activities for the further professional development and upgrading of experienced teachers.

3. some provision for assisting in the placement of the teacher into a position for which he is qualified.

4. a continuous system of evaluation for the teacher education program that is sensitive to any needed modifications or refinements of the program input phase and/or the training program phase.

Shown outside of the flow chart is the pre-requisite need for technicians which in turn establishes the need for technical teachers. It is understood that these joint needs must exist to energize the teacher education system. However, this research and development model presupposes the existence of this well documented need for technical teachers and considers only the four phase process of satisfying this need.

STRUCTURE OF THE MODEL FOR ANALYZING TECHNICAL TEACHER EDUCATION

As a structure for analyzing the system of technical teacher education, this document will analyze the process in terms of the following aspects:

1. Role of the Technical Teacher
2. Selection and Recruitment of Technical Teachers
3. Programs (with implications for placement) for Training Technical Teachers
4. Evaluation of Technical Teachers

Each of these four aspects of technical teacher education will be further examined in terms of identification of pertinent questions relevant to problem solutions, and review of the literature pertinent to these questions.

In the final chapter of this document, suggestions for future research and development activities are made which may provide answers to some of the questions unanswered by the literature review.

CHAPTER II

ROLE OF THE TECHNICAL TEACHER

In discussing the role of the technical teacher, it is generally agreed that there are certain personality characteristics, cognitive skills and behaviors that are essential to good teaching performance. In order to recruit appropriate teaching candidates and qualified teachers, a knowledge of these essential facets of role and teaching competency is essential. Role is defined by Sargent (29) as

> "....a pattern of type of social behavior which seems situationally appropriate to him in terms of the demands and expectations of those in his group."

For the purpose of this report, the role of the technical teacher includes the general behaviors, knowledge and competencies required of the functioning technical teacher.

Some of the most pertinent questions relating to the role of the technical teacher are as follows:

1. What are the major elements of the role of the technical teacher?

2. What knowledge and skills are required of the technical teachers?

3. To what degree does the role of the technical teacher differ from that of the vocational teacher and the engineering teacher?

4. Are there unique personality characteristics essential to good technical teaching?

5. What rewards are provided by technical teaching?

6. Are there particular types or groups of people for which the rewards of technical teaching are most attractive?

7. What is the educational and occupational background of

today's technical teachers?

8. What are the special skills and abilities needed by technical teachers of disadvantaged or special minority groups?

9. What is the minimum kind and depth of occupational experience necessary for technical teaching?

10. What motivational factors are associated with teachers who keep themselves updated?

11. What is the relationship of teacher involvement with advisory committees and teacher "up-to-dateness"?

12. Are there areas of technology teaching that occupational experience does not enhance?

13. What research competencies are essential for technical teachers?

14. Are there serious conflicts in the role of the technical teachers as perceived by technical educators, engineering educators, vocational educators and general educators?

15. What is the role of the teacher's aide in technical teaching?

16. How is changing education technology affecting the role of the technical teacher?

17. How do different institutional settings affect the technical teacher's role?

Competencies associated with good technical teaching may be classified into the areas of understanding of and commitment to technical education objectives, understanding students, effective teaching, and understanding research. The following review of selected literature is therefore made under this general classification.

UNDERSTANDING TECHNICAL EDUCATION

To function adequately, the technical teacher must thoroughly understand and subscribe to the philosophy of technical education. This need for a strong belief in technical education is further emphasized by the Educational Standards Committee of the American Technical Education Association (2,3).

A commitment to technical education includes a belief in the philosophy that technical education programs must be devoted to teaching highly specialized personnel capable of performing in a cluster of occupations and who must be semi-professional in

education, attitude and competence (38). In addition to a firm belief in technical education, McGraw (2) states that it is necessary to posses a basic understanding of the prime objectives or goals of technical education; that is, educating the student for gainful employment as a technician.

According to the Division of Vocational and Technical Education of the U. S. Office of Education (38), the technical teacher must be dedicated to impart the following essentials to technician trainees:

- A knowledge of applied scientific principles and of the hardware, processes, procedures, services, techniques, materials, and modern measuring and control devices.

- Skills necessary to communicate with the engineer or professional scientist doing research, development, or scientific or medical service work and to be his delegate and assistant.

