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COMPETENCY-BASED BEHAVIORAL ANCHORS AS AUTHENTICATION TOOLS TO DOCUMENT DISTANCE EDUCATION COMPETENCIES

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Abstract

This study developed a self-assessment instrument to document growth in distance education core competencies in a graduate course in a land-grant institution. Competency-based behavioral anchors served as authentication tools to document student learning. The researchers used naturalistic inquiry to design the data collection instrument and analyze the data using constant-comparative methods. The authenticated results were reported in three areas: individual and average growth in core competencies, open-ended verification of growth, and attitudinal change. Although individual students showed great variation in competence at the beginning of the course, students had similar competency levels at the end of the course. This competency model worked well as a self-assessment and behavioral benchmarking tool to document student learning and teaching effectiveness. Instructors can use this information to enhance course rigor and modify or refine teaching strategies and content delivery.

Introduction/Theoretical Framework

Some may recall *A Nation at Risk* (The National Commission on Excellence in Education, 1984) that initiated an intense reexamination of the quality of teaching and learning. Educational reformers continue to ask two fundamental questions: How well are students learning and how effectively are instructors teaching? Exams, papers, projects . . . How should we measure what and how much our students have learned? There is public and political pressure on higher education to explain student learning and most colleges have begun to plan assessment strategies. Often administrators are trying to document what is happening in college classrooms, with faculty not fully involved in the process, and the results of the institutional assessment are rarely used to make a difference in the classroom (Angelo & Cross, 1993).

"Through close observation of students in the process of learning, the collection of frequent feedback on students' learning, and the design of modest classroom experiments, classroom teachers can learn much about how students learn and, more specifically, how students respond to particular teaching approaches" (Angelo & Cross, 1993, p. 3). This particular paper and research are based upon this premise. The researchers wanted to provide opportunities for the learners to reflect on their personal growth as they progress in professional competence in the field of distance education.

In agricultural education, numerous studies have been conducted to look at specific student competencies within specific contexts. Place and Jacob (2001) found that Extension employees needed resource management competencies such as time management, workplace, and stress management to be effective. McCormick and Whittington (2000) found that students needed well-developed abilities to think critically at higher levels of cognition. Dyer and Osborne (1996) found that problem-solving skills are needed and could be taught to agricultural education students. Goecker (1992) stated that agricultural education graduate students needed, but did not possess, very high levels of teaching and learning competencies to be effective and productive professionals.

Fewer studies have focused on the compilation of knowledge, skills, and abilities that influence student success

(Garton, Spain, Lamberson, & Spiers, 1999). A student must possess certain knowledge, skills, and abilities in order to complete a planned course of study and graduate (Lindner, Dooley, & Murphy, 2001). Knowledge is a body of information applied directly to the performance of a given activity. Skill is a present, observable competence to perform a learned psychomotor act. Ability is a present competence to perform an observable behavior or a behavior that results in an observable product. Competencies, therefore, establish the behavior requirements needed to be successful as a student. Buford and Lindner (2002) define competencies as a group of related knowledge, skills, and abilities that affect a major part of an activity such as going to school. Competency models can be used: as a student recruitment and selection tool; as a student assessment tool; as a tool to develop curricula and other teaching material; as a coaching, counseling, and mentoring tool; as a career development tool; and as a behavioral requirement benchmarking tool (Yeung, Woolcock, & Sullivan, 1996).

Little research, however, in the agricultural education field has focused on the competencies needed to be successful as a distance education professional. Based on a competency model developed by the American Society for Training and Development (ASTD), Thach and Murphy (1995) identified roles, outputs, and competencies of distance learning professionals within the United States and Canada. Their top 10 competencies portray the dual importance of both communication and technical skills in distance learning. These competencies in rank order were: 1) Interpersonal Communication, 2) Planning, 3) Collaboration/Teamwork, 4) English Proficiency, 5) Writing, 6) Organizational, 7) Feedback, 8) Knowledge of the Distance Learning Field, 9) Basic Technology Knowledge, and 10) Technology Access Knowledge (Thach & Murphy, 1995). Williams (2000) replicated this study with similar results. Others have built complete degree programs (Ally & Coldeway, 1999) or certifications (CDLR, 2001) to provide the coursework or professional development (competence) to work in the growing field of distance education.

