Adaptive Competency Acquisition of Differently Certified Technology Teachers

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With the national shortage of technology teachers projected to intensify, the alternative certification of those teachers looms as an increasingly likely option for school administrators (Weston, 1997). Numerous studies have compared the effectiveness of alternative certification programs to traditional certification of teachers. These studies have focused on tangible factors and the background of the participants. But consideration has been limited concerning their readiness to manage the complexities of the technology classroom (Litowitz, 1998).

In an attempt to develop a base of understanding related to alternative certification, Truell (1999) explored levels of concern in career and technical educators. These levels of concern focused on seven categories: human relations, classroom management, instructional activities, personal concerns, work conditions, evaluation, and professional growth. The outcome of his research suggested that concerns by both certification types were task oriented. There was limited discussion related to differences in the essence of teaching, particularly with respect to attributes known as adaptive competencies: intuitive and inductive reasoning, practical skills, and people-oriented tasks.

Various types of alternative certification programs exist. Those noted by Litowitz (1998) include the graduate model, suitable background model, strand licensure model, military career transition model, life experience model, and add-on model. Litowitz also notes that "all of these alternative licensure models can provide the advantage of generating greater numbers of teachers, but some models may have inherent weaknesses in terms of quality teacher preparation" (p. 28). Otuya (1992) indicated that subject matter expertise alone is an inadequate foundation for instruc-

tion because teaching requires the transformation of content into situations that enhance a student's learning. Whiting and Klotz (1999) concurred, noting that alternative certification programs that prepare individuals who currently possess the content knowledge but enter the teaching profession without pedagogical skills are ineffective teachers.

Purpose and Framework

The purpose of this project was to determine if there are any differences in the adaptive competency acquisition between technology teachers who have completed a school district add-on alternative certification process and technology teachers who have completed a traditional baccalaureate degree certification program. This comparison should provide school district administrators and teacher educators with additional data regarding the effectiveness of this type of alternative certification process in preparing technology education teachers.

This study examines the adaptive competency acquisition of technology teachers certified through the add-on licensure model. The add-on model is an option for teachers who hold a teaching certificate in a discipline other than technology (Litowitz, 1998), who are then provided training related to the technical content of technology. One advantage of this model is that the individuals already have experience related to pedagogical skills and classroom management. However, it is important to examine whether such academic classroom skills can transfer to a technology laboratory environment.

Kolb's (1976) experiential learning theory was used to form the basic tenet of the conceptual framework for this study. This model was chosen because of its usefulness in determining competency acquisition (Laschinger, 1992).

Kolb's view of learning is centered on the assumption that learning does not occur in isolation, but through personal-environmental interactions; these interactions extend beyond formal learning situations into lifelong personal and work experiences (Kolb, 1976; Smith & Kolb, 1986; Ridley, Laschinger, & Goldenberg, 1995). Learning is conceptualized as a cycle that can be summarized through three central concepts: learning styles, adaptive competencies, and environmental press perceptions (Kolb, 1976; Smith & Kolb, 1986). The first area, learning styles, are the means by which an individual processes information. Adaptive competencies, the second area, are the skills required to effectively complete a particular task. The third area, environmental press perceptions, are the learners' views of their competency acquisition. Thus, the acquisition of adaptive competencies served as the conceptual framework of this study.

Adaptive competencies are the skills required to effectively complete a particular task and are the congruencies (balance) between personal skills and task demands (Kolb, 1984; Ridley et al., 1995). These adaptive competencies are accommodative, assimilative, convergent, and divergent.

- *Accommodative adaptive competencies* are the skills required to effectively complete intuitive reasoning tasks, including the following abilities: committing oneself to objectives, influencing and leading others, dealing with people, seeking and exploiting opportunities, and being personally involved.
- *Assimilative adaptive competencies* are the skills required to effectively complete inductive reasoning tasks. They include building conceptual models, designing experiments, organizing information, analyzing quantitative

data, and testing theories and ideas.
- *Convergent adaptive competencies* are the skills required to effectively complete problem solving and practical application tasks, and include the following abilities: making decisions, generating alternate ways to do things, experimenting with new ideas and approaches, choosing the best solution, and setting goals.
- *Divergent adaptive competencies* are skills required to effectively complete people-oriented tasks. They include listening with an open mind, being sensitive to values, imaging implications of situations, and being sensitive to people's feelings (Fry, 1981; Kolb, 1976, 1984; Ridley et al., 1995).

This study explored the following research questions:

1. Is there a significant difference between the accommodative adaptive competencies developed by traditionally certified and alternatively certified technology education teachers as measured by the Adaptive Competency Profile (ACP)?
2. Is there a significant difference between the assimilative adaptive competencies developed by traditionally certified and alternatively certified technology education teachers as measured by the ACP?
3. Is there a significant difference between the convergent adaptive competencies developed by traditionally certified and alternatively certified technology education teachers as measured by the ACP?
4. Is there a significant difference between the divergent adaptive competencies developed by traditionally certified and alternatively certified technology education teachers as measured by the ACP?