UNDERSTANDING STUDENTS

The technical teacher must understand the significance of individual differences and accept the fact that his classes are composed of individuals. An understanding of the physical and mental growth processes and of the effect of stimuli on behavioral patterns is necessary in establishing the proper environment for learning (14, 21, 25, 33). Within this learning environment, the technical educator must be aware of the importance of his own enthusiasm of spirit and interest in guiding, inspiring and motivating each student to do the following (9):

A. Acquire knowledge. It is not enough to just drill the student in technical facts and mathematical manipulations. The student must be inspired to apply technical facts to new and unusual problems of broad scope.

B. Build confidence. The student must be encouraged to seek his own level of attainable goals by achieving within himself a feeling of accomplishment and understanding. This process of developing self-confidence is built up by the successful solution of problems which gradually become more complex.

C. Synthesize ideas and knowledge. The student should be shown the importance of synthesizing knowledge and ideas from related technical fields in the attack of problems rather than assume simple applications of standard formulas or laws of science.

D. Simplify complex situations. The exposure of the student to judiciously planned pertinent data provides the opportunity for explanation of the importance and necessity of

simplifying complex situations into reasonable technician-engineer approximations.

E. Broaden one's outlook. The teacher's use of problematical situations wherein no exact answer is produced will provide the technical student with opportunities for growth experience and challenge.

EFFECTIVE TEACHING

A quality technical program is dependent on the quality of teaching from its faculty. Good teaching in turn hinges on an understanding and practice of the elements of good teaching (39). For further examination, these elements are grouped as follows: knowledge of subject matter and related fields, appropriate industrial experience, and mastery of teaching methods.

A. Knowledge of subject matter and related fields.
The technical teacher must have a thorough knowledge of subjects taught and of relevant supporting subjects. This knowledge should be substantially broader in scope and depth than the subject content which will be presented to student technicians (2, 3, 38, 40). At a conference of technical teacher education held by the area Vocational Education Branch of the U. S. Office of Education (8), conferees identified subject matter competencies of technical teachers as:

1. Facility in the use of appropriate mathematics in the development of ideas that make use of scientific and engineering principles.

2. Proficiency in the application of physical science.

3. An understanding of the materials and processes commonly used in technology.

4. Knowledge of communication skills.

5. The ability to interpret and define principles of economics in industrial relations as applied to technology.

6. A thorough fundamental knowledge and understanding of the basic sciences, the sciences associated with the technical program being taught, and their applications to the technology being presented.

B. Appropriate industrial experience specifically relating toward the teaching speciality.

It is essential that the technical teacher have employment experience recent enough to be valid and representative of current practice. This experience either as a professional or technician should involve extensive experience in the skills and competencies to be taught (2,3,8, 5,28).

C. Mastery of teaching methods.

The competent technical teacher, in his quest for effectiveness in the classroom, the laboratory, and on the job, must know the most effective techniques for teacher-learning situations. He must be able to:

1. analyze, identify, and apply specific blocks of knowledge to solving problems (21).

2. present knowledge and understanding in ways that will have meaning to students (6).

3. integrate technological theory and practice into effective presentations (19, 43).

4. demonstrate skills which are characteristic of the technology being taught (28, 33).

5. effectively utilize a variety of appropriate instructional aids and media significant to learning (21, 27, 35).

6. inspire creative thinking and emulate good values concerning behavior, quality of judgment and social responsibility (6).

7. stimulate student interest throughout the instructional process (6, 33).

8. evaluate his methods and procedures with the intent and desire of teacher improvement (5, 20, 38).

RESEARCH

To achieve effective learning, the technical teacher must possess the versatility and ability to maintain and improve technical competence in his field. To foster this, he should be encouraged to participate in technical and professional societies and to engage in work in industry or in research. Dean Hansen of the Massachusetts Institute of Technology has characterized a "good teacher" as, "one who keeps abreast of changing subject matter by delving in research, publications, and consulting to keep his mind razor sharp and stand equal among his peers, thus, giving him self-confidence and

self-esteem" (30). The term research, as it pertains to the technical teacher in this document, does not refer to the generation of new knowledge, as in the laboratory situation, but to the continuous study and review of literature concerning the development of new methods, materials, and processes. It also emphasizes the importance of the teacher as a resource person (one who has access to new knowledge) and director or stimulator of student inquiry (2, 6, 17).