Determining competencies needed for a given profession is an important first step, but the difficult task is in trying to measure and verify that competence! Industries, as well as universities, are struggling with appropriate techniques to document professional growth and learning over time. One method for addressing this problem is to develop and use competency-based and behaviorally anchored rating scales to measure student growth. In this study, behavioral anchors are defined as characteristics of core competencies associated with the mastery of content. Competency-based behavioral anchors are defined as performance capabilities needed to demonstrate knowledge, skill, and ability (competency) acquisition. Competency-based behavioral anchors require considerable time and effort to develop, however, they provide more accurate judgments than item-based scales (Buford & Lindner, 2002). Further, such anchors provide teachers and other expert raters with behavioral information useful in providing assessments and feedback to students. Such information can help students better understand their unique bundles of competencies and increase student satisfaction, motivation, learning, and ultimately success in a course (Drawbaugh, 1972). Competency-based feedback based on behaviors can provide a foundation for student-centered learning plans. Behavioral anchors can also be used to describe minimally acceptable knowledge, skills, and abilities on identified core competencies, thus, giving teachers tools and information needed to improve curricula, teaching materials, evaluation processes, and instructional delivery methods.

Purpose

The purpose of this study was to describe student growth (learning) in distance education core competencies in a graduate course in a land-grant institution. The study further sought to develop competency-based behavioral anchors for expert authentication to document student growth.

Methods

This study was grounded in the qualitative research paradigm. The general characteristics of this qualitative study reflect those identified by Fraenkel and Wallen (1999) as professionally acceptable and appropriate methods for studying a phenomenon when: The natural setting is the direct source of data (qualitative) versus a "snapshot" in time (quantitative); data are collected holistically from a participant's perspective (qualitative) versus relying on a participant's quantitative response (quantitative); the process (qualitative) as well as the variables of interest (quantitative) are considered; data are analyzed inductively (qualitative) versus deductively (quantitative); and data attempts to capture concern for a participant's behavior, attitude, reason, or motive (qualitative).

As with any study, it is important for the researcher to establish internal validity, external validity, reliability, and objectivity. However, in the qualitative paradigm these terms are referred to as credibility, transferability, dependability, and confirmability. Credibility and dependability were established by using the technique of triangulation. Member checks were conducted by providing respondents with a summary of the data to correct any misinterpretations. The description of the data provides sufficient detail and/or richness so that the reader can interpret and make meaning of the data (thick description), thus establishing transferability. And finally, confirmability was established by conducting an audit trail. The researchers used a variety of qualitative methods to ensure truth value, applicability, consistency, and neutrality as described below (Erlandson, Harris, Skipper & Allen, 1993).

The natural setting and prolonged engagement for the study was a 15-week graduate course that served students across the college. Students had weekly readings and assignments to build proficiency and ultimately synthesized the course materials by converting a lesson into distance education format. The course met over the Trans-Texas Videoconferencing Network (interactive video) once a week, with the remaining course materials and activities over WebCT. The course instructor had weekly participant observation and interaction with the learners (prolonged engagement). One of the researchers was the instructor for the course, while the other served as a peer debriefer, methodologist, and data interpreter.

The researchers used student pretest and posttest assessments along with researcher/instructor authenticated assessments to document learning. In analyzing the data, researchers considered participants' attitudes, comments, and meanings given to behavioral anchors. Data were analyzed inductively using competency-based behavioral anchors for authentication. Attempts to capture participants' behavior, attitudes, and reasons were described.

