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Developing Metrics for Effective Teaching in Extension Education: A Multi-State Factor-Analytic and Psychometric Analysis of Effective Teaching

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To successfully educate the public about agriculture, food, and natural resources, we must have effective educators in both formal and nonformal settings. Specifically, this study, which is a valuable part of a larger sequential mixed-method study addressing effective teaching in formal and nonformal agricultural education, provides direction for future effective teaching research in extension education. Particularly, this study assessed 142 behaviors, characteristics, and techniques considered indicative of effective teaching, to reduce the number of competencies and identify constructs of effective teaching in extension education. A total of 1,470 extension educators from 30 states, surveyed in the fall of 2011, served as the population for this study. As a result, 63 effective teaching competencies in 11 constructs were identified. Psychometric evaluation of the 11 constructs resulted in Cronbach's alpha coefficients ranging from .82 to .93, supporting the reliability of the identified constructs. An expert panel then named the constructs, many of which aligned with those identified in previous teaching effectiveness research. Implications for practice and research resulted from this study, including a proposed three-part framework for assessing effective teaching in extension education, which includes self-evaluation, observation-based assessment, teaching-related output and/or outcome measures.

Keywords: extension; effective teaching; metric development; nonformal education

The National Research Agenda for agricultural education noted the need to educate and inform the "non-agriculture" public and policy makers about agriculture, food, and natural resources, must be a top priority for agricultural educators (Doerfert, 2011). To be successful in that endeavor, agricultural educators—in both formal and nonformal settings—must be effective teachers, capable of comm.-unicating the messages of the agriculture industry. The characteristics, behaviors and techniques employed by effective teachers have the potential to greatly impact learning and produce a subsequent behavior change (Dyer & Osborne, 1996; Kaiser, McMurdo, & Block Joy, 2007).

Effective teaching in school-based, or formal, agricultural education environments has been the focus of considerable research (e.g., Buchanan, 1997; Feldman, 1976; Nicholls, 2002; Reid & Johnstone, 1999; Rosenshine & Furst, 1971; Scheeler, 2008), including in agricultural education (Dyer & Osborne, 1996; Johnston & Roberts, 2011; Miller, Kahler, & Rheault, 1989; Newcomb, McCracken, & Warmbrod, 1993; Roberts, Dooley, Harlin, & Murphrey, 2007; Roberts & Dyer, 2004). Reid

and Johnstone (1999) identified six components of quality teaching, including approachability, clarity, depth of knowledge, interaction, interest and organization. Effective educators must be well-prepared, enthusiastic, clear and business-like, offer variability and involve students in the learning process (Etling, 1993). Feldman (1976) found stimulating student interest and clarity were highly related to effective teaching. Young and Shaw (1999) reported effective communication, a comfortable environment, concern for student learning, student motivation, and course organization as measures of teacher effectiveness. Furthermore, Feldman suggested effective instructors were knowledgeable about their content, prepared and organized for class, and were enthusiastic.

Rosenshine and Furst (1971) studied characteristics of effective educators in formal settings. Their work suggested the five most notable variables associated with effective teaching included clarity, variability, enthusiasm, task-oriented and/or businesslike behavior, and student opportunity to learn criterion material (Rosenshine & Furst, 1971). Newcomb et al. (1993) identified 13 principles of effective teaching believed to impact student learning: Students must be motivated to learn, reinforced behaviors are most likely to be learned, directed learning is more effective than undirected learning, students should inquire into the subject matter, problem-oriented approaches to teaching improves learning, and students learn what they practice.

Although research in formal education settings is necessary and beneficial, one could argue that education occurring in nonformal settings may be even more essential when trying to educate the "non-agriculture" public. Because both formal and nonformal agricultural education programs often stem from complementary goals, this has necessitated combined educational programming and educator training (Shinn & Cheek, 1981; Phipps, Osborne, Dyer, & Ball, 2008). Although such collaborative efforts are useful, it is also necessary to note the differences that exist between formal and nonformal settings, and the learners in each environment.

Nonformal education has been defined as a category of political and social organizations, an educational strategy, or as a modality of teaching and learning (Grandstaff, 1976). Historically, Grandstaff (1976) identified the desire to associate nonformal education with situations where educational content is embedded in an activity context. Etling (1993) suggested nonformal education is more learner-centered than formal education and offers options and choices rather than a formal, prescribed, sequential curriculum. Additionally, Etling (1993) postulated that the freedom of nonformal education allows learners to leave whenever they lack motivation for learning.

