SELECTING TECHNICAL COMPETENCIES FOR BEGINNING
INDUSTRIAL ARTS WOODWORKING TEACHERS
IN A COMPETENCY-BASED TEACHER
EDUCATION PROGRAM

THESIS

Presented to the Graduate Council of the
North Texas State University in Partial
Fulfillment of the Requirements

For the Degree of

MASTER OF SCIENCE

By

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December, 1975
ABSTRACT

Hay, William C., Selecting Technical Competencies for Beginning Industrial Arts Woodworking Teachers in a Competency-Based Teacher Education Program. Master of Science (Industrial Arts), December, 1975, 66 pp., 2 tables, bibliography, 46 titles.

The problem was to identify the technical competencies necessary for beginning industrial arts woodworking teachers in Texas public secondary schools.

Twenty-seven clusters of competencies were listed on a questionnaire sent to ninety-one supervisors of industrial arts in eighty-six Texas school districts requesting that these supervisors evaluate each cluster as "Essential," "Desirable," or "Unnecessary." Sixty-six questionnaires were returned (72.53 percent). A weighted rating scale was used to determine an overall evaluation for each cluster, with the result that twenty-five of the clusters were judged to be "Essential" and the two remaining clusters were judged to be "Desirable."

It was concluded that the clusters judged to be "Essential" should be part of the required curriculum and that more training in tool maintenance be given.
# TABLE OF CONTENTS

**LIST OF TABLES** ............................................. v

**Chapter**

I. **INTRODUCTION** .................................................. 1

- Statement of the Problem ............................................. 6
- Need for the Study ..................................................... 6
- Limitations of the Study ............................................... 9
- Definition of Terms .................................................... 11

II. **RELATED RESEARCH** ................................................ 21

III. **TREATMENT AND ANALYSIS OF DATA AND FINDINGS** .................. 29

- Sources of Data ....................................................... 29
- Organization and Treatment of Data ..................................... 29
- Analysis of Data ....................................................... 32
- Findings .................................................................... 33
- Respondents' Comments .................................................. 37

IV. **SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS FOR FURTHER STUDY** ...... 41

- Summary .................................................................. 41
- Conclusions ............................................................... 43
- Recommendations for Further Study .................................... 45

**APPENDICES**

A. Persons from Whom Material was Requested ......................... 48

B. Typical Letter Sent to Educators Requesting Material or Related Research ........ 50

C. Skills Common to Occupations of Model Maker, Boat Builder, Kitchen Cabinet Maker and Furniture Maker (from Project Able) ........ 51

D. Cover Letter for Questionnaire ....................................... 53
E. Questionnaire Regarding Technical Competency Clusters for Beginning Industrial Arts Woodworking Teachers ........................................... 55

F. Copy of Reminder for Questionnaire .................................. 60

G. Tabulation of Weighted Responses for Each Cluster .............. 61

BIBLIOGRAPHY .............................................................. 62
LIST OF TABLES

Table

I. Tabulation of Sixty-Three Questionnaires
   Completed ........................................ 34

II. Weighted Rating of Responses to Questionnaire
    Resulting in Overall Rating for Each
    Cluster ........................................... 36
CHAPTER I

INTRODUCTION

Competency-Based Teacher Education (CBTE) is a relatively new development. A synonymous term for competency-based is "performance-based," although some authorities view the term "competency-based" as more comprehensive and more capable of including the wide range of types of objectives and abilities (14, p. viii).

Bies contends that when discussing CBTE, persons in the field use "competency," "goal," and "performance" interchangeably (2, p. 83). He also said, "Identified competencies and performance objectives are inextricably combined in any CBTE program and must be carefully matched with one another. . . . " (2, p. 84).

In the early 1970s all state colleges and universities in Texas were placed under a mandate to implement CBTE by the fall of 1977; however, in January, 1974 a ruling by the Texas Attorney General reversed this mandate and made CBTE optional (27, p. 3). Governor Dolph Briscoe of Texas, on June 19, 1975, signed into effect a new law which prohibits the Texas State Board of Education from requiring teacher preparation institutions to conform to any program
based on behavioral objectives, performance-based objectives, or competency-based objectives (22, p. 65).

Change has been a characteristic of almost every area of life since World War II, with education being a notable exception. As a consequence of education's unchanging course, there has been an increasing demand for relevance and effectiveness in the different areas of education, and especially in teacher education. This demand for effectiveness and efficiency has been termed "accountability" (14, p. 3).

The concept of competency-based instruction has emerged from the emphases on goal-orientation and individualization. Learning goals or objectives can be made explicit by and for the learner. The individual then can pursue learning activities and develop performance skills or competencies in the process (14, p. 3).

The essential elements, implied characteristics and advantages of competency-based education are outlined as follows:

1. Essential Elements
   A. Competencies are pre-determined in advance of instruction.
   B. The student must be told in advance of the instruction what competencies he is going to be expected to master.
   C. Competencies must be written in performance terms and be measurable.
   D. Students must be told in advance what the criteria for success in mastering the competency will be. Tell the students how they are going to be evaluated. Even in the knowledge competencies, students must perform something so we can infer knowledge.
E. The criteria must be based on the competencies to be developed and be explicitly stated.

F. Rate of progress is determined by demonstrated performance.

II. Implied Characteristics

A. Instruction is individualized and personalized. Remember, this is not an "essential," learning activities can be group oriented.

B. Learning is guided by feedback (almost instantaneous).

C. The program as a whole is systematic. The parts must be inter-related.

D. Emphasis is on exit.

E. The student is held accountable for performance.

III. Advantages

A. Achievement. If one knows exactly what must be done, he may be able to attain a higher level of performance.

B. Accountability. Both student and teacher are accountable.

C. Humanization. Advantage of knowledge of goals is that we treat students like people and they respond better.

D. Individualization. Some students can go through faster. Those having trouble can get more attention and this really does happen.

E. Motivation. Just putting the real goal out there seems to be motivating (23, pp. 16-17).

According to Nagel and Richman, the important reason for individualizing instruction is to allow students to work at their own rate (19, p. 59).

In order to allow a student to work at his own rate, that student will need materials and instructional activities which he may complete with little outside assistance. In competency-based instruction this instructional package is called a module. A module is a self-contained unit of instruction made up of the following parts:

1. A clear, concise statement of objectives including instructional and expressive objectives.

2. Prerequisites (Readiness, knowledge and skills).

3. Pre-assessment.
4. Instructional activities.
5. Post-assessment.
6. Remediation activities (19, p. 60).

Nagel and Richman wrote that pre-assessment allows the student who demonstrates mastery of the objective of the module to by-pass the instructional activities and post-assessment and start the next module, thus increasing the opportunity for the student to progress at his own pace (19, p. 66).

Regarding individualized instruction, Schmieder states "A competency program allows the student the opportunity to engage in an individualized instructional program. It does not espouse an individualized outcome . . ." (21, p. 25).