The purposive sample was 20 graduate students enrolled in *Advanced Methods of Distance Education* at a land-grant institution. There were 11 females and nine males in the course, 15 who were master's students and five who were working toward a doctoral degree. The majors included agricultural education, entomology, horticulture, wildlife and fishery sciences, animal science, and educational human resource development. Respondents were coded based upon gender, major, and classification to determine any trends in the data, but still provide confidentiality. For example, the first male doctoral student in agricultural education was coded as "MDAE1."

The content for the course was developed around the competencies for the distance education professional (Thach & Murphy, 1995). The researchers conducted a document analysis of course materials and clustered the distance education competencies into six major themes or "core" competencies needed by students and practitioners: Adult Learning Theory, Technological Knowledge, Instructional Design, Communications Skills, Graphic Design, and Administrative Issues (Figure 1).

Core Competency	Behavioral Anchors
Adult Learning Theory	• Philosophy of Teaching • Adult Learner Characteristics • Learning Styles
Technological Knowledge	• WebCT • Interactive Videoconferencing • Computer Hardware/Software • Communication Tools
Instructional Design	• Course Planning and Organization • Gaining Attention • Writing Instructional Objectives • Active Learning Strategies • Evaluation
Communication Skills	• "Presenting" Content • Questioning and Facilitation • Feedback • Collaboration/Teamwork
Graphic Design	• Formatting Visuals for TV Display • Design Considerations for Web-pages • Multimedia Components
Administrative Issues	• Support Services • Copyright/Intellectual Property • Technology Access • Financial Considerations

Figure 1. Core competency behavioral anchors

A self-assessment instrument was created based upon the literature on distance education competencies and the document analysis of the graduate course content. The instrument was intended to serve as a reflection tool for the students to measure their growth (learning) in the six core competencies. The instructions noted that learners may or may not have grown in all areas. The researchers chose a stair-step approach (rather than a continuum or Likert scale) to visually represent progression from novice (0) to expert (7). The numbers were intended to measure perceived growth rather than any statistical significance. Averages were calculated to show trends in the data. Students were provided behavioral anchors, shown below, from which to base their pre- and post-assessment competencies (Figure 2).