Gamon, Mohamed, and Trede (1992) evaluated the training needs of extension personnel. Teaching methods were found to be an important component of training for pre-service and in-service extension personnel (Benge, Harder, & Carter, 2011; Harder, Place, & Scheer, 2010; Waters & Haskell, 1989). Additionally, Cooper and Graham (2001) found subject matter competency, teaching decision making skills to clients, being familiar with the teaching and learning process, experience as a teacher, and the ability to train personnel were among the core competencies identified as necessary for a successful county extension agent or county supervisor. Etling (1993) suggested effective "educators must emphasize those skills, knowledge and attitudes which are desired by the learners" (p. 74). Etling (1993) also proposed that nonformal educators must be flexible and ready to change instruction to meet the needs of diverse and evolving dynamics exhibited by students. Given these parameters, and the somewhat limited research in this area, there is great need for further research on effective teaching in nonformal settings.

Frameworks

The theory of psychometrics provided guidance for this study. With the goal of developing a model of effective teaching leading to a self-assessment and observational instrument, efforts were made to establish psychometric soundness with as few items as possible (Ferketich, 1991). Psychometrics allows researchers to objectively measure concepts through indirect means, rather than physical characteristics (Nunnally, 1967). Measurements must

include rules for assigning numbers to objects to represent quantities of attributes "…to objectify the recording of impressions (e.g., rating scales) and to objectify the analysis of the results" (Nunnally, 1967, p. 486). When proposing a new measure (or revising an existing measure), it is important to clearly qualify and quantify the properties of the concept, thereby providing the rules of the measure and the mechanism to establish validity and reliability. Empirical analyses are used to create the rules of the measure, i.e., legitimate or standardized measure of a concept or unitary attribute (Nunnally, 1967). Measures of several unitary attributes are then combined to form an overall objective appraisal (Nunnally, 1967). To illustrate this concept, one may form an overall objective appraisal of an individual's basic math ability by assessing the unitary attributes of his or her ability to add, subtract, multiply, and divide—the sum of the pieces are then used to assess the whole.

Appraisals are often guided by two assessment methods commonly noted in the literature, observational assessment and self-assessment. Both have their strengths and weaknesses, namely the objectivity of the assessment protocol. Objectivity is directly related to accurate measures, which require substantial construct validation. Construct validation begins with establishing functional relations among important variables or test items (Nunnally, 1967).

This study focused on behaviors, characteristics, and techniques associated with effective teaching, largely rooted in a teacher's belief in his or her ability to create desired outcomes (Tschannen-Moran & Woolfolk Hoy, 2001), because "teachers' efficacy beliefs also relate to their behavior in the classroom" (p. 783). Hence, the development of variables or test items was guided by Bandura's theory of self-efficacy (Bandura, 1986).

Self-efficacy is believed to influence thought patterns and emotions that drive actions (Bandura, 1986; 1993; 1997). Although teacher efficacy may be difficult to measure (Tschannen-Moran & Woofholk Hoy, 2001), efficacy studies include, but are not limited to, references of characteristics, beliefs, behaviors, knowledge or competence in specific content areas, and techniques demonstrated by efficacious teachers (Allinder, 1994; Bandura, 1986; 1993; 1997; Berman, McLaughlin, Bass, Pauly, & Zellman, 1977; Tschannen-Moran & Woolfolk Hoy, 2001). Such characteristics, beliefs, behaviors, knowledge, and techniques are often referenced when effective teaching is described and/or are listed as components of a framework of teaching.

Purpose and Objectives

Theories must be clearly operationalized using constructs before they can be tested (Gorsuch, 1983). In some cases, theories are not explicit in operationalizing the associated constructs—identifying the components needed to measure or test the theory (Gorsuch, 1983). In those cases, factor-analytic and psychometric analyses provide the mechanisms needed to identify the appropriate constructs and the associated competencies, before the research proceeds (Field, 2009; Gorsuch, 1983). The purpose of this study was to identify and describe the constructs of effective teaching in nonformal settings, through factor-analytic and psychometric analyses. The results of this study may lead to self-assessment and observational instruments for use in future studies. The following objectives guided this study:

1. Assess the factor-analytic and psychometric properties of effective teaching, based on the perceptions of extension educators.
2. Using the construct outcomes from research objective one, describe extension educators' self-perceived ability to perform the competencies associated with effective teaching.