Accountability, according to Olson, is a tool or process by which the public judges how well schools are performing. This accountability has taken various forms over the years, such as funding based on attendance, equipment, buildings, or budgets. The thing that is new in accountability is the heavy emphasis on student performance or outcome measures. A recent Gallup Poll showed that 70 percent of those questioned would like to see students given a national test to compare local students' educational achievements with students in other communities; 21 percent were opposed and 9 percent voiced no opinion (20, pp. 38-39).
Not all educators, however, believe that accountability will improve education. Hottleman contends that performance-based teacher education and competency-based teacher education are names for only two of several accountability systems that, in his opinion, will do harm to public education (12, p. 18).

In summary, the accountability movement was begun not as a way to improve learning opportunities for children but in response to problems rising out of the increasing costs of public education. The proponents, in the main, are not public educators but have an accounting mentality that views sorting, classifying, and measuring as significant per se. The overemphasis on measurement promises greater conformity, the diminishment of humaneness, individuality, and creativeness in public education, and, if unchecked, threatens a quantum leap toward educational mechanization (12, p. 20).

Heath and Nielson, in 1974, wrote the following concerning PBTE:

First, the research literature on the relation between teacher behavior and student achievement does not offer empirical basis for the prescription of teacher-training objectives.

Second, this literature fails to provide such a basis, not because of minor flaws in the statistical analysis, but because of sterile operational definitions of both teaching and achievement, and because of fundamentally weak research designs.

Last, given the well-documented, strong association between student achievement and variables such as socio-economic status and ethnic status, the effects of techniques of teaching on achievement (as these variables are defined in the PBTE research) are likely to be inherently trivial (11, p. 48).

While he does not foresee harm to education in PBTE, Drummond advocates evolutionary change to PBTE rather than
sudden changes to this system (9, p. 291). He raises several questions concerning PBTE such as the following:

Will prespecification of objectives or motives limit the subsequent options or freedom of choice of learners undergoing preparation experiences?

Should PBTE programs prepare people for a variety of educational roles variously described, with a variety of styles and models for teachers, administrators, educational specialists?

Do we have the instructional materials and facilities we need to qualify PBTE programs? (9, p. 292).

Lawrence believes PBTE programs should be based on theory and research for competency objectives rather than soliciting suggestions or statements from concerned parties then distilling them into a consensus list (18, pp. 299-300).

Statement of the Problem

The problem involved in this study was to identify the technical competencies essential for the beginning industrial arts woodworking teacher in Texas secondary public schools.

Need for the Study

Although few teachers are presently being certified on competency-based criteria, the movement seems to be in this direction. The main problem seems to be in finding a way to determine what competencies are necessary and then a feasible way to determine if these requirements have been met (24, p. 349).
Although CBTE may not be required under Texas law at the present time in state teacher education institutions, the law does not prohibit such programs. In 1973 Johnson wrote that over 40 percent of 1200 teacher training institutions contacted either had or were in the process of developing competency-based programs; that eleven states had passed laws requiring competency-based teacher certification, and many other states were studying such legislation. He also wrote that interest in competency-based education is not limited to professional educators, but that it was being studied by engineers, chemists, veterinarians, businessmen and others in technical and professional fields (15, p. 1).

Schmieder, in 1973, explaining the national movement toward CBTE, reported that it is rapidly becoming the most significant lever for educational reform since Sputnik. He also stated there is a great need for widespread and direct communication about its nature and potential (21, p. viii). Schmieder also wrote that many states in the United States had revised their standards and certification requirements along competency-based lines, and that the remaining states were studying the concept of CBTE (21, pp. 31-48).

In the next decade or two the concepts of accountability and systems design will produce teacher preparation programs that include the systematic specification of learning goals, teaching behaviors that can best effect those goals, and attitudes and feelings that contribute to a
healthy climate for learning. Professional licensure to teach will be based on demonstrated competencies defined in terms of knowledge, teacher behavior, and specified pupil outcomes.

Competency based teacher preparation derives from instructional activities designed and implemented to produce teachers who possess designated competencies for entry into the teaching profession. Traditionally, the competencies for entering the teaching profession have been defined ambiguously if at all. State departments of education offer the most readily available indicators of traditional expectancies in their requirements for teaching certificates. Almost without exception, these are stated in terms of required courses and time served in student teaching or internships. Demonstrations of competence will supercede evidence of courses passed and time spent in student teaching as certification requirements (8, p. 46).

The large volume of material in books, magazines and bulletins regarding competency-based education reflects that the U. S. Office of Education as well as numerous state departments of education have sponsored projects, conferences and assisted in pilot programs for competency-based instruction.

Research on competency based teacher education has been limited to the professional component of what the teacher does. Little attention has been given to the substantive (or technical) component and little attention has been given to the competencies required for the general component. However, the three must be integrated to provide a comprehensive pre-service competency based program for teacher preparation. To do this we must give attention to role-relevant education (23, pp. 7-8).

There are three roles involved in role-relevant education, roles which the teacher performs both on and off the job. These roles are (1) as a professional, (2) as a
master of substantive content, and (3) as a generally educated member of society (23, p. 8).

Technical competencies may be acquired by formal education and by work experience in industry and business. Professional competencies are used to draw from the technical material in presenting, managing, and evaluating learning experiences (23, p. 8).

In view of the belief by many educators that competency-based education is the answer to the demand for more relevance and effectiveness in education, and in view of the interest in the competency-based approach to education by both professional educators and by those in the professional, technical, and business fields, it appears that there is a definite need for a study to identify technical competencies needed by beginning industrial arts woodworking teachers.

Limitations of the Study

This study was limited to identifying technical competencies, or performance objectives, for beginning teachers of industrial arts woodworking in a college-level competency-based curriculum. In this study no effort was made to either specify the instructional activities necessary to achieve the desired competencies or to set forth rationale; neither will this study attempt to specify criteria for assessment nor methods of assessment.
Cook, Neuhauser, and Richey, in writing of the CBTE program in the Department of Vocational and Applied Arts at Wayne State University, and using the terms "performance objectives" and "behavioral objectives" synonymously, stated

... Our performance objectives are written in terms of learning content only. They are not intended to specify the delivery systems a professor must use to achieve these objectives. By eliminating mention of anything related to the teaching process, the behavioral objectives form the curriculum parameters of a competency-based system without infringing upon the rights of the professor to alter means of achieving the specified ends. Thus, the variables of student characteristics, faculty expertise, and available facilities, as well as a desire to try something new can still be recognized. The objectives become the common thread throughout each course offering, regardless of the instructor, or when the course is taught. In this way specified objectives of the graduating students are always established, but the variety of approaches, an asset of a diverse faculty, is still maintained (6, p. 3).

Although assessment of performance is an integral part of the overall CBTE philosophy, it is a separate topic from technical competencies, and therefore should be the subject of more research than is feasible to include in this study.

Dodl and Schalock wrote that one of the key conditions for implementing a competency-based program is the provision of multiple contexts for assessment. Many context questions remain to be asked, such questions as: In what setting will the behavior be demonstrated? What variation is acceptable in the performance of a given teacher behavior or in the selection of teaching behaviors to be demonstrated? Are all
students in a given program expected to perform to the same
criterion level on the same set of teaching behaviors? If
not, who is to determine what variance is acceptable? (8,
p. 50-51).

Definition of Terms

Words and terms used in describing or working with
CBTE in this study are, with a few exceptions, defined
according to educators and officials who have studied and
written about CBTE.

