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GUIDELINES FOR THE DEVELOPMENT OF BACCALAUREATE TECHNICAL
TEACHER EDUCATION PROGRAMS. EXCERPT FROM FINAL REPORT OF A
SUMMER INSTITUTE FOR THE IMPROVEMENT OF TECHNICAL TEACHER
EDUCATION PROGRAMS.

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DESCRIPTORS- *GUIDELINES, *TECHNICAL EDUCATION, *TEACHER
EDUCATION, TEACHER EDUCATION CURRICULUM, PROGRAM IMPROVEMENT,
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GUIDELINES WHICH WERE DEVELOPED DURING THE INSTITUTE FOR
THE IMPROVEMENT OF TECHNICAL TEACHER EDUCATION PROGRAMS
(REPORTED IN VT 004 936) ARE GIVEN. ASSUMPTIONS WHICH
UNDERLIE THE GUIDELINES ARE--(1) TECHNICAL TEACHERS WILL BE
PREPARED FOR POST-SECONDARY OR COLLEGE TEACHING, (2) THEY
WILL BE PREPARED PRIMARILY FOR TEACHING TECHNICAL SUBJECTS,
AND (3) THEIR EMPLOYERS WILL DESIRE OR ULTIMATELY EXPECT THAT
THEY HAVE GRADUATE DEGREES. THREE GENERAL GUIDELINES ARE
AIMED AT (1) ESTABLISHING A MINIMUM BACKGROUND SIMILAR TO
THAT OF THE PROSPECTIVE TEACHER'S FUTURE TECHNICAL PROGRAM
GRADUATES, (2) RELATING THE TEACHER'S OCCUPATIONAL
ORIENTATION TO FUTURE JOB FUNCTION OF THE TECHNICAL STUDENT,
AND (3) FOCUSING ATTENTION ON INCLUDING A BALANCE OF CONTENT
AT THE THEORETICAL AND OPERATIONAL LEVELS. THE 21 GUIDELINES
ARE PRESENTED UNDER SIX CATEGORIES--(1) GENERAL EDUCATION,
(2) MATHEMATICS, (3) SCIENCE, (4) TECHNICAL CONTENT, (5)
OCCUPATIONAL EXPERIENCE, AND (6) PROFESSIONAL EDUCATION. (EM)

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TECHNICAL TEACHER EDUCATION PROGRAMS

Excerpt from Final Report of
A Summer Institute for the Improvement
of Technical Teacher Education Programs

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Director

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INTRODUCTION

The well acknowledged shortage of technical teachers finally has resulted in a focus upon the near absence of formal programs for preparation of such teachers. While baccalaureate programs of instruction have become the standard source of teachers for public elementary and secondary schools, no parallel for the preparation of post-high school technical teachers has developed. Staffing the new and expanding technical programs has caused a massive search for qualified teachers, nearly all of whom are expected to have the bachelor's degree as a minimum standard of preparation. As the search for technical teaching staff accelerates, relatively few colleges and universities have baccalaureate programs designed to prepare technical teachers. The purpose of the guidelines stated in this document is to provide direction for those involved in the initiation or revision of baccalaureate technical teacher education programs.

The guidelines represent a culmination of organized effort by institute staff based upon group work of participants and presentations by speakers during the Institute for the Improvement of Technical Teacher Education Programs conducted at Purdue University, Summer 1967.

The transitional nature of the guidelines should be recognized. It is expected that revisions will become appropriate at such time as future experience and research in technical teacher education dictate.

Policy statements describing desirable characteristics, limitations, and content of baccalaureate technical teacher education programs were developed in small group discussions among the institute participants.

The experience and orientation of the individual participants were supplemented with prepared presentations by consultants with relevant experience in education. Institute participants also had available a variety of institutional catalogs, curriculum materials, and research reports. The resulting synthesis of prior and immediate experience and supplemental information became the basis for the participants' development of the policy statements. Daily panels, comprised of one representative of each small group, reported, reviewed, and refined the policy statements developed by the groups of participants. These refined statements were in turn utilized by institute staff as the primary source in developing the guidelines.

Three assumptions were made prior to the development of these guidelines. First, it was felt that the technical teacher under discussion in this report is to be prepared for post-high school and/or college level technical teaching. Second, the teacher is to be prepared primarily for teaching subjects within his technical specialty. A program based on these guidelines would not be intended to produce a good mathematics, physics, or chemistry teacher for a technical program. Third, the guidelines are written in full recognition that graduate degrees are ultimately expected or at least desired by potential employers.