Method

This study is the quantitative strand of a larger sequential mixed-method study, (QUAL → QUAN) as defined by Morse (2003), of effective teaching in formal and nonformal environments in agricultural education. In sequential mixed designs, "mixing occurs across chronological phases (QUAL, QUAN) of the study; questions or procedures of one strand

emerge from or depend on the previous strand" (Teddlie & Tashakkori, 2008, p. 151). Mixed-method developmental studies in the QUAL → QUAN configuration often identify statements or themes through qualitative analysis, followed by statistical analyses (Teddlie & Tashakkori, 2008).

The preceding qualitative component of the larger study asked agricultural educators a series of open-ended questions related to effective teaching. Researchers examined more than 1,500 statements through comparative analysis, a strategy that can "facilitate the discovery of grounded theory" (Glaser & Strauss, 1999, p. 9). The comparative analysis yielded 142 unique competencies, subsequently used in this study. The substantive nature of these competencies required further analysis and validation. Thus, this study served as the next step in the sequential QUAL → QUAN (Morse, 2003) study and sought to develop a closed-ended survey instrument (Teddlie & Tashakkori, 2008) using the 142 competencies for factor analysis.

Instrumentation

A three-section web-based survey instrument was developed and implemented through Qualtrics©. In the first section, respondents were asked how many years they had been an educator, how many hours they teach each week (excluding preparation time), and how many hours per week they spent preparing to teach. The second section included 142 statements representing the characteristics, behaviors, and techniques related to effective teaching in formal and nonformal settings, as identified by extension agents and agriculture teachers. Lam and Klockars (1982) recommended, "The researcher interested in obtaining an interval scale may thus be able to eliminate the effort of labeling all points on the scale in favor of labeling only the endpoints" (p. 321). A five-point sliding scale with bipolar anchors (1 = *Strongly Disagree* to 5 = *Strongly Agree*) was used to measure respondents' agreement with the 142 statements. Using the sliding scale, respondents indicated their level of agreement to the hundredth of one point, providing a more finite response than would be obtained by simply selecting a whole number. The third section asked respondents to report gender, year of birth, highest level of education completed, number of hours worked in a typical week, and number of hours working with youth development activities in a typical week.

The qualitative strand of the study addressed and established content validity for the items included. A panel of five experts in extension education, instrument development, and/or research methods assessed face validity of the survey instrument prior to data collection. Because an outcome of this study was to establish a valid and reliable instrument, both validity and reliability were assessed in objective one of this study.

Respondents seldom complete a lengthy questionnaire, resulting in item-response bias (Dillman, Sinclair, & Clark, 1993; Galesic & Bosnjak, 2009). To reduce item-response bias, the 142 items included in the second section were presented in a random order to each respondent, using the randomize function in Qualtrics. Additionally, data collected in the first section provided a basis of comparison between respondents who started the questionnaire, but did not finish (n = 125), and those who completed the entire questionnaire (n = 1,345). Hours typically spent teaching each week (excluding preparation time) and hours per week typically spent preparing to teach served as the dependent variables.

A multivariate analysis of variance (MANOVA) was used to compare variables of interest, thus, allowing for "examination of two variables while simultaneously controlling for the influence of the other variables on each of them" (Newton & Rudestam, 1999, p. 137). Box's test of equality of covariance was significant (p = .005), indicating that the matrices were not the same; however, in large samples Box's test could be significant even when covariance matrices are relatively similar (Field, 2009). Pillai's Trace is a powerful test that will often detect differences even when matrices are different (Field, 2009). Therefore, results were interpreted using the Pillai's Trace (V) statistics because of its robustness. The result of the MANOVA indicated no significant effect of item-response bias on the dependent variables V = .002, $F(2, 1{,}335) = 1.11$, p = .330, η_p^2 = .002.

Population

Two sampling problems are associated with psychometric development, one related to sampling of content, the other related to sampling of people (Nunnally, 1967). Sampling of people is concerned with the generality of findings to populations of persons; whereas, sampling of content is related to the generality of findings to populations of test items (Nunnally, 1967). Because this study was exploratory in nature, focus was placed on the development of psychological measures, internal validity, rather than the ability to infer the results to a population. Therefore, the objectives of this study were not inferential in nature.