Accountability
. . . as applied to education, has generally been
taken to mean that the public schools and the
professional educators who operate them should
be held responsible for educational outcomes for
what children learn (25, p. 12).

Behavioral Objectives
. . . are descriptions, in behavioral terms, of
what the learner is to be able to do at the end
of any instructional period (4, p. 42).

Competence
. . . the realization of publicly specified criteria
for classes of learning outcomes found to be appro-
priate to teacher preparation, i.e., knowledge,
skills (performance), and products (3, p. 48).

Competencies
. . . are labels given to results of a comparison
of a particular performance state of a process
with a static performance standard or behavioral
criterion. Competencies are inferences, then, and
each competency is only inferentially related to
the learning process from which the static compar-
ison is derived (16, p. 33).

Competency
. . . the demonstrated ability to perform to
criterion at function and job levels (7, p. 195).
Competency-Based Education (CBE)
Competency-based education (CBE) is based on the specification or definition of what constitutes competency in a given field. Usually a great deal of research is considered, when available, before competency levels are identified. The way in which the agreed upon level of competency is communicated is through the use of specific behavioral objectives for which criterion levels of performance have been established (17, p. 7).

Competency-Based Instruction (CBI)
... a simple straightforward concept with the following central characteristics: (1) specification of learner objectives in behavioral terms; (2) specification of the means for determining whether performance meets the indicated criterion levels; (3) provision for one or more models of instruction pertinent to the objective, through which the learning activities may take place; (4) public sharing of objectives, criteria, means of assessment, and alternative activities; (5) assessment of the learning experience in terms of competency criteria; and (6) placement on the learner of the accountability for meeting the criteria (13, pp. 5-6).

Competency-Based Teacher Education (CBTE)
... specifies the competencies to be demonstrated by the student, makes explicit the criteria to be applied in assessing the student's competencies, and holds the student accountable for meeting those criteria (25, p. 1).

Competency cluster, for the purpose of this study, is the term used to distinguish and separate one group of related technical competencies from other groups of related technical competencies, as applied to beginning industrial arts woodworking teachers for secondary public schools.

Competent
... a descriptive label one applies to an interaction when it has approximated the standard or the behavioral criterion (16, p. 31).
Curriculum

... a systematic group of courses or sequences of subjects required for graduation or certification in a major field of study, for example, social studies curriculum, physical education curriculum ... (10, p. 157).

Enabling Objectives

... objectives which describe those knowledges, skills and attitudes which a learner must attain at some intermediate point if he is to acquire the terminal objective (21, p. 62).

Evaluation

The systematic generation of statistical, descriptive, and analytical information on program (project) activities. Evaluation facilitates decision making in a specific context within a given time frame (21, p. 55).

Expressive Objectives

An expressive objective is a statement which specifies an event a student is to experience (1, p. 9.2).

Individualized Instruction

Instructional activities designed to attend to expressed needs of the individual learner, taking into account each learner's accumulated knowledge, skills, and attitudes, his potential and his rate of learning. Programed materials are often appropriate for individualized instruction (21, p. 57).

Industrial Arts (IA)

... (2) an area of education dealing with socio-economic problems and occupational opportunities, involving experience with a wide range of materials, tools, processes, products, and occupations typical of an industrial and technological society; (3) a phase of the educational program concerned with orienting individuals through study and experience to the technical-industrial side of society for the purpose of enabling them to deal more intelligently with consumer goods, to be more efficient producers, to use leisure time more effectively, and to act more intelligently in regard to matters of health and safety, especially as affected by industry ... (10, p. 298).
Instructional Activities
Instructional activities are learning experiences which are made available to a student with the intent that they would facilitate that student's mastery of an objective or a set of objectives (1, p. 9.2).

Module
... includes a set of activities intended to facilitate the learner's achievement of a specific objective or set of objectives. It is a relatively self-contained unit, designed for a specific purpose, and is a part of a broader, more comprehensive instructional system (13, p. 10).

Objective
... explicit statements of the criteria to be met by the learner as a sign of successful completion of the learning activities. In a competency-based teacher education program, the objectives are explicit statements of the abilities required by an effective teacher (5, p. 17).

Performance-Based Teacher Education (PBTE)
A teacher education program where the learning outcomes and the indicators acceptable as evidence of the realization of these outcomes, specified and made public ... (21, p. 63).

Performance Objectives
... the specification of objectives in terms of specific behaviors to be attained by the learners or teachers and the measures and means for assessing the degree of accomplishment of these predetermined standards (21, p. 49).

The term "performance objective" is used synonymously with "technical competencies" in those portions of this study regarding organization and treatment of data, conclusions and recommendations.

Performance Standards
The criteria in behavioral terms by which actions are judged to be effective or ineffective in meeting intended outcomes (21, p. 64).
Personalized Instruction
Instruction which is designed to meet the specific needs of learners. Education is personalized when assessment, objectives, strategies, and evaluation are planned with the learners and tailored to the learner's individual needs, level, rate, values, and choices. . . . (21, p. 64).

Postassessment
. . . measures competency in meeting the module objectives. Successful performance on a post-assessment signals completion of the module (13, p. 10).

Preassessment
. . . tests the learner's competence in selected prerequisites and evaluates his present competence in meeting the objectives of the module (13, p. 10).

Prerequisites
Prerequisites are those competencies a student is expected to demonstrate prior to his beginning to work on a particular instructional module (1, p. 9.2).

Professional competencies, in this study, refer to those competencies applicable to the teaching process regardless of subject matter.

Rationale
. . . a clear statement explaining the importance and relevance of the objectives to be achieved (13, p. 10).

Remediation
Remediation procedures are instructional activities which are intended to assist the student who has failed to demonstrate mastery of a particular competence— as indicated through postassessment results— to acquire mastery (1, p. 9.2).

Teach
. . . basic sense "to show, demonstrate." 1. to show how to do something; give instructions to; 2. to give lessons to; 3. to give lessons in (a subject); hold classes in; 4. to provide with knowledge, insight . . . the basic, inclusive word
for the imparting of knowledge or skills and usually connotes some individual attention to the learner (26, p. 1495).

Teacher. In this study, a teacher is one whose profession is to teach.

Teacher Education
... the vehicle for preparing those who wish to practice in the teaching profession. As in all professions this preparation involves on the one hand the acquisition of knowledge and the ability to apply it, and on the other the development of the needed repertoire of critical behaviors and skills (13, p. 6).

Technical competencies, in this study, refer to those competencies applicable only to the subject matter of a course of study. In those sections of this study regarding organization and treatment of data, conclusions and recommendations, this term is used synonymously with "performance objectives."

Terminal Behavior Objectives
Objectives which state what the learner is to be able to do at the end of instruction. They specify the standard levels of performance in behavioral terms (21, p. 62).

Woodworking
(1) an activity including the designing, construction, finishing, and reclaiming of wood articles or structures; (2) an area of study relating to industries producing or using lumber (10, p. 649).
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22. "Texas Says Good-by to All That Mandated P/CBTE," Phi Delta Kappan, 57 (September, 1975), 65.