GUIDELINES

The guidelines were developed within six categories, which are:

- (1) General Education, (2) Mathematics, (3) Science, (4) Technical Content,
- (5) Occupational Experience, and (6) Professional Education.

General Guidelines

It became evident that a few of the guidelines were applicable to several of the six categories or topics in the program agenda. These guidelines were recognized as having general import to baccalaureate program development in technical teacher education.

1. The level of instruction for the technical teacher (particularly in science, mathematics, and the technical areas) should be at least commensurate with that expected of the graduates of the technical program in which the prospective teacher is most likely to be placed.

In certain technologies it is necessary for the teacher to have depth well beyond that expected of his students on graduation. For example, completing an associate or other degree in the technology to be taught would likely provide a sound basis for counseling students and working with other technical teachers. Similarly, a strong technical background may aid in interpreting future technical developments.

This guideline is not intended to mean that the bachelor's degree technology teacher must have completed an associate degree technical program as a part of or in addition to his baccalaureate work. A baccalaureate program designed for associate degree graduates is one feasible approach. However, an associate degree prerequisite can place severe restrictions on being technically current upon entry into teaching.

2. Coursework and other instructional activities for the technical teacher should, whenever possible, reflect an understanding and awareness of the functional role of the graduates of the program in which the technical teacher is most likely to serve.

Successful employment in a technical occupation is the primary objective for the technical program graduate. The technical program

enrollee should develop an understanding of the functions and responsibilities expected of the technician. The responsibility for this understanding rests with the technical teacher, who must therefore strive to relate curricular experiences to the future job function of technical students.

3. Balance between theoretical and applied content for the technical teacher should be carefully established and maintained to provide a meaningful frame of reference while retaining the theoretical basis necessary for adjustment to technological advances.

One generally distinguishing characteristic of technical occupations is the need for knowledge of and facility with sophisticated testing and laboratory equipment and/or precision measuring devices of various kinds. Procedures for the effective use of such equipment usually demand judgment and rational thinking beyond that normally required of the skilled craftsman. Teaching the theoretical bases of a given technology will help both the technician and the technical teacher adjust to changes as they occur. Theoretical emphasis, however, must not be stressed to the exclusion of skills using hardware and/or test equipment which tend to differentiate many of the technical occupations from the professional.

General Education Guidelines

1. Courses and activities which enable the technical teacher to communicate ideas mathematically, linguistically, and graphically should be included in the program.

Technical teachers must be able to communicate effectively with students, potential employers, parents, and other teachers as a requisite for success in the teaching environment. Instruction in speech, technical

report writing, print reading, computer programming, business letter writing, and other communication skills important to the technology should be included in the program. These written, oral, and computer language skills should occupy a position of prominence as should graphical and mathematical communication tools peculiar to the technology.

2. Non-technical elective courses and related activities should be required as part of the program to enrich the technical teacher's academic background.

A technical teacher education student should be required to complete a portion of the degree requirements in courses outside the technical areas and outside areas of study considered as preparation for teaching. Development and maintenance of interests beyond the teaching objective would thus be encouraged. The intent is to broaden the otherwise relatively narrow experience of the prospective teacher, improving the level of understanding as a requisite for effective interaction with people of varying interests and backgrounds.

The technical teacher probably has a more critical need for general education than do most other teachers, because of the nearly impossible task of constantly updating technical background throughout a teaching career. Because of the pressures of remaining current in the technology, the only real opportunity for a prospective technical teacher to obtain background in areas such as the humanities and the social and behavioral sciences may be in the baccalaureate program.

The master's degree is considered as an accepted minimum standard of preparation for the technical teacher as well as for most other teachers. Background beyond the technical and scientific areas will anticipate enrollment in graduate programs following completion of the

baccalaureate. Substantial involvement in the general studies areas will help the prospective teacher gain admission to an adequate graduate school and provide capabilities necessary for competition with graduate students of other disciplines.

3. Instruction in the social sciences should be provided to broaden the technical teacher's awareness, understanding, and intelligent participation in the activities of a complex society.

Educators are perennially struggling with selection of content designed to include and transmit those aspects of the culture which will enable each student to become a responsible, participating member of society. The technical teacher must share with other citizens the elements of background based on the social, economic, and governmental structures as necessary for understanding and supporting the goals of the democratic community. Hence, the prospective technical teacher lacking a measure of knowledge and maturity in the social sciences would be unnecessarily handicapped in assuming the responsibilities of citizenship and the demands of the teaching profession.