An explanation of the study was sent to state extension service offices or extension educators in each state, with a request for names and e-mail contacts of extension educators. Sixteen states provided lists and another 14 were secured from state extension websites, including two lists of extension educators associated with 1890 Land Grant Universities. The accuracy and inclusiveness of the lists obtained was unknown. It was not reasonably possible to access an accurate national frame of extension educators or determine the extent of frame error.

Data included in this study were collected from extension educators from 30 U.S. states between September and November 2011. After five points of contact (Dillman, Smyth, & Christian, 2009), 1,541 responses were received. Of those responses, 1,519 indicated that their job included teaching formally, informally, or nonformally—data from 22 respondents who indicated they did not teach were excluded. Responses from an additional 49 respondents were not included in the analyses related to the objectives because more than 50% of the questionnaire was incomplete, thus reducing the useable sample for this study to 1,470 respondents.

The majority (77.6%) of respondents were county-, parish-, or borough-level educators, of which, 963 possessed the title of Extension Agent or Extension Educator; 177 possessed the title of Extension Associate or Extension Assistant. The remaining 22% of respondents consisted of Extension Specialists (n = 203), Professors (n = 21), administrators (n = 9), or individuals with other appointments (n = 78). The survey instrument did not force responses; therefore, not all respondents indicated their level of service or area of specialization. A summary of the respondents' (n = 1,470) characteristics, including years of teaching experience and area of specialization are included in Table 1.

Table 1

Characteristics of Extension Educator Respondents (n = 1, 470)

				Area of Specialization							
		Yrs. Exper.[a]		Agriculture		FCS[b]		Youth Dev.[c]		Other	
State	*n*	*M*	*SD*	*F*	*%*[d]	*f*	*%*[d]	*f*	*%*[d]	*f*	*%*[d]
AL	42	15.09	10.48	17	41.5	15	36.6	14	34.1	6	14.6
AK	22	14.39	10.95	3	16.7	5	27.8	7	38.9	9	50.0
AZ	33	19.66	10.23	16	50.0	10	31.3	14	43.8	7	21.9
AR	76	16.66	11.33	31	43.7	35	49.3	38	53.5	5	7.0
CA	26	16.80	10.57	4	17.4	2	8.7	22	95.7	5	21.7
CO	65	16.49	10.61	34	52.3	17	26.2	30	46.2	12	18.5
CT	10	22.30	9.92	3	30.0	2	20.0	1	10.0	4	40.0
DE	11	17.22	12.69	5	55.6	1	11.1	1	11.1	2	22.2
FL	40	17.35	10.75	13	34.2	6	15.8	28	73.7	4	10.5
GA	31	13.27	10.74	12	37.5	12	37.5	8	25.0	0	0.0
HI	13	22.64	6.10	5	45.5	5	45.5	5	45.5	2	18.2
IA	30	22.21	10.04	7	26.9	5	19.2	15	57.7	2	7.7
KS	95	16.91	10.44	40	43.5	42	45.7	29	31.5	7	7.6
MD	42	14.73	10.18	15	36.6	17	41.5	13	31.7	9	22.0
MN	131	20.40	10.78	40	33.9	23	19.5	23	19.5	37	31.4
MO	44	21.41	12.57	11	25.6	12	27.9	7	16.3	13	30.2
MT	35	13.66	8.93	20	60.6	10	30.3	22	66.7	7	21.2
NE	95	17.51	11.18	36	40.0	29	32.2	41	45.6	16	17.8
NV	46	14.84	10.47	10	22.7	7	15.9	19	43.2	22	50.0
NH	39	18.79	11.31	9	26.5	11	32.4	5	14.7	11	32.4
NJ	29	18.63	10.94	6	24.0	7	28.0	9	36.0	6	24.0
ND	45	16.35	10.73	15	34.9	16	37.2	16	37.2	10	23.3
OH	108	16.11	9.39	27	28.4	28	29.5	31	32.6	15	15.8
OK	86	15.21	10.15	30	34.9	42	48.8	50	58.1	8	9.3
OR	68	16.48	10.49	25	43.1	17	29.3	25	43.1	9	15.5
SC	12	13.45	8.78	2	18.2	3	27.3	11	100.0	0	0.0
UT	33	19.15	9.37	17	51.5	12	36.4	19	57.6	5	15.2
WA	84	16.32	10.68	19	25.0	25	32.9	33	43.4	27	35.5
WV	48	12.93	9.66	9	20.5	23	52.3	20	45.5	5	11.4
WY	31	11.22	9.78	12	40.0	8	26.7	13	43.3	8	26.7
Total	1,470	16.82	10.64	493	36.1	447	31.3	569	41.3	273	19.7