CHAPTER II

RELATED RESEARCH

A review of articles listed in The Education Index, Review of Educational Research, Educational Resources Information Center (ERIC), Readers' Guide to Periodical Literature and the bibliographies of the written works reviewed concerning CBTE did not reflect any title or titles indicating that this study is a duplicate of any previously conducted research.

In August 1974, Korb and Callahan, director and assistant director, respectively, of the Performance-Based Education Project at Northern Montana College published a paper entitled "Performance-Based Education at Northern Montana College." A review of this paper reflected it contains nothing on woodworking (3).

School Shop, in November 1974, published an article entitled "Performance Testing for Vo-Ed Teachers" by Adolf Panitz, then director of the National Occupational Competency Testing Institute (NOCTI). NOCTI is affiliated with Educational Testing Service, Princeton, New Jersey, and it conducts competency examinations consisting of both written
and performance parts in twenty-four occupational scopes (6, pp. 56-57). In reply to a letter inquiring about woodworking competencies, NOCTI director Leon S. Tunkel wrote, in part, on June 26, 1975:

Regretfully, we do not have anything that solely or specifically relates to woodworking at the Industrial Arts level. The NOCTI Program is focused on journeyman level competencies and probably bears small relationship to your interest.


In recent years, many curriculum experts and vocational educators have advocated the need for defining and developing basic core content curriculum for the General Woodworking job family. Such a course is now in operation at the grade ten level in Quincy. . . .

This identification was accomplished by describing all selected occupations in the Woods area, listing all basic tasks, conducting a job description and analysis for each job and developing course and topic objectives for the tasks. . . . A frequency count of objectives identified the extent to which given skills and knowledges appeared in a number of selected occupations. . . .

The results of the frequency count served as a basis for selecting those skills and knowledges to be included in the basic Woodworking Core Curriculum. By definition, those skills and knowledges which are required by all or a large number of occupations in the area can be considered as "basic" or "core" to the job family (4, p. 11).
Concerning the objectives in this program, authors Leporini, Neifing and Ullery wrote

The exact number of objectives to be completed in the basic program was not specified since it was only possible to make a rough estimate of the learning activities an individual student could complete in one year. Obviously, a program of individualized instruction will operate by job levels—not grade levels. And, accomplishment of goals and objectives will vary with the ability, experience, and efforts of each learner. Thus, some students will take longer than others to certify competency at the basic job level (4, p. 11).

This curriculum includes a "Frequency Chart of Job Skills" listing twenty-eight occupations and eighty-one skills (4, p. 12). Some of these skills are highly specialized; for example, "Steaming" is listed as a skill for only two of the occupations. Other skills are listed for only three, four, or five occupations. The four occupations listed in this chart requiring the largest number of skills are model maker, listing seventy-three skills; boat builder, listing seventy-two skills; kitchen cabinet maker, listing seventy skills; and furniture maker, listing sixty-four skills. The skills common to these four occupations number sixty-three. These sixty-three skills are enumerated in Appendix B. The names and terminology of these skills are set out as they appear in the "Frequency Chart of Job Skills." There are some duplications in listing skills or two listings that could be combined into one, such as "Computing lumber requirements" (number 2) and "Computing
material required" (number 47); "Layout" (number 20) and "Using layout tools" (number 48).

The September 1974 issue of the PBTE Newsletter contained a report that each National CBE Center was developing or had developed competency-based products, and among these products were competency lists (5, p. 4). This report further advised that requests for specific products should be directed to the appropriate CBE Center, which for Texas is at the University of Houston, Houston, Texas.

A letter of inquiry sent to the Houston CBE Center regarding a competency list for woodworking resulted in a reply dated June 23, 1975, referring to a book entitled Woodworking which lists fifty-five objectives and which is published by Instructional Objectives Exchange, Los Angeles, California. The reply from the Houston CBE Center also referred to work done at Wayne State University, Detroit, Michigan.

The 1975 catalog issued by Instructional Objectives Exchange (IOX), Los Angeles, California, contains the following:

The Instructional Objectives Exchange is a non-profit educational corporation established in 1968 for the purpose of collecting, developing, and disseminating measurable instructional objectives so that busy educators could select such objectives from a number of alternatives rather than having to generate their own ....

IOX materials are developed by a staff of subject matter specialists under the directions
of experts in the fields of measurement and evaluation . . . (2, p. 14).

This catalog lists the experts as W. James Popham, IOX Director and Professor of Education, Graduate School of Education, University of California at Los Angeles (UCLA); John D. McNeil, Professor of Education, UCLA Graduate School of Education; Eva L. Baker, an Associate Professor, UCLA Graduate School of Education; and Jason Millman, Professor of Educational Research Methodology, Cornell University (2, p. 14).

Woodworking 7-12, published by Instructional Objectives Exchange, and priced at $8.00 per copy, states in the Introduction:

The objectives and items contained in this Collection have been adapted from curricular material contributed to the Exchange and, generally, have not been used in their present form in the classroom. The names of the contributors can be found on the acknowledgements page (7, p. iv).

There is no acknowledgements page.

In the Introduction, this book states "The Woodworking Collection" is composed of fifty-five objectives and related items of evaluation for grades seven through twelve (7, p. vi). Examination reflects that of the total fifty-five objectives in the book, objectives twenty-six through thirty-two deal with "Making Joints" and objectives thirty-three through thirty-six deal with "Fastening Joints"; objectives forty through forty-eight pertain to "Finishing."
Brooks and Brueckman, in 1974, listed the names of twenty-two individuals at various universities and colleges throughout the United States which have "action oriented IACBTE programs" (1, p. 12). Fourteen letters were sent to individuals on this list, including Brooks (see Appendix A), requesting material or referral to related research concerning performance objectives or competencies for a college-level competency-based industrial arts woodworking course. Appendix B is a sample, which is typical, of the letters sent to the persons mentioned.

Thirteen replies were received; however, none of the replies furnished any specific information concerning technical competencies for a college-level woodworking course in industrial arts. Some of the replies contained materials and/or references relating to professional competencies for teachers, and several replies indicated that their work done in CBTE was limited to the professional competencies needed for teacher education. One reply indicated the respondent institution had instructional modules available at that institution for viewing. Another reply stated the respondent institution has done work on competency based programs but the materials are classified and cannot be sent elsewhere.

Several other letters, similar to the fourteen mentioned above, were sent to the U. S. Office of Education,
U. S. Department of Health, Education and Welfare, the Texas Education Agency and individuals at educational institutions whose names have appeared in CBTE literature as active in the CBTE movement. None of the responses received contained any specific information concerning technical competencies for a college-level woodworking course in industrial arts.
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7. *Woodworking, 7-12* (author not given), Los Angeles, Instructional Objectives Exchange, no date.
CHAPTER III

TREATMENT AND ANALYSIS OF DATA
AND FINDINGS

Sources of Data

The primary data of this study are the technical competencies necessary for a beginning industrial arts teacher to possess for a CBTE program. The existing behavioral objectives listed for the various woodworking courses by the Industrial Education Department of North Texas State University constitute the foundation for technical competency clusters set forth in this study. Also considered are the skills listed on the "Frequency Chart of Job Skills" in The General Woodworking Core Curriculum: Project Able (4, p. 12) and the information and woodworking procedures set forth in the first thirty-nine units of Woodworking for Industry (2, pp. 12-402).