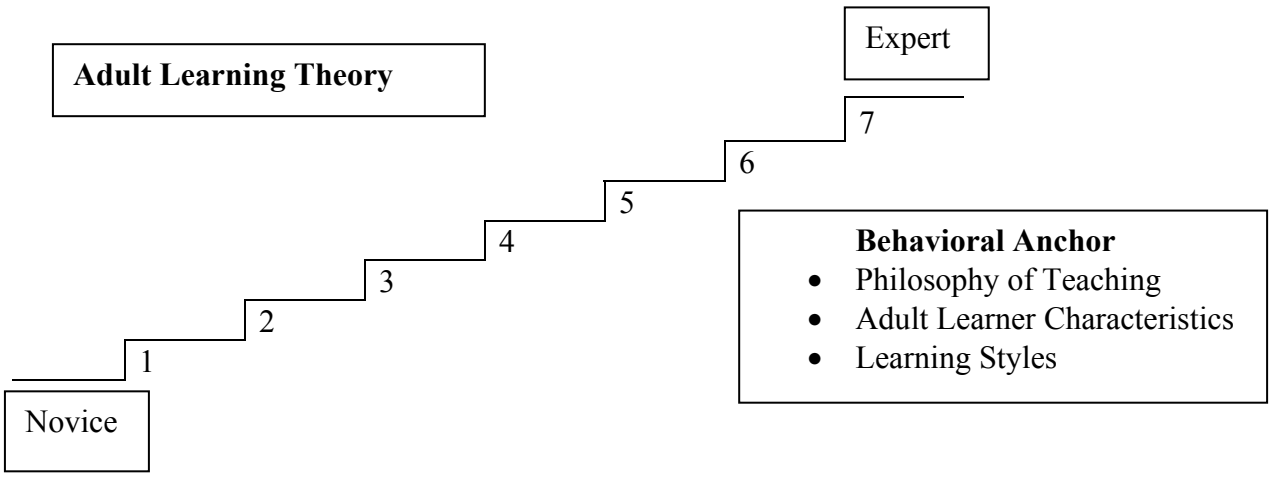

Figure 2. Example of adult learning theory core competency on self-assessment

Two open-ended questions were used for verification: "Comments about your self-assessment (Where did your growth occur?)" and "Comments about any attitudinal change as a result of taking this course." The researchers also developed competency-based behavioral anchors at level 2, 4, and 6 to authenticate ratings and standardize judgments of expert raters (Smith & Kendall, 1963). Students' written comments with respect to self-assessment and attitudinal change, and any noted critical incidents, along with the researcher's professional expertise were used to establish the competency-based behavioral anchors (Figure 3).

Core Competency	Level	Competency-Based Behavioral Anchors
Adult Learning Theory	2	• Show someone how to do a literature review on student-centered learning
	4	• Present a short workshop on the theory of andragogy
	6	• Develop and deliver a student-centered training program that incorporates adult learner characteristics and student learning styles
Technological Knowledge	2	• Show someone how to log onto a computer and search the Internet
	4	• Show someone how to access and use Web course tools
	6	• Show someone how to design and execute a Web-delivered course using Web course tools
Instructional Design	2	• Use an ice-breaker or opening to gain attention
	4	• Prepare a lesson plan
	6	• Write measurable instructional objectives for curricula that provide for student-centered learning
Communication Skills	2	• Facilitate a videoconference
	4	• Create virtual teams for discussion threads
		• Design appropriate synchronous and asynchronous communications methods for delivering course materials at a distance
	6	
Graphic Design	2	• Rely on technical experts to develop multimedia
	4	• Show someone how to develop a PowerPoint presentation with graphics
	6	• Show someone how to use animation, video streaming, and text to effectively deliver content
Administrative Issues	2	• Rely on technical experts for scheduling and copyright clearance
	4	• Identify and use available support services to plan and organize a course
	6	• Determine fiscal, human, and technical needs to plan and implement a curricula entirely at a distance

Figure 3. Competency-based behavioral anchors.

The constant comparative method was used for data analysis (Lincoln & Guba, 1985). This method includes four stages: 1) comparing incidents applicable to each category, 2) integrating categories and their properties, 3) delimiting the construction, and 4) writing the construction. In summary, the researchers completed a content analysis of the graduate course materials and compared competencies with those found in the literature for the first stage (Thach & Murphy, 1995; Williams, 2000). Once categories were integrated, six core competencies were identified. A self-assessment instrument was created based upon the triangulated and integrated themes. Numerical averages were calculated and open-ended responses were coded and categorized. An audit trail was used to ensure the trustworthiness of the data.

Results

The results of this study were reported in three areas: (1) the individual and average growth in core competencies, (2) the open-ended verification of growth categories, and (3) the attitudinal change as a result of taking this course. In Table 1, the individual growth is indicated for each of the six core competencies. Based upon the researchers' past experiences and inductive judgments, a one-step incremental was established as a discrepancy indicator between groups.

For Adult Learning Theory, graduate students rated their competence from a 0-6 at the beginning of the course and from 3-7 at the end of the course. With 4 as the mid-point, nine of the students were a 4 or above before the course, and eleven were below 4. Two students already possessed a strong competence in this cluster (Level 6). The average growth was from 3.4 to 5.2 in Adult Learning Theory (See Table 2). At the end of the course, students had similar competency levels, regardless of gender, department, or degree sought. Male students, however, started out at a higher level of competence than female students.

