IDENTIFYING AND ASSESSING TECHNICAL COMPETENCE OF PROSPECTIVE TEACHERS

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There is growing recognition that competency-based teacher education must be concerned with technical as well as professional competence. It is therefore imperative that the profession identify the technical competencies needed by teachers of agriculture. It is also important to consider possible approaches for establishing and measuring level of technical competence.

Identification of Technical Competency Requirements

Recent research has been conducted to identify the competencies essential to successful performance in agricultural occupations There are few occupational areas in agriculture where there is total absence of at least one competency study. Teacher educators need to make use of existing information in developing a systematic procedure to insure that teachers possess the needed competencies.

A major recommendation resulting from a study (McCracken and Yoder, 1975) conducted at Ohio State University was that the resulting task inventories should be used as a resource in developing the technical agriculture competencies needed for competency-based teacher education programs. Twenty-eight different agricultural occupations were studied to arrive at a list of validated tasks believed to be essential across instructional areas, and a list believed to be valid across all agricultural occupations. Little commonality was discovered in the technical competencies required to teach in the different instructional areas found within the broad field of Agricultural Education. The technical preparation of a horticulture teacher must be considered as something quite different from the technical preparation of a production agriculture teacher.

Problems in Establishing Level of Competence

A thorough review of the literature would serve as a starting point in listing the technical competencies desirable for graduates of teacher education programs in agriculture. The listings may not, however, provide a true picture.

Is it really necessary for a teacher to possess all the competencies on the production agriculture list in order to be a qulaified teacher? Many teacher educators would readily admit that they were not competent in all the areas of production agriculture at the beginning of their first year of teaching. Some may have been very competent in some areas and somewhat deficient in others They were also to succeed by involving community resource persons, studying with the students, taking additional formal study, and utilizing concentrated practice.

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Interesting questions for further research remain. What are the minimum levels of mastery needed to succeed in teaching? What is a desirable breadth of technical competence to possess for acceptable performance in teaching?

Existing competency lists are designed to communicate the tasks essential for occupational success. They are written in terms of what the worker does. Should teachers be prepared in only these "doing" skills? To what extent must beginning teachers also understand the principles and underlying theory supporting the performance of job skills?

Should we even attempt to establish minimum levels of technical competence? It is possible that one teacher might succeed with little technical competence and another fail even though the level of technical competence is high. It is for this reason that a hypothesis is forwarded: "Minimum levels of professional and technical competence required for success in teaching are inversely proportional " In other words, when the level of technical competence is high, a teacher can succeed with less professional competence than normal. When the level of professional competence is high, a teacher can succeed with less technical competence than normal.

Even though some questions might be raised concerning the use of existing competency list, this is the best information that is currently available. Procedures for using such listings in further program development should be explored.

Students are entering Agricultural Education preservice programs with more specialized experiences. Many possess only experience in crop farming, and even then are unable to calibrate a corn planter or adjust a harvesting machine. Many students preparing to enter specialized instructional areas, without prior occupational experience, are seeking help from teacher educators in securing needed technical competence.

Assessment of Technical Competence

After technical competencies needed by entering teachers have been identified, another equally important and difficult task is the assessment of the extent to which prospective teachers possess the technical competencies deemed essential or desirable. Assessment of competencies possessed is a part of the competency-based approach that is as important as the identification of competencies; therefore, valid and reliable assessment of level of competence is an essential element of the competency-based strategy.

Present Procedures for Assessing Competence

Two basic strategies have been used for assessing the level of technical competence of beginning teachers of agriculture. Primarily these assessments are made at the time the prospective teacher applies for certification; however, in some cases a partial assessment is made at the time the prospective teacher formally enters a pre-service edu-

cation program. For teachers who complete a preservice teacher education program in a college or university, assessment of technical competence is largely in terms of the number of credit hours of course work completed in the subject matter areas that comprise or are closely related to the instructional content that the teacher will teach once he or she is on the job. If prospective teachers have completed certain courses, they are assumed to possess at least the minimum level of technical competence needed to enter teaching.

A second approach to assessing technical competence is no more defensible than the "credit hours earned" approach. "Years of work experience in an occupation" is used also as an indication of the level of technical competence. This criterion has been used when teachers are recruited directly from business and industry Admission to an undergraduate teacher education program in Agricultural Education frequently involves evidence of some relevant work experience. Also, certification upon completing a formal preservice teacher education program usually requires evidence of some minimal amount of relevant experience in the world of work.

Proposed Procedures for Assessing Technical Competence

The proposed procedures for assessing technical competence are based on the assumption that the prospective teacher acquires technical competence through structured learning experiences, formal course or independent study, and experiential learning Two points need to be made clear. The first is that learning through formal study and experiential learning are not mutually exclusive. It is possible and highly desirable, to have overlap between the two. The second point is that acquiring knowledge is not associated exclusively with formal study and acquiring skill associated exclusively with experiential learning.