CHAPTER III

SELECTION AND RECRUITMENT OF TECHNICAL TEACHERS

Technical education programs are growing at an unprecedented rate. This increased program activity has resulted in vast demands for competent teaching faculty at all levels (5). This need for teachers is also reflected in a substantially increased need for vocational-technical teacher education (4).

One of the major administrative tasks in program implementation is the selection and recruitment of teachers. Some of the most pertinent questions relating to selection and recruitment of technical teachers are:

1. For what reasons do persons leave business or industry to become technical teachers?

2. For what reasons do technical teachers leave the teaching profession?

3. Are there reliable methods for identifying potential technical teachers?

4. What is the feasibility of recruitment and placement of technical teachers on a regional or national basis?

5. To what degree do state certification requirements enhance or impede technical teacher recruitment?

6. To what degree can the various commercial advertising and communications media be used to increase the effectiveness of technical teacher recruiting?

7. What is the minimum amount of financial support or aid necessary to attract and hold potential technical teachers in pre-service training programs?

8. What are the most efficient and accurate methods for forecasting technical teacher needs?

9. What is the cost effectiveness of the various kinds of communications media used to recruit technical teachers?

10. What are the positive and negative factors relating to a career choice of technical teaching?

11. To what extent can technical teachers be recruited on a part-time or leave of absence basis from business, industry and the professions?

12. How effective can teacher education institutions be in assisting with recruitment of technical teachers?

MAJOR MEDIA EMPLOYED BY SCHOOL ADMINISTRATION IN TECHNICAL TEACHER RECRUITMENT

Cotrell (7) reported the following as the major media used by school administrators in technical teacher recruiting (in order of importance):

A. College placement service - School administrators working through the college placement office.

B. Advisory committee referral - Administrators working through the local advisory committee, interviewing and screening board referrals.

C. Industry - School representatives seeking qualified teaching personnel from business and industry, working through industry supervisors.

D. Engineering College - Recruitment of technical teachers via engineering colleges.

E. State Supervisor of Technical Education - Follow-up by school administrators on referrals made by the state department director.

F. Technical School - Selection and recruitment of technical school graduates for future teaching, working through technical institute teachers and administrators.

Storm (31) in a nationwide survey reports that technical instructors who enter teaching from a background of technician work in industry are generally considered more successful than those who enter with a background in engineering. His study points out that the successful technical teacher received his technical preparation from three sources -- post-high school programs, industry and four year colleges and universities.

McCord and Rung (18) advocate pre-selection of technical teachers by recruiting associate degree people for baccalaureate techical-teacher programs, and Harris (15) suggests the recruitment of technical teachers from part-time teaching staff who are technicians and engineers in industry.

McGraw (2), in an alternate view, states that it is important for the technical teacher to teach his subject at the engineering technology level. According to McGraw, this objective is best accomplished if most of the instruction in engineering technology is conducted by graduate engineers or equivalent. This suggests recruiting the bulk of teaching faculty from engineering colleges or industry.

DESIGN OF RECRUITMENT PROGRAM

Feirer (12) sees teacher recruitment as the most crucial problem to be faced in education in the next few years.

He advocated a constant and continuing recruitment program utilizing all public relations devices to interest more young men and women. He suggests the following public relations program:

A. Intervisitation between college departments and high schools.

B. College staff working with school counselors and technical teachers.

C. Student-teacher visitations to colleges to become familiar with college programs.

D. Professional society sponsorship of scholarships.

E. Teacher communication with parents concerning teaching as a career.

F. Publicity material development.

Several state departments of vocational education have recently initiated intensive technical teacher recruiting programs which utilize advertisement of teaching opportunities in national periodicals and professional journals. Early informal reports from these states indicate a sizeable number of responses from interested applicants; however, a final evaluation of data from this recruiting technique is not presently available.

CHAPTER IV

PROGRAMS FOR TRAINING TECHNICAL TEACHERS

Forecasts of manpower needs by the Bureau of Labor Statistics, U. S. Department of Labor, indicated a growth rate in the employment of technicians far in excess of the combined output of the nation's schools. The U. S. Department of Labor estimates include a need for 200,000 additional engineering and science technicians each year through 1970. At present, not more than 25,000 graduates of engineering and science technology programs are entering the labor market each year (24).

These figures clearly point to the need for additional technical programs to train and develop needed technicians. In addition, they illustrate the need for teacher education programs to provide the needed technical teachers to staff present and future technical programs.