Table 1
Individual Growth in Competency Clusters (N=20)

Respondent Code	Adult Learning Theory		Technology Knowledge		Instruct-ional Design		Communi-cations Skill		Graphic Design		Adminis-trative Issues	
	B[a]	A[b]	B[a]	A[b]	B[a]	A[b]	B[a]	A[b]	B[a]	A[b]	B[a]	A[b]
MDAE1	6	6	4	5	5	6	5	6	2	5	3	5
MDAE2	5	6	3	6	7	7	5	6	1	3	3	5
MDEN3	2	4	3	4	3	4	2	3	1	3	1	2
FDAE4	2	5	4	5	2	4	4	6	5	6	2	5
FDAE5	3	5	1	5	3	6	5	7	1	4	4	6
MMEH6	4	6	5	6	4	6	5	5	4	6	1	5
FMAN7	0	3	0	2	0	3	2	3	0	2	0	2
FMHT8	6	7	6	7	5	7	6	6	6	7	6	6
FMWF9	2	6	4	7	1	5	3	6	1	5	2	5
MMAE10	3	6	2	4	3	6	1	4	1	2	5	6
MMAE11	4	5	0	4	1	4	5	6	0	3	5	6
MMAE12	5	6	6	6	4	6	4	5	5	6	4	5
MMAE13	3	5	4	6	3	6	4	6	3	6	4	6
MMAE14	4	6	2	4	5	6	4	5	0	3	1	5
FMAE15	5	5	1	4	3	5	4	5	2	4	4	4
FMAE16	2	5	1	4	3	7	2	5	2	3	2	4
FMAE17	3	4	1	4	4	5	3	4	0	3	1	3
FMAE18	4	5	4	5	3	5	5	6	3	5	3	5
FMAE19	2	4	4	6	3	5	2	3	4	4	1	3
FMAE20	3	5	5	6	4	6	5	6	4	6	3	5

Note. B[a] = Before; A[b] = After

Table 2
Average Growth in Competency Clusters (N=20)

Core-Competency	Class Average		Gender				Department				Degree			
			M		F		In		Out		M[c]		D[d]	
	B[a]	**A[b]**	**B[a]**	**A[b]**	**B[a]**	**A[b]**	**B[a]**	**A[b]**	**B[a]**	**A[b]**	**B[a]**	**A[b]**	**B[a]**	**A[b]**
Adult Learning Theory	3.4	5.2	4.0	5.6	2.9	4.9	3.6	5.2	2.8	5.2	3.3	5.2	3.6	5.2
Technological Knowledge & Skills	3.0	5.0	3.2	4.8	2.8	5.0	2.8	4.9	3.6	5.2	3.0	5.2	3.0	5.0
Instructional Design	3.4	5.5	3.9	5.8	2.8	5.3	3.5	5.6	2.6	5.0	3.1	5.5	4.0	5.4
Communication Tools	3.8	5.2	3.9	5.1	3.7	4.9	3.9	5.3	3.6	4.6	3.7	5.0	4.2	5.6
Graphic Design	2.3	4.3	1.9	4.1	2.5	4.5	2.2	4.2	2.4	4.6	2.2	4.0	2.0	4.2
Administrative Issues	2.8	4.7	2.9	5.0	2.5	4.4	3.0	4.9	2.0	4.0	2.7	4.0	2.6	4.6
Note. B[a] = Before; A[b] = After; M[c] = Master's; D[d] = Doctoral														

The open-ended question about where the most growth occurred was analyzed based upon the core competencies. For Adult Learning Theory one student noted, "[Since] my undergraduate work did not include any education classes, everything I had learned about learning styles was gained through personal experience. Many of the discussion topics were quite relevant to my work in Extension and have helped me answer the 'why' question. That is, why do people prefer different teaching styles (I didn't even know what a learning style was before this class)? Without a doubt, most of my learning 'growth' occurred in the area of Adult Learning Theory" (MMAE10). Another student commented, "As for adult learning theory, I gained considerable knowledge into the different learning styles and characteristics of this audience. Most of my 'teaching' has been done with youth so it was neat to see how adults differ from youth in some ways but are also similar in others" (MMAE13).

For Technology Knowledge, graduate students rated their competence from 0-6 at the beginning of the course and 2-7 at the conclusion. The average growth was 3.0 to 5.0. As with Adult Learning Theory, Technology Knowledge varied greatly among graduate students. Two students also possessed a high level of expertise in technology upon entering the course. At the end of the course, students had similar competency levels, regardless of gender, department, or degree sought.