Laschinger (1992) assessed student achievement related to competency acquisition in the field of nursing educa-

tion through adaptation of the ACP. The fields of nursing education and technology teacher education share learning components; these shared components are documented in *Elements and Structure for a Model Undergraduate Technology Teacher Education Program* (Henak, 1991) and the *Guide to Undergraduate Education* (National League for Nursing, 1995). Based on a review of these documents, the authors noted similarities between undergraduate nursing and technology education curricula as (a) emphasis on the sciences, (b) interpersonal skills, (c) clinical/field experiences, and (d) preparation for a professional licensure examination.

The ACP is an alternate measure of learning style in which participants rate their achievement level on each of the tool's competency questions, using a 7-point Likert-type scale. The items were generated by Kolb and a panel of experts in the fields of engineering and social work in 1981; they represent specific competencies characteristic of each of the four modes of learning espoused in Kolb's learning theory (Fry, 1981). These items were intended to be generic enough to be useful in describing learning orientations of individuals in a variety of disciplines (Kolb, 1984). In this instance the ACP items were used to calculate a personal profile of adaptive competencies. Mean scores on the four competencies indicate the individual's achievement in that area (Sims, 1983).

To calculate the mean scores for each of the four adaptive competencies, the five ACP items for that competency were tabulated and then this sum was divided by five. This process placed the resulting means back into a Likert-type scale range of 1 to 7, with 1 being unskilled and 7 being highly skilled. Only 20 items of the 34-item ACP assessment tool were calculated; the remaining 14 items serve as distracters. Kolb (1984) reported alpha reliability estimates for the subscales between 0.67 and 0.82.

Based on the common emphasis in the sciences, both nursing education and

technology teacher education programs prepare their graduates with the ability to link scientific knowledge and skill with the interpersonal requirements of the profession. This convergence of intuitive and inductive reasoning, problem-solving abilities, and interpersonal skills form the foundations of clinical reasoning for these professions. This research utilized the ACP that was validated previously in nursing education programs by Coyle-Rogers (2001) and Laschinger (1992) to assess the effectiveness of technology teacher education models, both traditional and alternative.

Methods Used

Nonprobability sampling was used for this study. The sample consisted of two groups: 5 teachers who had completed a Midwest school district's add-on alternative certification program for technology education and 10 technology teachers with two years or less of experience, who had graduated from the same Midwest state's land-grant university, The district's add-on model consisted of 80 hours of instruction related to the technical content of the technology education field and was conducted by school district personnel.

The ACP and a demographic assessment constituted the mail survey which was sent to members of both groups. The results provided both individual ACP scores and group ACP means from the Likert-type scale responses. For statistical purposes, the ACP subscale means were compared to determine adaptive competency acquisition. Since this research study involved two samples, the *t* test for independent samples was utilized for statistical analysis (Polit & Hungler, 1991).

The response rate was 80% (*n* = 4) for the alternatively certified technology teachers and 60% (*n* = 6) for the traditionally certified teachers. The alternatively certified technology education teachers averaged 50 years of age and were initially certified to teach special education, foreign language, and health science. The traditionally prepared technology teachers averaged 24 years of age

with two years of teaching experience. Seventy-five percent ($n = 3$) of the alternatively certified teachers and 33% ($n = 2$) of the traditionally certified technology teachers were female.

What We Learned

Overall, the adaptive competency acquisition of the alternatively certified technology teachers was higher than the adaptive competency acquisition of the traditionally certified technology teachers. The acquisition of accommodative adaptive competencies was 6.2 for the alternatively certified teachers and 5.3 for the traditionally prepared teachers. This difference was significantly greater for the alternatively certified teachers when compared to the traditionally prepared technology teachers ($t = 2.582$). Assimilative adaptive competency acquisition was only slightly higher for alternatively certified teachers ($M = 5.2$) than their traditionally prepared counterparts ($M = 5.1$). Both the convergent and divergent adaptive competencies were higher for the alternatively certified sample ($M = 6.0$; $M = 5.7$) than the technology teachers who had completed a university-based traditional program ($M = 5.4$; $M = 5.5$).

Significantly higher accommodative adaptive competency acquisition scores would indicate that these alternatively certified technology teachers can perform intuitive reasoning tasks more effectively than the traditionally prepared teachers. Higher scores by the alternatively certified teachers in relationship to the acquisition of convergent and divergent skills indicated that these teachers effectively developed problem-solving and practical application tasks as well as people-oriented skills. Similar assimilative adaptive competency acquisition scoring between the two technology teacher groups indicated that inductive reasoning tasks were acquired regardless of the certification program structure.

The result indicating a significantly higher accommodative ACP by the alternatively certified teachers was similar to the finding by Shoho and Martin (1999) who reported significantly lower levels of isolation by alternatively certified teachers. Higher acquisition scores in convergent and divergent tasks support the work of Truell (1999) who also noted that alternatively certified teachers indicated lower levels of human relations concerns than traditionally prepared teachers.

What It Means

The difference between the two groups was significant in the accommodative adaptive competency ($t = 2.582$). These findings suggest that these alternatively prepared teachers were able to adapt and successfully manage the environment of the technology education laboratory. However, this difference may be explained by the distinct difference in age and classroom experience between the two samples.

While this study focused on the adaptive competency acquisition, this is only one facet of comparison between the two types of certification of technology education teachers. This study did not examine the technical competency of the alternatively certified technology education teachers. A follow-up study should be conducted to assess whether or not the alternatively certified teachers possess the technical competency to be effective technology education teachers.

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