The preceding plea to include education for social and civic responsibility is in response to pressures on the technical teacher exerted mainly from outside the teaching environment. It must be stated that a parallel, overlapping set of responsibilities exist from within the teaching community. The technical teacher should be able to define the relationship of his work to the goals of society and defend his professional interests on the basis of knowledge and maturity in the social sciences.

Mathematics Guidelines

1. Mathematical knowledge and facility for the technical teacher should be at least equivalent to that expected of graduates of the type of technical program for which the teacher is being prepared.

Teaching effectiveness is enhanced by the comprehensiveness of instructor knowledge of a given technological field. That knowledge is, at least in many major technological areas, dependent on mathematical background and explanations for effective communication. However, since this is obviously not true for certain of the technologies, it appears that the best overall recommendation for mathematics content is to require as a minimum in all technical teacher education programs that level of facility provided the prospective teacher's students.

2. Additional mathematical competency (beyond that outlined in the preceding guideline) should be required of the technical teacher in programs where the technology demands additional competency in order to understand and communicate the technical content.

Mathematical explanations are basic to the engineering and certain other technologies. The teacher in these technical programs must therefore be equipped with mathematical background and facility in addition to that expected of technical students as a requisite for graduation. The amount and type of additional mathematics required should be dictated by the demands of the particular technology.

The teacher in some technologies needs mathematics of a higher level, or in other cases a variety of approaches and concepts at the same level as required of technical program graduates. Overall, it must be recognized that differences across the many technologies in a teacher's explanatory usage of mathematics are extensive.

Differences within a given technology also are obvious but should cause relatively few problems in a teacher education program. When identically titled technical curricula in different institutions have dissimilar mathematical requirements, the preparation of the prospective technical teacher should be geared to the more complex program. Actual selection of mathematical content for the technical teacher then must relate not only to its explanatory value in teaching, but also to variation within technical programs of the same type as well. Mathematical content in technical teacher education programs should be based on the mathematics courses in the technical programs in which the prospective teacher is likely to find employment.

3. Mathematics courses for the technical teacher should emphasize applications appropriate to the orientation and job function of the technician.

Problem solving has been mentioned previously as basic to the role of the technician. Education both for the technician and for the teacher of the technician should therefore attempt to maximize the transfer and applicability of the content for use by the technician in performing his job. Mathematics courses emphasizing approaches to the solution of technological problems should take precedence over courses which stress derivatives and mathematical theory for explanation and examples. (See General Guideline Number 2, Page 3)

Science Guidelines

1. Scientific knowledge required of the technical teacher should be at least equivalent to that expected of graduates of the type and level of technical program for which the teacher is being prepared.

Teaching effectiveness is at least partially contingent upon comprehensive knowledge of a given field. Although teaching skills play a definite role in teaching effectiveness, knowledge of the scientific principles underlying the primary technical content is mandatory. Comprehensive knowledge of scientific principles equal to the knowledge required for entry level technicians must be considered as the minimum permissible level of proficiency for technical teacher education graduates.

2. Additional scientific background (beyond that outlined in the preceding guideline) may be required for study in those technologies where additional depth and/or breadth is necessary to understand and communicate the scientific bases of the technical content.

Although a level of scientific understanding may be required to function effectively as a technician, additional knowledge often is required to explain alternatives or handle remedial instruction to create effective teaching-learning situations. Depth and breadth in the sciences beyond the level expected of graduating technical students should make technical content and underlying principles more meaningful to the teacher and therefore easier to transmit to students in technical programs.

3. Science courses should provide the technical teacher with the laboratory emphasis appropriate to the job function of the technician.

Science courses, regardless of level, should be taught with laboratory oriented problem solving approaches. Laboratory activity should stress the organization and quantification of data relevant to the phenomenon under study and utilize appropriate procedures for problem solution. (See General Guideline Number 2, Page 3)

Technical Content Guidelines

1. Depth and breadth in technical courses for the prospective teacher should extend beyond that required of the graduates of the program in which employment as a teacher is anticipated.

The technical teacher needs a thorough knowledge of the technical specialty. This competence is requisite to (1) qualifying as an authority to students, (2) working with a broad range of student abilities, (3) reducing time in lesson preparation, (4) adapting to changes in the technology, (5) accommodating teaching assignment revisions, and (6) establishing self-confidence as a teacher.