For the open-ended comments on growth in Technology Knowledge, many students mentioned WebCT as the software tool they learned the most about (MDAE2, FMHT8, FMWF9, FMAE15, FMAE17, FMAE18). "I grew most in the area of technical competence. I had absolutely no idea what WebCT was and not much about distance education until this class" (FMAE15). "My biggest growth was learning so much about the technology through the use of WebCT and the communication tools" (FMAE17). "I was comfortable with the [interactive video], Internet skills and e-mail before, but definitely not WebCT. I have become a true WebCT convert, though; I have another class that is set up to use a WebCT site and nobody was daring to touch it. Through my painful and embarrassing experiences, I was able to actually help this class by answering several questions and now they are all able to get on there and communicate" (FMWF9).

In the third core competency, students assessed their knowledge of Instructional Design, ranging from 0-7 at the beginning to 3-7 by the end. One doctoral student in agricultural education had a score of 7, and eight students had a 4 or above at the beginning of the course. The average at the beginning of the course was a 3.4, with students assessing their competence at 5.5 by the end of the course (the highest competence average from within the six core competencies). At the end of the course, students had similar competency levels, regardless of gender, department, or degree

sought. Male students, however, started out at a higher level of competence than female students in Instructional Design.

One particular assignment posed the philosophical foundations of behaviorism and constructivism. A student mentioned, "[I grew] mostly in my theory of teaching and design of class techniques. I feel the reaction paper on constructivism and behaviorism really pulled information from other teaching courses together" (FMAE20).

In the context of distance education, Communications Skills incorporated the full gamut of presentation skills, from teaching over interactive video to asynchronous communication. Student self-assessments at the beginning of the course ranged from 1-6 and ended at 3-7. Thirteen students reported a score of 4 or better at the beginning of the course (the highest average competence at the beginning of the course). The average growth changed from a 3.8 at the beginning to a 5.2 at the end of the course. At the end of the course, students had similar competency levels, regardless of gender, department, or degree sought.

One student stated, "I knew nothing about the vast number of techniques used to make a good presentation and make distance sites feel included. I had some distance courses in which I felt more comfortable than others, but I couldn't put my finger on why. Now I know all about eye contact with the camera and calling on students directly and keeping conscious of what is being projected over the screen" (FMWF9).

For the core competency of Graphic Design, students rated themselves between 0-6 at the beginning and 1-7 by the end. Nine students rated themselves a 1 or 0 at the beginning of the course. The average competence was 2.3 before participating in the course and 4.3 at the end (the lowest average of all the core competencies). At the end of the course, students had similar competency levels, regardless of gender, department, or degree sought. "In the graphic design area my growth mainly occurred in the area of web-page design and formatting visuals for TV display. I had no idea all the work that goes into creating one [web-page]!" (MMAE13).

The final core competency was Administrative Issues. Students expressed beginning competence ranges of 0-6 and ending competence ranges of 2-6. Seven students rated themselves a 4 or higher at the beginning, with seven students clustering around 2-3. Six students rated themselves at a level of 0 or 1. The average level was a 2.8 at the beginning and 4.7 at the end of the course. By the end of the course, students had similar competency levels, regardless of gender, department, or degree sought. Students in the Department of Agricultural Education began the course with a higher level of competence than students in other departments.

"Most of my growth occurred in administrative issues such as copyright" (MMAE14). One student did not specify a particular area of growth but makes the comment, "The great thing about this class to me was to see how everything (skills and topics) come together. I have had classes in instructional design, graphic design, presentation skills, learning theory, but this class really showed me why they are all important and how they fit together" (MMEH6).