Organization and Treatment of Data

The data for this study are divided into twenty-seven clusters of technical competencies. The first five clusters deal with (1) orientation, (2) care of laboratory, tools and equipment, (3) safety, (4) wood technology, and
(5) careers related to wood and woodworking. The following clusters of competencies, where feasible, follow the orderly sequence of procedure for working with the tools, equipment and materials used in woodworking. For example, a knowledge of units of measurement and the use of tools for measuring and marking precede the cluster of competencies involving reading blueprints, sketching and execution of working drawings; the clusters dealing with the use of cutting and boring tools precede the clusters on the construction of joints, adhesives, and abrasives. It should also be noted that all the clusters of competencies involving operations performed by hand precede those clusters of competencies involving the use of power machinery and equipment. No effort was made to have an equal number of technical competencies in each cluster, rather the technical competencies which are directly or closely related are included in a cluster. The technical competencies in each cluster are of a general nature rather than specific.

Shane and Shane quote Tyler as follows regarding behavioral objectives and performance objectives,

I think many current uses of the term, behavioral objectives, imply procedures that are too specific. I believe that the individual human being is able to solve many of his own problems and so I think that more of our educational objectives should be general in nature--like learning how to go about attacking problems, finding out where the difficulties are, getting information, analyzing the data, and drawing inferences from data.
Hence in my view, many behavioral objectives should be set at a considerably higher or more general level than the extremely specific things I find in many current efforts to write them.

... behavioral objectives is a statement of what teachers are trying to help students learn from their instruction—the ways of thinking, feeling, or acting that they want students to develop.

Performance objectives tend to pertain only to matters of overt behavior, to what students do that one can see. . . .

I think many people who are trying to use behavioral objectives today perceive them as very specific kinds of behavior. If they consider that's what schools are all about, they are confusing knowing answers with being educated. . . . (5, pp. 42-43).

Some years before the terms "behavioral objectives" and "performance objectives" became common in the field of education, Fryklund wrote

The breaking-up of information topics into fine classifications and the listing of separate classifications on paper under separate subject headings . . . is hard to do and unnecessary. In order to teach such information, the parts must be put together again by the teacher. Such an analysis places a burden on the shop teacher. It hinders rather than helps him. It merely makes the instructional material look formidable to the person who does not know otherwise, but it is of little help to the teacher who is supposed to use it. . . . (3, pp. 56-57).

A cover letter (Appendix D) and a questionnaire (Appendix E) listing twenty-seven clusters of technical competencies were sent to ninety-one individuals in eighty-six school districts throughout the state of Texas. These individuals are listed by the Texas Education Agency, Public School Occupational Programs, Industrial Arts
Education, as "Personnel Responsible for Industrial Arts Supervision in Texas in 1974-1975."

These supervisors were requested to evaluate each cluster of technical competencies listed on the questionnaire for beginning industrial arts woodworking teachers by placing a check mark under one of three categories according to their judgment. The categories are (1) Essential, (2) Desirable, and (3) Unnecessary. Space was left after each cluster for comment, and space was left at the end of the questionnaire for general comments.

Analysis of Data

Of the ninety-one questionnaires mailed on July 22, 1975, fifty-seven responses were received by September 6, 1975, a return of 62.64 percent. On September 6, 1975, a postal card reminder (Appendix F) was sent to the thirty-four persons who did not respond to the original mailing. Nine responses were received by September 27, 1975, in answer to the reminder, making a total of sixty-six responses for a return of 72.53 percent.

Three of the questionnaires returned were completely blank in the evaluation of the twenty-seven clusters, and these questionnaires were accompanied by explanatory notes indicating that the respondents' school districts did not have industrial arts programs.
Table I shows the evaluation totals of the three categories for each cluster of competencies in the questionnaires completed. Table I does not include in the totals those instances when a particular cluster was not evaluated on an otherwise complete questionnaire. Such evaluations were omitted once for each of the following clusters: one, four, five, seven, twenty-three, and twenty-four. Because one respondent checked more than one category for cluster two and for cluster three, these responses were invalidated and these two responses were omitted from the totals for these clusters in Table I.

Findings

In an effort to further analyze and give meaning to the data, after tabulating the responses, a weighted rating was assigned to each evaluation category for every cluster, in a manner similar to that used by Envick in his doctoral dissertation "Competencies Desired for Employment in the Plastics Industry" (1). For this study, each evaluation of "essential" was given a numerical rating of two; each evaluation of "desirable" was given a numerical rating of one; and each evaluation of "unnecessary" was given a rating of zero. The numerical ratings for each evaluation category were added for each cluster, and the totals were divided by
<table>
<thead>
<tr>
<th>Cluster No.</th>
<th>Essential</th>
<th>Desirable</th>
<th>Unnecessary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
<td>33</td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td>44</td>
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<td>6</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>37</td>
<td>21</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>24</td>
<td>32</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
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<td>10</td>
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<tr>
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<td>2</td>
</tr>
<tr>
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<td>39</td>
<td>23</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>60</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>56</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>47</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
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<td>43</td>
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<td>1</td>
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<tr>
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</tr>
<tr>
<td>27</td>
<td>53</td>
<td>10</td>
<td>0</td>
</tr>
</tbody>
</table>
the number of valid responses. Each cluster was then rated "essential," "desirable" or "unnecessary" according to the scale below:

   Essential . . . . . 1.50-2.00
   Desirable . . . . . 0.50-1.49
   Unnecessary . . . . 0.00-0.49

Appendix G shows the weighted responses for each cluster. Table II shows the total of the weighted responses for each cluster divided by the total number of valid responses, resulting in a weighted numerical rating for each cluster which is then given an adjectival rating according to the scale above.

In those instances in which respondents did not check any of the three evaluation categories for one or more of the competency clusters, the total number of valid responses was reduced by one; and when more than one category was checked for a particular cluster, that response was invalidated and subtracted from the total number of valid responses. Thus, competency clusters one, two, three, four, five, seven, twenty-three, and twenty-four show totals of sixty-two valid responses while all the other clusters show totals of sixty-three valid responses.
TABLE II