2. Technical content for the prospective teacher should be integrated with science, mathematics, communications, and professional courses.

Technologies are generally recognized as being rooted in scientific and mathematical knowledge and principles. Therefore, technical content for both the technical teacher and for his students should be coordinated and integrated with scientific and mathematical principles and theories. Relating technical content as closely as practicable to its theoretical bases, while emphasizing the laboratory skills and equipment orientation which are fundamental to most technical occupations, appears imperative. Post-high school technical programs generally are focused on accomplishing this end, but such coordination could easily be overlooked when designing a baccalaureate technical teacher education program in an institution without previous staff and program experience in technical education.

3. Technical content for the prospective teacher should be distributed and scheduled throughout the entire span of the baccalaureate program.

Dispersing technical courses throughout the entire program is considered a necessity. This procedure maximizes readiness for student teaching or internship near the end of the program. In addition, the prospective teacher will upon graduation have recently completed advanced technical courses and as a consequence will tend to begin teaching with more current technical knowledge.

4. Technical content for the prospective teacher should employ a laboratory emphasis which strongly relates to the occupational objective of students in the type of program for which the prospective teacher is preparing.

The various technical occupations with which technical teachers are concerned involve testing, analyzing, computing, measuring, inspecting, and other functions requiring use of specialized instruments and procedures. The new technician should be skilled in the use of the basic instruments with which he will be expected to work.

Occupational Experience Guidelines

1. Technical level occupational experience should provide the teacher with depth and breadth as well as knowledge of current industrial or business practice at a level minimally commensurate with that associated with the employment expectations of graduates of technical programs of the type and level for which the prospective teacher is being prepared.

Technical employment can contribute to the teaching effectiveness of the teacher by supplementing the technical knowledge and experience gained in the classroom and laboratory. The technical teacher with appropriate work experience can rely on both formal instruction and work experience as a basis for teaching. Any meaningful work experience

probably adds to the teacher's maturity and judgment. However, experience in or closely related to the employment of technical program graduates will maximize his teaching effectiveness. Employment on jobs which demand little or no relevant technical knowledge are not acceptable. Conversely, appropriate field experience at professional levels which call for technical functions above the technician level would usually merit consideration.

2. Occupational experience requirements for the prospective teacher should emphasize pre-arranged, supervised, cooperative programs rather than evaluation of previously obtained employment experience.

The supervised, cooperative type of work experience program affords opportunity for placement in a job situation which provides the appropriate level of activity, opportunity to work in several areas of importance to the technology, and exposure to current industrial practices. Hence this type of work experience can minimize repetitive and non-applicable efforts which are often significant components of previously obtained work experience.

Previously obtained occupational experience, when considered as part of a program of study, should be carefully documented and scrutinized for its relevance and possible usage for credit. If credit is granted for previous experience, consistent policies for its evaluation should be established and should stress relevance of the experience rather than job tenure.

3. The amount and emphasis of occupational experience required of the technical teacher should relate to the requirement of the technology.

A blanket work experience requirement established without consideration of the technological area or the courses to be taught is increasingly difficult to defend. A teacher in one technology may find

an appropriate technical level work experience to be a major contributor to teaching effectiveness. The teacher in another technology may find technical background acquired through formal class and laboratory activities to be the primary criteria for teaching success. The requirements of the technology itself, the level of the program, and the courses likely to be taught are all factors which determine the true relationship of occupational experience to teaching performance.

4. The major portion of the occupational experience of the teacher can often follow graduation from the baccalaureate program.

Including a complete occupational background as a requirement for the baccalaureate degree is comparable to requiring the medical internship for the Doctor of Medicine degree. Although the doctor is not licensed until the internship is satisfactorily completed, the "occupational" requirement is completed after graduation. While some occupational experience upon entry into teaching is perhaps desirable in many technologies and necessary in others it is suggested that building an appropriate occupational background after graduation may be justifiable.

Pre-service occupational experience of necessity increases time required to complete a baccalaureate program. Hence, differentiated occupational requirements that allow later completion of a major portion of the occupational experience will improve the position of technical teacher education programs in attracting students.