Pertinent questions pertaining to technical teacher pre-service and in-service training programs are:

1. What kinds of programs presently exist to train technical education administrators?

2. What methods or programs are used to keep technical teachers up-dated in their subject matter fields?

3. What incentives are needed to encourage teachers to return to business, industry, or the profession for current work experience?

4. What are the possibilities of team teaching for occupational or technology clusters?

5. How can new media (such as video-tape, etc.) be used for greater efficiency in both pre-service and in-service training of technical teachers?

6. Is there a common core of subject matter competency needed by all technical teachers?

7. To what extent do technical teachers take advantage of available opportunities for technical updating?

8. What methods are used by technical teachers to reflect updated technical knowledge into actual curriculum change?

9. Do state teacher certification requirements affect the continued technology competence of teachers?

10. What place should cooperative work experience have in a technical teacher education program?

11. Should a technical teacher return to business, industry, or the profession for additional occupational experience? If so, how often?

12. Are there methods of providing technical teachers with educational experience that will adequately substitute for certain occupational experiences?

13. What is the cost effectiveness of pre-service teacher training programs as opposed to the in-service training of people recruited as teachers from business, industry, or the profession?

A review of the literature pertaining to technical teacher education programs disclosed few published journals references which would describe or compare on-going programs, although there are a variety of technical teacher education programs currently in operation throughout the country (23). These existing programs offer technical teacher preparation at the baccalaureate, masters, and doctoral levels. Generally, however, most pre-service technical teacher education programs fall into one of two categories. One category is the short-term (9-12 mo.) cooperative venture which involves the joint effort of an industrial firm and an educational institution. The other category includes a longer-term (2 to 3 years) institutional program designed to provide a capstone of teacher training for the technical institute graduate.

A SHORT-TERM COOPERATIVE PRE-SERVICE PROGRAM

Programs of this type are sponsored jointly by business or industry and educational institutions and are generally assisted by federal funds or foundation funds. They are usually of short duration, highly intensified, and primarily directed at undergraduate students desiring careers as technical teachers. A somewhat typical example of this type of program is the 1966-67 University of Tennessee-Union

Carbide Vocational-Technical Teacher Institute (42).

This basic program consists of advanced college credit studies as outlined below.

A. Methodology Coursework--(33%)--Designed to impart knowledge of and facility with modern methods and philosophical foundations of vocational-technical education.

B. Industrial Theory and Laboratory Coursework--(55%)--Divided among the following: mechanical drafting technology, industrial electronics technology, machine technology and welding technology.

C. Supervised Teaching--(12%)--Instruction of an adult vocational class in the student's area of preparation, one half day throughout one academic quarter, under the supervision of teaching specialists.

TWO YEAR PRE-SERVICE PROGRAMS

These programs are designed to provide selected, interested graduates of associate degree technical curricula with the basic qualifications for teaching technical subjects in post-high school and/or adult education programs.

Associate degree graduates entering such programs generally complete courses in advanced technical mathematics, science, general studies and the pedagogy considered necessary to prepare technical teachers.

Some programs of this type require the associate degree holder to have had work experience at the technician level, prior to enrolling (22, 24). Others encourage graduates to obtain two years of technical work experience after receipt of the baccalaureate degree and before making application for teaching positions (1).

The curriculum content of these types of programs generally have the following distributions of coursework:

Mathematics and/or Science	25%
Technical subject matter, technical work experience, and technical subject matter electives	35%
General Studies	25%
Professional	15%

IN-SERVICE PROGRAMS

In-service programs for technical teachers vary widely between states and between different institutions within states. These programs range from occasional teacher's meetings and technical seminars to highly structured college degree programs designed to meet special state certification requirements. Documentation of the various kinds of individually tailored in-service programs is beyond the scope of this document.

CHAPTER V

EVALUATION OF TECHNICAL TEACHERS

In considering any systematic approach to the training of technical teachers, the system must include a sensitive monitoring or evaluative technique. This evaluative device must assure that each process in the system is properly functioning and making an optium contribution to predetermined goals. Therefore, evaluation must be viewed as a continuous and on-going process aimed at making adjustments in the total technical teacher educational program, when it is determined that such adjustments are necessary and appropriate.

Some of the important questions pertaining to teacher effectiveness are:

1. Are there appropriate methods for assessing the validity of occupational experience?

2. What is the potential for the use of competency tests to determine occupational and educational qualifications of prospective technical teachers?