WEIGHTED RATING OF RESPONSES TO QUESTIONNAIRE RESULTING IN OVERALL RATING FOR EACH CLUSTER

<table>
<thead>
<tr>
<th>Cluster No.</th>
<th>Weighted Total</th>
<th>Divided by Total Number of Responses</th>
<th>Weighted Numerical Rating</th>
<th>Overall Evaluation of Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>63</td>
<td>62</td>
<td>1.01</td>
<td>Desirable</td>
</tr>
<tr>
<td>2</td>
<td>101</td>
<td>62</td>
<td>1.63</td>
<td>Essential</td>
</tr>
<tr>
<td>3</td>
<td>110</td>
<td>62</td>
<td>1.77</td>
<td>Essential</td>
</tr>
<tr>
<td>4</td>
<td>95</td>
<td>62</td>
<td>1.53</td>
<td>Essential</td>
</tr>
<tr>
<td>5</td>
<td>80</td>
<td>62</td>
<td>1.29</td>
<td>Desirable</td>
</tr>
<tr>
<td>6</td>
<td>116</td>
<td>63</td>
<td>1.84</td>
<td>Essential</td>
</tr>
<tr>
<td>7</td>
<td>96</td>
<td>62</td>
<td>1.55</td>
<td>Essential</td>
</tr>
<tr>
<td>8</td>
<td>101</td>
<td>63</td>
<td>1.60</td>
<td>Essential</td>
</tr>
<tr>
<td>9</td>
<td>123</td>
<td>63</td>
<td>1.95</td>
<td>Essential</td>
</tr>
<tr>
<td>10</td>
<td>119</td>
<td>63</td>
<td>1.89</td>
<td>Essential</td>
</tr>
<tr>
<td>11</td>
<td>110</td>
<td>63</td>
<td>1.75</td>
<td>Essential</td>
</tr>
<tr>
<td>12</td>
<td>116</td>
<td>63</td>
<td>1.84</td>
<td>Essential</td>
</tr>
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<td>105</td>
<td>63</td>
<td>1.67</td>
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<td>114</td>
<td>63</td>
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<td>Essential</td>
</tr>
<tr>
<td>15</td>
<td>106</td>
<td>63</td>
<td>1.68</td>
<td>Essential</td>
</tr>
<tr>
<td>16</td>
<td>110</td>
<td>63</td>
<td>1.75</td>
<td>Essential</td>
</tr>
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<td>17</td>
<td>104</td>
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<td>111</td>
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<td>Essential</td>
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<tr>
<td>20</td>
<td>116</td>
<td>63</td>
<td>1.84</td>
<td>Essential</td>
</tr>
<tr>
<td>21</td>
<td>123</td>
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<tr>
<td>26</td>
<td>121</td>
<td>63</td>
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<td>Essential</td>
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<tr>
<td>27</td>
<td>116</td>
<td>63</td>
<td>1.84</td>
<td>Essential</td>
</tr>
</tbody>
</table>
Respondents' Comments

Of the sixty-three questionnaires returned completed, thirty-two contained no comments on either the specific clusters or on the questionnaire in general. Thirty-one questionnaires contained comments, either on specific clusters or comments in general, or both. Although both the heading of the questionnaire and the cover letter state that this study is for the purpose of deciding upon competencies needed for beginning industrial arts woodworking teachers, many of the comments, both specific and general, indicate the respondents were also thinking of secondary school students of industrial arts as well as competencies needed by beginning industrial arts woodworking teachers. This is illustrated by the negative comments of nine respondents concerning written tests which are included in clusters one, three, four, five, seven, and sixteen. One respondent stated the tests would bore the students; others indicated a preference for oral tests; and some wanted demonstrations rather than written tests. Regarding cluster number five, one respondent wrote "Students lack of interest is very noticeable." Another respondent commented that careers should not be taught as a unit but "fused" in teaching.

Other comments favored cluster number five, such as "More important today than ever before"; "Becoming more
important daily"; and "An area we find our teachers are weak in."

One respondent indicated that in addition to passing a written test on general safety practices (cluster number three), there should be a written test covering specific safety rules on individual tools. One comment regarding cluster number nine indicated that lineal feet and square feet should be included along with board feet. One of the comments concerning cluster number thirteen indicated it is good to know how to sharpen bits, but this equipment is replaced more than it is renewed. The wood lathe and accessory tools is the subject of cluster number twenty-five, and one respondent stated that the wood lathe seems to be the least useful tool in shops today because few people earn a living operating a wood lathe.

Of the twenty-two questionnaires returned with general comments at the end, six questionnaires (27 percent), indicated that more emphasis should be given to lubrication and other care, maintenance and repair practices for tools and equipment. Some of the general comments emphasized safety, and others indicated that necessary competencies should include planning, organizing, budgeting, step-by-step construction procedures, and mass production principles. Eight of the twenty-two questionnaires with general comments (35 percent) contained comments indicating approval of the
competencies listed. One of these respondents indicated his school district has several vacancies and any applicant who could qualify on 50 percent of these competencies would be considered. Another comment in this group stated that it would be hard to find a teacher possessing all the competencies listed. However, another respondent in this group commented that woodworking teachers must have these competencies for maximum effectiveness, but unfortunately too many with teaching certificates do not have them.

None of the sixty-six questionnaires returned contained any comment unfavorable to a competency-based approach to education of industrial arts woodworking teachers.
CHAPTER BIBLIOGRAPHY


CHAPTER IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS
FOR FURTHER STUDY

Summary

Competency-Based Teacher Education (CBTE) is considered by many professional educators to be the answer to the demand for accountability, or effectiveness and efficiency, in education. This educational philosophy requires that competencies be written in performance terms in advance of instruction; that these competencies be made known to the students and that they also be told in advance of the criteria to be used in evaluating their mastery of the expected competencies; and the students' rate of progress be determined by demonstrated performance which implies individualized and personalized instruction.

While a recently enacted Texas law reverses a former mandate requiring all state colleges and universities to implement CBTE by the fall of 1977, and states that the Texas State Board of Education may not require teacher education institutions to conform to such a program, the law does not specifically prohibit these institutions from following such a program.
The problem of this study was limited to identifying competencies essential for the beginning industrial arts woodworking teacher in Texas secondary public schools. Literature regarding CBTE indicates a growing interest in it outside the field of education, in the fields of science, technology and business.

The writings concerning CBTE, reviewed in connection with this study, and inquiries directed to professional educators active in CBTE programs and research failed to produce any lists of competencies essential for beginning industrial arts woodworking teachers.

Twenty-seven clusters of competencies were listed on a questionnaire sent to ninety-one supervisors of industrial arts in Texas public schools for their evaluation of these competency clusters as Essential, Desirable or Unnecessary. Sixty-six questionnaires were returned, three of which were not executed because the school districts involved had no industrial arts program. A weighted scale was used to determine an overall evaluation for each of the clusters, with the result that twenty-five of the twenty-seven clusters were judged to be Essential, and two were judged to be Desirable. None of the twenty-seven were judged to be Unnecessary in the overall evaluation.
Conclusions

Because this study found that twenty-five of the competency clusters listed in Appendix E are considered essential for beginning industrial arts woodworking teachers, it was concluded that the competencies included in these clusters should be made a part of the curriculum required for industrial arts woodworking teachers. The other two clusters listed in Appendix E are considered desirable by Texas industrial arts supervisors, and the competencies in these clusters should be made a part of the curriculum if such considerations as time, money, and space permit.

It was also concluded that some of the essential competency clusters should be given more emphasis and more instructional time than others because the weighted ratings showed these clusters to be near the top of the rating scale for Essential, while some were very close to the bottom of the rating scale and others were near the center of the scale. The competency clusters which should be given more emphasis and instructional time are the following: cluster number nine which is concerned with figuring bills of material; cluster number ten which deals with the identity, use and care of hand tools for cutting and sawing; cluster number twenty-one which pertains to identity, use, care and safety practices for power saws; cluster number twenty-two which is concerned with use,
maintenance and safety practices for power jointers, surfacers and hand power planes; cluster number twenty-three which deals with use, maintenance and safety practices for various power drilling tools; and cluster number twenty-six which concerns the proper use, care and safety practices for the different types of power sanders.