Summers, sabbatical leaves, and other periods of time subsequent to graduation could be utilized to extend or build a background of occupational experience which would be more current. This plan also has the added advantage of focusing attention on activities which relate more directly to improving teaching through coordinating occupational experience

with teaching responsibilities. In addition, a major part of the responsibility for obtaining and coordinating occupational experience would thus transfer from the college or university to the teacher and to the employing institution.

Professional Education Guidelines

1. Professional courses for the technical teacher should focus on the adult as a learner.

A basic assumption influencing all of the proposed guidelines is that the prospective teacher will teach in a post-high school and/or college level position. Technical teacher education programs preparing teachers for secondary school programs are thus arbitrarily excluded. Adult learners entering the teaching-learning situation with unique value perceptions, different motivational patterns, and an advanced level of maturity demand a unique approach to teaching. Common problems, issues, and methods in teaching are acknowledged for all levels of teaching. However, factors such as motivation, pace of instruction, and potential examples and illustrations are quite different for elementary school children than for the more mature technical students. Consequently, the professional aspects of the program should be based on consideration of the adult as a learner.

2. An integrated sequence of professional courses should be designed to provide the prospective teacher with an understanding of the methods and problems associated with technical teaching.

Professional courses early in the baccalaureate program should introduce the prospective teacher to the nature and problems of technical teaching. Sequencing and integrating pedagogical content are strategic factors in leading the student from an orientation to the nature and

problems of technical teaching through the educational psychology, course construction, or other professional courses or units which precede and culminate in a supervised teaching experience. The integrated sequence of pedagogical content should emphasize application of scientific and technical knowledge in practical classroom and laboratory situations.

Many currently experimental practices should be considered to demonstrate, review and evaluate student teaching performance. Micro-teaching, video tape monitoring, and interaction analysis are examples of innovations for study and possible employment to improve the efficacy of professional activities.

Advanced technical courses can be structured to contribute to future effectiveness as a teacher. For example, demonstration of test equipment usage can draw attention to how to teach others to use the equipment.

3. The evolution and function of technical education should be taught in the technical teacher education program.

The technical teacher should understand the role and function of technical education in the educational spectrum. This understanding should assist in the development of a consistent and enlightened point of view toward the goals of the technical teaching objective. If the prospective teacher is equipped with a defensible purpose, then course construction activities, student-teacher relationships, inter- and intra-faculty associations are all likely to acquire a consistent direction.

4. A supervised teaching experience or teaching internship should be completed in the technology in which the student is being prepared to teach.

A variety of possible approaches to providing a suitable supervised teaching experience typically revolve around student teaching and internship. Student teaching^o for credit under the supervision of a competent technical teacher is probably the most economically and administratively feasible approach for new programs. However, requiring completion of a carefully planned and operated teaching internship would provide a more appropriate exposure and experience in technical teaching. A third, perhaps supplemental but important consideration is the possible involvement of students as laboratory and teaching assistants.

SUMMARY

The general guidelines were originated in recognition of characteristics and requirements which probably should permeate the total baccalaureate technical teacher education program. These guidelines (Pages 3 - 4) are aimed respectively at (1) establishing a minimum background similar to that of the prospective teacher's future technical program graduates, (2) relating the teacher's occupational orientation to future job function of the technical student, and (3) focusing attention on the inclusion of a balance of content at the theoretical and operational levels. The general guidelines are intended to provide curriculum planners with considerations which are applicable in the initial planning or revision of nearly any aspect of a baccalaureate technical teacher education program.

Application of all the guidelines in the development of baccalaureate technical teacher education programs across institutions would result in the establishment of programs which are considerably different

one from another. The organizational structure of each institution, staff characteristics, political restraints, and a host of institutional policies and attitudes would heavily influence the nature and operation of any program. Although in writing the guidelines the temptation prevailed to suggest courses, number of semester hours credit, and a myriad of other relatively specific recommendations, such action was deferred to allow only those statements which would recognize the capability and prerogative of college staffs in gearing each technical teacher education program to the technologies and type of teaching employment for which each institution is best qualified to prepare its students.

Recommendations on the use of the guidelines in the categories of general education, technical content, occupational experience, mathematics, science, and professional teacher education, are intended as considerations above and beyond the general guidelines. The noticeable overlap among the guides in the areas of mathematics, science, technical content, and professional education is recognized. Integration and coordination of these particular areas is currently well focused in many existing technical programs. However, to provide orientation and integration across the various areas of technical teacher preparation in colleges and universities which have little or no experience in technical program design and operation may be unusually difficult.