3. To what degree could or should representatives from business and industry assist in technical teacher evaluation?

4. What inconsistencies exist between present requirements for technical teacher's certification and actual competencies needed by the technical teacher?

5. What criteria should be used to evaluate technical education programs? (placement, student ratings, etc.)

A review of the literature pertaining to technical teacher evaluation disclosed the following views.

CRITERIA USED IN THE EVALUATION OF TECHNICAL TEACHERS

Evans (11) suggests the following as factors to be examined

in teacher evaluation:

Scholarship and research--evidence of a publication.

Professionalism--active committee work in a national society.

Educational Preparation--advanced degrees.

Prestige--consultant work for other colleges.

Basic personality traits--including the following: enthusiasm, interest in students, knowledge of subject matter, attitude toward teaching, intellectual honesty, ability to stimulate and inspire, ability for self-expression, tolerance, ability to cooperate, judgment and tact, professional attitude, originiality and ingenuity, and personality.

Evans further advocates a combination of objective and subjective methods of measurement as an approach to measure the merit of all items considered. He notes that many of these items may not measure a man's teaching ability, but may be retained because of their importance in improving teaching ability.

Tyler (36) suggests that the appraisal of student learning is the most direct and ultimate criterion for evaluating teaching effectiveness. He points out the importance of examining the extent to which the conditions for learning are provided. These positive learning conditions are: motivation, guidance, appropriate material utilization, study time provision, sequential practice assignments, high standards, after class study, and satisfaction realization.

In a study by Kingston and Gentry (13), it was pointed out that the evaluation criteria for teaching effectiveness that was most commonly chosen by teachers was: knowledge of subject, achievement of students, overall teacher cooperation, teacher personality, and instructional methods.

Jackson (16) identified the following factors as evaluation criteria: knowledge of subject, classroom manner, contributory factors of experience, research and publications, and professional activities.

METHODS OF EVALUATION

Jackson (16) suggests that evaluation of teaching should include both self-evaluation and evaluation by others. He further suggests that certain in-service training experiences of the teacher lend themselves to introspection and self-evaluation. These in-service experiences include:

A. Internship--the placement of new and inexperienced faculty members with experienced master teachers on the faculty.

B. Self-instruction--the reading and review of special materials on application of methods to effective teaching.

C. Seminar Involvement--participation in seminars involving presentations on effective teaching by outstanding speakers.

Evaluation of teaching effectiveness by groups or agencies (other than teacher self-evaluation) generally falls within one of two categories; student ratings or ratings by administrators and supervisors.

Student ratings utilize forms filled out by students, used to rate the instructor. While these forms are generally initiated during the period of time when the students are receiving instruction from the teacher being rated, Stout (32) suggests that a more accurate evaluation is obtained where there is a time lapse of one year between the time the students receive the instruction and the time that teacher evaluation forms are initiated.

Administrative rating of teachers is by far the most frequently used method of teacher evaluation. This generally involves the use of internal records and some type of rating form by the teacher's department head or supervisor.

CHAPTER VI

RESEARCH AND DEVELOPMENT SUGGESTIONS

The following suggestions for research and/or development activities have been submitted by some of the nation's foremost technical education researchers, teacher educators and administrators who have served as consultants on this project. It should be understood, however, that this listing is not exhaustive and merely represents some examples of problem areas worthy of consideration, and possible approaches for further research and development activities.

1. FACTORS RELATED TO THE CAREER CHOICE OF TECHNICAL TEACHING.

Purpose: To determine the factors related to the choice of technical teaching as a career.

Determine the factors that positively relate to choice of technical teaching as a career.

Determine from experienced technical teachers the degree to which the positive expectations expressed by those choosing technical teaching are actually met.

Determine what factors relate to a teacher's leaving the field of technical teaching.

Insights gained from an analysis of these suggested data should provide the basis for a realistic technical teacher recruiting program.

2. THE DETERMINATION OF PRESENT SOURCES OF TECHNICAL TEACHERS

Purpose: To determine the various sources of present technical teachers to gain insights into future sources for teacher recruiting.

Examine, categorize and itemize current sources of technical teachers to determine where they come from, their educational

background and their past occupational experience. Sample both public and private technical institutes, community colleges and area vocational schools in surveying the backgrounds of these teachers.