The constant comparative analysis of the attitudinal changes was a valuable addition to the self-assessment instrument. Often instructors measure the knowledge, skills, and abilities through course assessment tools, but may not capture the affective domain of learning. At the beginning of the course, students perceived distance education to be impersonal, with little interaction between the instructor and learners (MMAE10). Students were skeptical of its effectiveness (MMAE13, MDAE2, MDEN3, FMAE19, FMAE16) and nervous or hesitant to use the technology tools to mediate communication (MMAE14, FDAE4, MDAE1, FMAE15). After taking the course students realized the amount of preparation time needed to successfully design and deliver distance education instruction (MMAE11, FMAE20). Students appreciated the role of the facilitator in building rapport and interaction so that they felt involved (FMWF9, MDAE2, MMAE10). They also believed that distance education could provide access to people who cannot come to campus (FMAE19) and a richer environment for on-campus learners because of the ability to

communicate with different people in different places (FMAE20). Some students believed that distance learners must be more self-directed and motivated (MMAE13, FMAE18). After taking the course, students were more inclined to take another distance education course (FMAE17, FMAE18) and to even teach one (MDAE2, FMAE17). Those that were skeptical and nervous were now more confident (MMAE14) and comfortable (MDAE1, FMAE15) with the distance education environment.

Conclusions and Implications

As the notion of how well students are learning and how well instructors are teaching is reexamined, there is a continued need to develop and refine student assessment instruments to evaluate and authenticate student growth. The findings of this study contribute to the growing body of literature related to identifying and assessing student competencies. It is recommended that this model be replicated in other distance education graduate courses and training programs to evaluate the extent to which the results presented here would be similar and applicable.

The competency-based behaviorally anchored instrument developed in this paper provides a model to evaluate and authenticate student growth (learning). Findings suggest self-reported competencies were similar to authenticated scores. This model also can be used to help students better understand their core competencies, which can be compared against behavioral anchors, and may increase student satisfaction, motivation, learning, and ultimately success in a course (Drawbaugh, 1972). This information can also be used as a foundation for student-centered learning plans. For example, a teacher would need to design and deliver individualized instructional sequences to provide the greatest opportunity for student growth when confronted with students with dichotomous competencies, such as FMAN7, who had little to no competence on any of the measurement items, and FMHT8, who had high levels of competence on most of the items. Without a way of documenting student competencies as they enter a program or course, a teacher cannot provide student-centered learning. At best, they would be forced to teach to "the middle." Unfortunately, this is often the case thereby providing course material that is too challenging for some students and too simple for others.

Although individual students' distance education competencies varied, results of the study show that, on average, students were below the mid-point at the beginning of the course and above afterward. Students increased approximately two steps in each of the core competency areas. At the end of the course, students had similar competency levels, regardless of gender, department, or degree sought; however, males started out at a higher level of competence in Adult Learning Theory and Instructional Design. Students in the Department of Agricultural Education were also higher in their beginning competence in Administrative Issues.

Findings show, additionally, that male doctoral students in Agricultural Education and male master's students outside the department began the course at higher levels of overall competence than other students. Male doctoral and female master's students outside of the department began at a lower level of overall competence. As mentioned previously, all students completed the course at a similar level of overall competence. This information serves to document course curriculum and instructor/facilitator effectiveness in helping students achieve a certain level of competence. Teachers can further use this information to make judgments about learning, to enhance rigor, and modify or refine teaching strategies and content delivery.

The competency model used in this study provided a tool to measure competence in distance education. What is not known is the numerically acceptable level for competence. Is a step 4 or 5 acceptable or should graduate students be at a step 6 or 7? Obviously, graduate faculty must make judgments on acceptable levels of competence in order to give "grades" to students to determine student success. This model can be used to document minimally acceptable levels of competence, competency growth, or a combination of the

two. For example, on one hand, an instructor may require students to show growth of at least two steps, to a minimum of step six, on two core-competencies for a student to receive an "A" in the course. On the other hand, an instructor may require an authenticated step 5 on four core competencies, and a step 4 on two for a student to receive a grade of "A."

The competency-based behavioral anchors developed in this study provide for expert authentication of student growth (learning) as described above. Use of anchors to authenticate results overcomes limitations of self-administered rating scales that are typically used to measure student perceptions of competencies. This model can serve as an additional tool to measure the quality of teaching and addresses public and political pressure to explain student learning.

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