Because of the comments of respondents to the questionnaire concerning the competencies essential for beginning industrial arts woodworking teachers, it was concluded that in addition to the competency clusters judged to be essential, more training in care and maintenance of tools should be required by institutions training industrial arts woodworking teachers. These comments also support a conclusion that these institutions place more emphasis, through additional training, on careers in woodworking and in related occupational areas.

It was further concluded that North Texas State University give careful consideration to implementing a CBTE program for industrial arts woodworking. Such a program would not delete any objectives in the current woodworking curriculum, since the competency clusters for this study are based to a great extent on behavioral objectives in the current curriculum. It is believed that a CBTE program would add relevancy and effectiveness through having competencies specified to the learners in advance of
instruction, along with criteria specified in advance by which their competency is evaluated.

It is also anticipated that performance-based teacher education will necessitate modularization of a large part of the curriculum and considerably more emphasis on individualized instruction. In short, competency-based teacher education is the catalyst that can revitalize the teacher education enterprise by inviting and demanding an evaluation of individual and institutional effectiveness at every level (2, pp. 2-3).

The CBTE approach to education and the methods used may be new; however, the goal is unchanged. Grieve, in addressing the Seventh Annual National Vocational and Technical Teacher Education Seminar held in October, 1973, in Dallas, Texas, stated

Although the demand for accountability seems to be getting more emphasis these past few years it is not a new concept. Outstanding teachers and teacher educators have always had that as a major goal (1, p. 127).

If North Texas State University is to remain in the forefront of industrial arts teacher training institutions, it cannot afford to be among the last to adopt a system which is apparently already widely accepted as successful.

Recommendations for Further Study

This study deals only with technical competencies for a beginning industrial arts woodworking teacher. Before a CBTE program can be put into effect, other facets of such a program must be given careful study. In general, competency-based education programs emphasize individualized
advancement based on performance criteria rather than a certain number of hours spent in the classroom and laboratory. This approach to advancement would require further study of how to put this into effect in an efficient manner which would be satisfactory to students, faculty, and administration.

Another factor requiring further study is that of evaluation criteria, which is the basis for advancement and for certification of competency in a CBTE program. That study would deal with such questions as the following: Must a person achieve a performance objective of 100 percent in a stated competency to be considered competent? If 100 percent competency is too demanding, what is the dividing line between competency and incompetency? Can a person average his performance achievements so that if he rates below the acceptable competency level in some areas he can still be certified as competent if he rates high in enough other areas to obtain an acceptable overall competency?

Such studies would be worthwhile if CBTE is adopted with the expectation that it will result in more effective schooling.
CHAPTER BIBLIOGRAPHY


APPENDIX A

PERSONS FROM WHOM MATERIAL WAS REQUESTED

The following persons were sent letters requesting material or referral to related research concerning performance objectives or competencies for a college-level competency-based industrial arts woodworking course.

Stanley E. Brooks
State University College at Buffalo
Buffalo, New York

David L. Jelden
University of Northern Colorado
Greeley, Colorado

A. Dean Hauenstein
Florida International University
Miami, Florida

Franzie Loepp and Bessie Hackett
Illinois State University
Normal, Illinois

R. Thomas Wright
Ball State University
Muncie, Indiana

Robert Wenig
Iowa State University
Ames, Iowa

Robert Kuhl
University of Minnesota
Minneapolis, Minnesota

William Alexander
Trenton State College
Trenton, New Jersey
Philip Wynn
Millersville State College
Millersville, Pennsylvania

Walter Hall
Prairie View A & M University
Prairie View, Texas

W. A. Mayfield
Texas A & M University
College Station, Texas

Ross C. Hilton
Southern Utah State College
Cedar City, Utah

Harold Silvius
Wayne State University
Detroit, Michigan

Larry Wright
University of Wisconsin--Stout
Menomonie, Wisconsin
APPENDIX B

TYPICAL LETTER SENT TO EDUCATORS REQUESTING MATERIAL OR RELATED RESEARCH

June 29, 1975

Dr. Philip Wynn
Millersville State College
Millersville, Pennsylvania

Dear Dr. Wynn:

I am a graduate student at North Texas State University working toward the Master of Science degree in industrial arts. My thesis topic is "Identifying Performance Objectives for Use in Developing a College-Level Competency-Based Curriculum for Industrial Arts Woodworking Teachers."

It is my understanding that MSC has an action oriented Industrial Arts Competency-Based Teacher Education Program, and I would appreciate any material you can furnish or related research to which you can refer me that would be pertinent to my thesis topic.

A stamped, addressed envelope is enclosed. Thank you for any assistance you may give.

Very truly yours,

William C. Hay
12910 Mitchwin Road
Dallas, Texas 75234
APPENDIX C

SKILLS COMMON TO OCCUPATIONS OF MODEL MAKER, BOAT BUILDER, KITCHEN CABINET MAKER AND FURNITURE MAKER (FROM PROJECT ABLLE)

1. Reading blueprints
2. Computing lumber requirements
3. Using spirit level
4. Using hammer
5. Using six-foot rule
6. Sawing lumber
7. Using level
8. Measuring to nearest one-fourth inch
9. Measuring angles
10. Using hand drill
11. Using straightedge
12. Using jigsaw
13. Measuring to nearest one-sixteenth inch
14. Using scribe
15. Using planes
16. Using nailset
17. Using square
18. Using screwdriver
19. Identifying lumber
20. Layout
21. Using knife
22. Using chisels
23. Identifying joinery
24. Computing dimensions
25. Fitting joints
26. Milling
27. Using bit brace
28. Using auger
29. Using mallet
30. Using putty knife
31. Sanding
32. Using coping saw
33. Applying finish
34. Measuring to nearest one-thirty-second inch
35. Operating circular saw  
36. Operating surface planer  
37. Operating shaper  
38. Operating borer  
39. Operating tenoner  
40. Operating mortiser  
41. Operating moulder  
42. Operating sander  
43. Operating jointer  
44. Making stock lists  
45. Gluing  
46. Uses spray equipment  
47. Computing material required  
48. Using layout tools  
49. Uses adhesive tools  
50. Cleaning area  
51. Operating lathe  
52. Applying sealer  
53. Arranging assembly sequence  
54. Uses scales  
55. Using gouges  
56. Using scrapers  
57. Operating saw filer  
58. Operating band saw  
59. Operating drill press  
60. Operating router  
61. Using router plane  
62. Using spokeshave  
63. Making up joints
APPENDIX D

COVER LETTER FOR QUESTIONNAIRE

July 22, 1975

Dear Sir:

You and other Industrial Arts Supervisors throughout Texas are being requested to help in a study by completing the enclosed questionnaire.

As a graduate student at North Texas State University, I have chosen to write my master's thesis on technical competencies needed by beginning industrial arts woodworking teachers in secondary public schools. Dr. Earle Blanton, Chairman, Department of Industrial Education; Dr. Tommy Koonce, my major professor in this study, and others of the faculty at NTSU agree that you and other Supervisors are in the best position to decide upon the competencies needed for beginning industrial arts woodworking teachers in Texas secondary public schools.