Develop profiles for the several types of technical teachers based upon their past experience, training, education and other relevant background data.

Evaluate the relative effectiveness of these profile groups and sources of teachers by some pre-determined criteria.

3. RECRUITING TECHNICAL TEACHERS FROM INDUSTRY

Purpose: To determine factors that may be observed in planning teacher recruiting programs aimed at business, industry and the professions.

Survey successful technical teachers who have entered teaching from occupational employment to determine the reasons and positive benefits that attracted them into teaching.

Determine any unique characteristics of these teachers that might be related to the expressed positive benefits which attracted them into teaching.

Launch an information and recruiting campaign directed toward potential technical teachers presently working in industry, business or the professions. Particular focus could be directed to any group with unique expressed needs, as revealed by an analysis of the data.

4. BUSINESS, INDUSTRY, AND PROFESSIONAL SOURCES FOR TECHNICAL TEACHERS

Purpose: To recruit technical teachers from business, industry and professions.

Utilize commercial mass communication media in a vigorous recruiting campaign to recruit technical teachers from business and industry. These recruits will be people with at least an associate degree and preferably a baccalaureate degree, and industrial, business or professional experience but no prior teaching experience.

Give the new recruits an intensive short course in philosophy of technical education and teaching methods before assigning them to a teaching role. During the course of their first year's teaching experience, these new teachers will be given intensive in-service education.

Coordinate the specialized education through a university, state department of education, or a specially designed center. This training center would be used to continuously re-cycle newly recruited groups in from occupational employment and out into teaching positions.

5. TEACHER EXCHANGE PROGRAM

Purpose: To recruit, develop, and upgrade technical teachers through a business, industry and profession worker-teacher exchange plan.

An exchange program could be worked out whereby a regular technical teacher exchanges jobs with an employee who is his full-time occupational counterpart. This job exchange would last for two or three months, perhaps during the summertime, every two or three years.

The program for the teacher would be worked out well in advance of his entering employment. His work plan would be organized in terms of the specific skills and knowledges that the teacher needs, the work experiences necessary for him to gain these skills, and the expertise available in the employment situation.

The school or educational institution where the teacher was employed should finance the entire program.

Measurement for gains might be in terms of the experimental group engaged in an exchange program versus a control group without this exchange program opportunity.

6. ASSISTANCE PROGRAM FOR POTENTIAL TECHNICAL TEACHERS

Purpose: To develop technical teachers through a variety of programs designed to meet specialized training needs.

Recruit and train technical teachers from the following four sources:

A. Two-year technical institute graduates with employment experience as a technician. Personally contact these outstanding recruits and bring them back to a campus for a baccalaureate degree technical teaching program.

B. Two-year associate degree graduates without employment experience as technicians. These technicians will go directly into a baccalaureate degree teacher education program. These candidates will have one year of

cooperative training included in their technical teacher education program, and will thus have one year of practical experience before their graduation.

C. Those from the military service or industry with valid occupational experience but without formal college credit. These recruits are given tests to establish their level of occupational competency. From these tests, credit toward their baccalaureate degree is given. A baccalaureate degree teacher education program is then designed to meet the specific needs of each recruit.

D. Transfer students from technical institutes or other post-high school institutions. These recruits are tested to validate their prior occupational and/or academic training. They are then fitted into a baccalaureate degree program designed to meet their individual needs.

As a part of this program, competency tests must be designed and validated. Tests must be developed for both technical knowledge and manipulative skills.

Some minimum stipend or financial incentive could be paid to the recruits to help in recruiting the very best from the four listed sources.

Evaluation of pilot programs based on these suggestions would include comparing the various groups and methods in teacher training.

8. EARLY IDENTIFICATION OF TECHNICAL TEACHER TRAINEES

Purpose: To identify promising technical teaching candidates during their technician education program.

Identify promising future technical teachers during their first year of a two-year technical institute program.

Plan and implement a cooperative work experience for these students during the summer. This work experience should be highly related to the student's educational program.

After completion of the two-year technician education program the trainee would complete the next two to three years in a technical teacher education program leading to a baccalaureate degree.

The highly related and coordinated work experience for the trainee would be completed every summer during the four- or five-year program. At the end of the educational program, the trainee would have approximately one year of recent, valid occupational experience and would be placed in the classroom--on the job.

9. TEACHING ASSOCIATES

Purpose: To develop technical teachers through a teaching associate program.