A quick and unscientific way of using existing competency lists to assess level of technical competence is self-assessment by students. Shown in Figure 1 is an example of part of a skills inventory currently in use in the Department of Agricultural Education at The Ohio State University For each duty area identified in the competency listings, students rate themselves on specific tasks Emphasis has been placed on practical skills which may not be included in college-level courses. Students needing experience are placed in occupational internships supervised by local teachers of Vocational Agriculture. The skills inventory serves as a pre- and post-assessment of the internship experience. In addition to the self-assessment, students on an internship must submit a monthly activity report (Figure 2). They must rate themselves concerning the jobs performed, skills learned, and level of proficiency attained. The report is verified by the employer

Another possibility for systematically assessing the technical competence possessed by entering teachers is the application of the competency-based strategy to technical competencies in the manner that it is being applied to the professional competencies of entering teachers. For preservice teacher education programs, this means the application of the competency-based approach to technical courses in agriculture

Figure 1: Skills Inventory	Can Perform with No Supervision	Can Perform with Little Supervision	Can Perform with Much Supervision	Can Not Perform
Handling and Caring for Livestock				
Help Deliver Calves and Pigs				
Help Young to Nurse				
Bed Animals				
Castrate Animals				
Dehorn Animals				
Trim Feet				
Clip Animals				
Clip Needle Teeth on Pigs				
Give Iron Shots				
Weigh Animals				
Wean Animals				
Move and Pen Livestock				

Figure 2: Intern Activity Report

Breakdown of Jobs Performed (Be Specific)	Approximate Number of Hours on Each Job Per Reporting Period
Total Number of Hours Worked	

Skills Learned:	Proficiency Some	Average	High

Time Absent from Duty: Days____ Hours____

Reason for Absence(s) _____

Number of Personal Conferences Between

Manager and
Intern_____

Subject_____

--that is, courses in animal science, agronomy, agricultural engineering, horticulture, and the other subject matter areas

Applying competency-based strategies to technical subject matter courses is not accomplished by decree from faculty members in Agricultural Education departments or personnel in state departments of education The technical courses are planned, taught, and administered by persons expertly qualified in their technical speciality who rightfully claim that they know a great deal about what courses in the technical subject areas should include, how the courses should be taught, and how students should be assessed. Our job is one of working with experts in the technical subject matter areas to identify more clearly the technical competencies that are to be developed in each course so that satisfactory completion of these courses can be interpreted more specifically as the acquisition of certain knowledge and skills needed by entering teachers.

A third possibility for evaluating technical competence is through criterion-referenced tests, specifically written tests and performance test. Properly developed and validated written tests can be helpful in assessing the prospective teacher's level of knowledge in the technical subject matter areas that he or she will be teaching Properly constructed written tests do not necessarily assess knowledge recall only; written tests can be developed that validly and reliably test understanding of concepts and principles, problem-solving skills, the application of facts and principles, and the acquisition of knowledge that is basic to the proper performance of skills.

If level of skill performance is to be assessed through tests, then performance tests are required The development, validation, and administration of performance tests are difficult, time consuming, and expensive tasks. Probably the most extensive tests for assessing the technical competence possessed by prospective teachers are those developed for trade and industrial education that are administered by the National Occupational Competency Testing Institute--NOCTI (Panitz, 1974). The tests were developed specifically to measure the technical competence of prospective trade and industrial education teachers, many of whom enter teaching directly from industry with little formal study at the post-secondary level

A fourth possible approach for assessing more precisely the technical competencies possessed by prospective teachers pertains specifically to the assessment of knowledge and skills acquired through experiential learning A process whereby an evaluation can be made of learning from experience involves the prospective teacher preparing a "portfolio"--a petition describing the relevant knowledge and skills acquired from experience. The portfolio might include a description of the basic knowledge and skills acquired, an indication of how the teacher sees these knowledges and skills relating to the instructional content to be taught, and some documentation of the learning experiences. Documentation could include letters from employers, samples of work, and certificates indicating successful completion of on-job or industry training programs. Once the portfolio is prepared, then it is up to the appropriate persons to evaluate the petition to determine whether the

prospective teacher possesses an acceptable level of technical competence.

Serious consideration must be given to assessing more systematically the scope and depth of the technical competence prospective teachers have acquired through experiential learning. A topic being discussed widely in higher education today relates directly to the assessment of knowledge and skills acquired through experience. Colleges and universities are seriously discussing how to judge the worth, in terms of academic credit, of learning through experience. The Educational Testing Service and some 160 institutions have formed a program called "Cooperative Assessment of Experiential Learning" in an effort to assess the academic relevance of learning acquired through experience (Carnegie Quarterly, 1975) Several universities now grant credit for occupational experience for teachers in Vocational Education.

Summary

Four possiblilties are proposed for assessing the technical competence possessed by prospective teachers that build on and further extend the "credit hours earned" and "years of occupational experience" criteria. The first is a self-assessment of the breadth and level of technical competence possessed Another is the application of the competency-based strategy to technical competencies needed by entering teachers. The result can be, at best, specific documentation of the technical competencies acquired, or at least "credit hours earned" becomes a more precise indication of the technical competencies possessed by the entering teacher.

The third possibility is the use of written and performance criterion referenced tests that measure level of technical competence, particularly technical competence acquired through experiential learning. Some major problems in implementing this procedure are the expertise, time and money required to develop, validate, and administer the tests. The fourth possibility is that the prospective teacher prepare a portfolio that describes and documents technical knowledge and skill acquired through experience. The contention is that years of occupational experience is an incomplete criterion for assessing technical competence unless consideration is given to the scope, depth, and nature of those experiences.

Vigorous efforts need to be undertaken to investigate the issues that have been discussed. Some of these issues are the identification of the technical competencies needed by teachers in the various instructional areas, the extent to which the teachers' required technical competencies are identical to the technical competencies required by students upon completion of an occupational education program, and the relationship between a teacher's level of the technical competence achieved by students. A prime candidate for investigation is the hypothesis that postulates an interesting relationship between the levels of professional and technical competence needed by teachers.

If we in the profession really want to evaluate more systematically the technical competence possessed by prospective teachers, the

expertise is available to develop and perfect the necessary procedures. An important concern is whether the commitment is sufficient so that the necessary resources will be allocated to accomplish the task.

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