The enclosed questionnaire deals only with technical competencies in the area of woodworking, and no attempt is being made to separate competencies by grade level. It is hoped that this study will contribute to the overall competency industrial arts woodworking teachers trained at NTSU will possess.

The enclosed questionnaire should take only a few minutes of your time. If you do not supervise woodworking, please forward this letter to the proper person with the enclosed stamped, addressed envelope. You are requested to identify your school system as a means of cross-checking replies. It is felt that if Supervisors sign their names and titles, it will lend weight to this survey. No respondents or school systems will be identified by name in the thesis.
"Time is of the essence." Your prompt reply will be very much appreciated.

Thank you for your attention and your help in this matter.

Very truly yours,

William C. Hay

Approved by: Tommy R. Koonce, Ed. D.
Assistant Professor of Industrial Education
APPENDIX E

QUESTIONNAIRE REGARDING TECHNICAL COMPETENCY CLUSTERS FOR BEGINNING INDUSTRIAL ARTS WOODWORKING TEACHERS

**DIRECTIONS:** Please indicate your opinion of the competency clusters listed below by placing a check ( ) in one of the columns to the right of the listing of that competency cluster. Add comment, if desired, after each cluster.

<table>
<thead>
<tr>
<th></th>
<th>ESSENTIAL</th>
<th>DESIRABLE</th>
<th>UNNECESSARY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pass written orientation test regarding institutional and departmental policies concerning class attendance, payment for materials, size and time limitations on projects.</td>
<td></td>
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<td>Comment:</td>
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<tr>
<td>2. Participate equally with other students in care and maintenance of tools and equipment and in cleaning laboratories.</td>
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<td>Comment:</td>
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<td>3. Pass written test on general safety practices; observe such practices in laboratory work.</td>
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<td>Comment:</td>
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<tr>
<td>4. Pass written tests in wood technology such as wood identification, proper use of various types of wood and wood products, methods of cutting boards from logs, seasoning and grading of lumber.</td>
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<td>Comment:</td>
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<td>5. Pass written test concerning careers related to wood and woodworking.</td>
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<td>Comment:</td>
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<tr>
<td></td>
<td>ESSENTIAL</td>
<td>DESIRABLE</td>
<td>UNNECESSARY</td>
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<td>6.</td>
<td>Demonstrate proper use of layout, checking and measuring tools such as rules and tapes, various squares, sliding T bevel, dividers, trammel points, levels, marking gauge, scratch awl, plumb bob and line. Comment:</td>
<td></td>
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<td>7.</td>
<td>Pass written test for blueprint reading and for elements and principles of good design. Comment:</td>
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<tr>
<td>8.</td>
<td>Demonstrate ability to sketch, make pictorial drawings and working drawings of woodworking projects. Comment:</td>
<td></td>
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<td>9.</td>
<td>Correctly figure bill of materials including board feet of lumber, cost of fasteners, hardware, finishing materials. Comment:</td>
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<tr>
<td>10.</td>
<td>Correctly identify, use and care for sawing and cutting tools such as hand saws of various types, hand planes, chisels, gouges, spokeshaves, scrapers. Comment:</td>
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<tr>
<td>11.</td>
<td>Demonstrate proper method of sharpening plane irons, chisels, scrapers, etc. Comment:</td>
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<tr>
<td>12.</td>
<td>Correctly identify, use and care for boring and drilling hand tools such as brace and various types of bits, hand drill and twist bits, automatic drill.</td>
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<tr>
<td>13.</td>
<td>Demonstrate proper method of sharpening bits for hand drilling and boring tools. Comment:</td>
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<td></td>
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</tbody>
</table>
14. Demonstrate the ability to identify and use the following joints: scarf, butt, edge, rabbet, dado, lap, miter, mortise and tenon, and dovetail.  
Comment:

15. Demonstrate or describe orally or written, strengthening of joints with dowel, key, spline, glue block, corner block and gusset.  
Comment:

16. Pass written test and/or demonstrate proper use of nails, woodscrews, special fasteners, hinges, drawer pulls, handles, locks, etc. and tools used in installation (hammers, screwdrivers, nailsets).  
Comment:

17. Demonstrate proper method for using patterns and templates, making geometric shapes, irregular shapes, chamfers, bevels, and tapers.  
Comment:

18. State orally or in writing the various kinds of commonly used glues, proper use of these glues, preparation of material for gluing and identify different types of clamps and state proper usage. Demonstrate at least one type of glue after proper preparation of material; use proper clamps.  
Comment:

19. Identify abrasive supplies (various types and grades of abrasive paper and steel wool), and tools such as wood rasps, files, surform tools. Demonstrate use of appropriate abrasive supplies and tools. Observe safety practices.  
Comment:
20. Demonstrate ability to correctly apply handfinish, including use of wood sealers when appropriate, use of paint, enamel, bleaches, stains, varnish, waxes, oils, rubbing compound; use and care of brushes. Comment:

21. Identify various power saws (circular saw, band saw, radial arm saw, jig saw, panel saw, portable hand power saw). Demonstrate proper use of saws with the various blades commonly used in woodworking. Observe proper safety practices in use of saws. Demonstrate care and maintenance of machines and blades. Comment:

22. Identify, use, and maintain power jointers, surfacers, hand power planes. Observe safety practices. Comment:

23. Use and maintain in proper manner drill press, mortiser (or mortise attachment for drill press), hand power drills. Observe safety practices. Comment:

24. Use in proper manner, shaper with variety of cutting heads. Demonstrate proper care and maintenance of machine and cutting heads. Use in proper manner and with variety of cutters the portable hand power router, demonstrate ability to use guides, templates, and free-hand. Observe proper safety practices. Comment:
25. Identify and demonstrate proper use of, care and maintenance of wood lathe and accessory tools. Demonstrate by scraping and by cutting; spindle and faceplate turning. Observe proper safety practices. Comment:

26. Identify and demonstrate proper use of power sanders (belt, disc, drum, portable hand). Demonstrate care and maintenance of machines, proper use of various grades of abrasives. Observe proper safety practices. Comment:

27. Identify and demonstrate proper use, care and maintenance of power spray equipment; demonstrate proper use of finishing materials used in spray equipment. Observe proper safety practices. Comment:

NOTE: Please use space below and back of page(s) for comments, criticism, additions, deletions, etc., as you consider helpful. Thank you for your time and assistance.
Dear Sir:  

You were mailed a Questionnaire Regarding Technical Competency Clusters for Beginning Industrial Arts Woodworking Teachers on 7/22/75.

If you were on vacation, or if the tasks of starting a new school year caused a delay in returning this questionnaire, would you take a few minutes now to complete and return it in the stamped, addressed envelope provided?

Your cooperation will be greatly appreciated.

William C. Hay
APPENDIX G

TABULATION OF WEIGHTED RESPONSES FOR EACH CLUSTER

<table>
<thead>
<tr>
<th>Cluster No.</th>
<th>Essential Responses X 2</th>
<th>Desirable Responses X 1</th>
<th>Unnecessary Responses X 0</th>
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<td>104</td>
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