Establish a teaching associate position in the training institution. This teaching associate would be a two-year technical graduate who is well qualified with valid work or industrial experience. He would be assigned to a well qualified senior instructor during his associateship tenure. As an associate, he would work part-time as an assistant to the master teacher helping him in the laboratory, the classroom and in other professional situations. He would be paid as a teaching associate for his part-time work. During the balance of his time, he would schedule the necessary classes and coursework (perhaps in the late afternoons or evenings) necessary for him to complete his degree or teaching credential. Upon completing his degree or teaching credential, the associate would have his position changed to that of a regular beginning teacher.

10. ANALYZING THE ACTIVITIES OF TECHNICAL TEACHERS

Purpose: To determine and analyze technical teacher activities for teacher education curriculum planning, and to test the feasibility of utilizing technical teacher's aides.

Analyze the jobs of technical teachers in terms of professional teaching activities or activities that demand a background in technology and pedagogy, and activities that might be done by someone else other than a professional technical education teacher.

Initiate a pilot program where technical teachers do only the professional activities, and other activities (as determined by the analysis) are done by someone else (perhaps a technical teacher's aide).

Evaluate the pilot program against a convential control situation in terms of a cost benefit analysis, including extra available teaching time for the professional, gains in student learning, etc.

11. FORMATION OF A "TECHNICAL TEACHER RESERVE"

Purpose: To develop a pool of potential technical teachers in business, industry, and the professions.

This plan would form a reserve of technical teachers. These would be people who are interested in teaching at some future time but not interested in going into teaching at the present. These people in the reserve might be looking forward to technical teaching as a possible part-time or full-time career in the future.

Recruit those who are interested in forming such a technical teacher reserve. Provide special courses in technical education, principles and philosophy, pedagogy, advanced subject matter and various other teaching related activities for this reserve group.

Use the group wherever possible in internship and part-time teaching, and keep them up to date on job openings and teaching vacancies about the area or region.

12. INTERNSHIP PROGRAM

Purpose: To develop technical teachers through an in-service internship program.

Carefully select technical teacher trainees to fill teaching positions that will be available at the institution in the somewhat immediate future. These trainees will have had adequate technical experience and background without any teaching experience.

The trainee is placed on the institution's payroll. The trainee is paid some equitable salary as determined by his trainee position. The trainee will be assigned to a senior sponsoring teacher that will be responsible for his guidance and supervision during the internship.

During the internship, the trainee serves as a laboratory assistant, as an assistant or student teacher, and also takes any necessary pedagogy and general education coursework. These courses may be in the form of programmed instruction. During this internship, the supervising teacher is paid for his effort in the program.

Upon completion of his internship, the trainee is moved into an available teaching slot and goes on a regular salary.

13. COOPERATIVE WORK EXPERIENCE TEAM

Purpose: To provide occupational experience for the technical teacher through an in-service cooperative team approach.

Arrange for the technical teacher and his teaching counterpart in a professional program (for example: the technician teacher and the engineering teacher) to take their cooperative work experience as a team. This work experience would be in the business, industry, or profession appropriate to their fields of technical expertise.

During the work experience, the technical teacher would work with the technicians and the teacher of the professionals would work with the professionals. They would work at the same locations with the same employer. They would have scheduled conferences together so that they might more closely coordinate their experience and reorganize how they relate to teaching the technician-professional team.

14. UTILIZATION OF PART-TIME TEACHERS

Purpose: To utilize part-time teachers from industry, business and the professions as a resource for updating full-time technical teachers.

In post-high school technician training institutions where there are large evening programs, part-time teachers used for evening instruction frequently work full-time in business, industry, or a profession during the daytime. Formalized in-service training sessions could be scheduled utilizing the part-time teaching personnel who are employed in the technologies. These regular meetings could be used to bring the full-time classroom teacher up to date on current technical developments; also to advise full-time teachers on how the new technology information might be integrated into the curriculum and applied in the classroom and laboratory setting.

15. OBSERVATION OF BUSINESS, INDUSTRY OR PROFESSIONAL PRACTICES BY TECHNICAL TEACHERS

Purpose: To keep technical teachers technologically up to date through scheduled occupational observations.

During the summer months (or off-quarter), technical teachers could engage in at least one month of direct observation of technical operations in business, industry, or professions.

Observations would be of product manufacture, processes or procedures used. Full costs of the project would be subsidized by the educational agency.

The tours for the teacher would be planned well in advance. The technical teacher would know what kind of skills and technical knowledge he was looking for before the visit.

The teacher would take notes on new techniques, new processes, new products and necessary updating information.

Evaluation could be by written reports or by test/retest or both.

16. THE USE OF VIDEO TAPE FOR IN-SERVICE TRAINING

Purpose: To provide a technological updating service for technical teachers through the use of video tape recordings.

Make video tape recordings of the latest practices, techniques and processes in a certain field of technology. Appoint an advisory committee or committees from industry to determine what the content of the tapes should be in order to bring the latest information to the classroom. Use the video tape recordings of the latest technical processes available at in-service teacher's meetings.

17. IN-SERVICE SEMINARS

Purpose: To provide in-service training through inter-state or regional seminars.

Statewide one and two day seminars would be held on a regularly scheduled basis during the year. In order to attract top level people from business and industry, a consortium of states could go together in planning and presentations. The presentations or seminars would be for teachers of similar technologies; for example, all electronics teachers.

18. REGIONAL IN-SERVICE CLINICS

Purpose: To provide in-service technical teacher education through regional clinics.

Conduct regional technical teacher clinics to provide opportunity for technical teachers to engage in face-to-face

discussions with their counterparts about similar problems. Typical problems discussed could be: methodology, teaching techniques, actual classroom and lab mechanics, curriculum modifications, equipment selection and care, the construction of quizzes and tests, methods of grading, placement, follow-up, and evaluation.

19. TECHNICAL TEACHER VISITATION PROGRAM

Purpose: To improve teaching techniques through an in-service teacher-visitation program.

Establish three or four visiting days per year where a technical teacher could visit and sit in the class of his professional counterpart at some other institution. In this way, the teacher might gain new information or technical knowledge, new teaching techniques, or new exposure to different classroom mechanics.

Prior to the technical teacher's visit to some other institution, he would be required to prepare a plan listing the areas in which he was seeking help or wished to visit.

The teacher substituting for the regular teacher on visitation, would be paid by the administration.

Evaluation might be in terms of subjective supervisory data.

20. CURRENT LITERATURE RESOURCE

Purpose: To test the effectiveness of available professional literature for keeping technical teachers updated in technology.

Utilize the administration, the instructor involved, and an advisory committee to establish a shelf of current technical books, references, literature, etc. that would be available, in the laboratory, to the instructor. These materials would be paid for by the administration.

A comparison of materials usage might be made where current books and literature was deposited in the library of an institution versus books and literature available in the instructor's lab and office.

21. ABSTRACTING SERVICE

Purpose: To provide a means of keeping technical teachers up to date with the professional literature through an abstracting service.

Provide an abstracting service to abstract documents, articles, books and other pertinent literature for technical teachers. This abstract document would be available on a regular basis for technical teachers in the field.

22. PARTICIPATION IN PROFESSIONAL ACTIVITIES

Purpose: To test the effectiveness of participation in professional organizations as a means of keeping teachers up to date.

The educational institution or agency where the teacher was employed would subsidize the cost of membership in professional organizations. In addition, they would encourage participation and attendance in these professional activities.

Gains in terms of new knowledge might be measured when compared with a control group of similar teachers for which subsidization was not available.

23. DETERMINATION OF EMPLOYMENT CRITERIA FOR TECHNICAL EDUCATION TEACHERS

Purpose: To determine the employment criteria for technical teachers at the various program levels.

Determine the employment criteria and/or certification requirements of the state departments of vocational education for technical education teachers.

Determine the employment criteria as expressed by the various institutions employing technical teachers.

Determine any incongruity between employment criteria at the high school vs. the post-high school level; employment criteria in institutions subject to the regulations of state certification vs. institutions and organizations not subject to these regulations; and employment criteria as expressed by institutions vs. actual qualifications of teachers being employed.

24. REGIONAL TECHNICAL TEACHER CLEARINGHOUSE

Purpose: To provide a centralized inter-state clearinghouse for the employment of technical teachers.

Organize a consortium of states to provide an employment clearinghouse for technical teachers. This consortium would include representation from the various state departments of education, teacher education institutions, and other appropriate agencies or professional groups within cooperating states. This clearinghouse organization would provide a centralized point within a region for the purpose of bringing together teaching prospects and teaching opportunities.

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