Note. Not all respondents indicated their years of teaching experience or area of specialization. [a]Mean years of teaching experience. [b]Family and Consumer Sciences. [c]Youth Development. [d]Does not equal 100% because respondents were asked to "select all that apply"

Results

The purpose of research objective one was to assess the factor-analytic and psychometric

properties of effective teaching, based on the perceptions of extension educators. The 142 competencies identified in the qualitative strand of the larger sequential mixed-method study were included in the principal component analysis using a varimax rotation. Coefficients with an absolute value less than .45 were suppressed to eliminate double-loadings. Bartlett's test of sphericity was significant ($p <$ .001) and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was .967; values above .90 are considered to be superb (Field, 2009). After removing components of less than three items and components with Cronbach's alpha coefficients less than .80 (Field, 2009), the remaining 63 items composed the 11-component solution that accounted for 67.78% of the total variance. The 11-components were then treated as independent constructs and served as the dependent variables for the study. Eigenvalues, percentages of variance, cumulative percentages, and Cronbach's alpha coefficients for each construct are reported in Table 2.

Table 2

Number of Items, Eigenvalues, Percentages of Variance, Cumulative Percentages for Constructs, and Estimates of Reliability

	Items	Eigenvalue	% of variance	Cumulative %	*n*	Cronbach's α
Construct 1	11	8.233	12.107	12.107	1,275	.928
Construct 2	9	5.376	7.906	20.014	1,321	.903
Construct 3	7	4.836	7.112	27.126	1,305	.910
Construct 4	7	4.574	6.726	33.852	1,294	.881
Construct 5	7	3.845	5.655	39.507	1,283	.882
Construct 6	4	3.363	4.946	44.453	1,344	.899
Construct 7	5	3.265	4.801	49.254	1,285	.820
Construct 8	4	3.258	4.792	54.046	1,364	.877
Construct 9	3	2.805	4.125	58.171	1,355	.933
Construct 10	3	2.370	3.486	61.657	1,358	.883
Construct 11	3	2.364	3.476	65.133	1,352	.903

A list of the 11 constructs and corresponding items was then distributed to a panel of 10 experts, who were asked to describe what the items in each construct collectively measured. Panel members included experts in extension education, teaching methods, curriculum development, youth development, and program planning. Once the panel's feedback was received, responses were compiled and evaluated before assigning final descriptions to the constructs. Construct descriptions and loadings from the principal component analysis are reported in Table 3.

Table 3

Construct Loadings from Principal Component Analysis with Varimax Rotation

Item	Loading
Construct 1: Applied Best Practices in Curriculum Development	
I establish a scope for curriculum.	.758
I provide clear objectives for each lesson.	.752
I create a timeline for curriculum – amount of time for each component.	.733
I use objectives to organize lessons.	.709
I establish a logical sequence for curriculum.	.699
I establish goals that include desired outcomes.	.698
I keep lessons organized to help learners learn information.	.685
I keep lessons organized to help learners retain information.	.671
I follow instructional plans (e.g., lesson or workshop plans).	.631
I present clear objectives.	.611
I use each unit of instruction to introduce the next topic.	.554
Construct 2: Instructional Communication Skills	
I have a strong voice.	.741
I have the ability to be entertaining.	.714
I have a commanding presence.	.688
I vary my voice (I'm not monotone).	.679
I am exciting to watch while teaching.	.666
I have the ability to convey messages at multiple levels.	.636
I am articulate.	.620
I use two-way communication effectively.	.516
I move around the room (not tied to desk or PowerPoint).	.495
Construct 3: Respect for Learners	
I am concerned about learners' well-being.	.753
I show an apparent interest in learners' lives.	.748
I am compassionate.	.701
I care about learners.	.635
I show compassion toward learners.	.627
I give attention to all learners.	.614
I am concerned about learners' success.	.497
Construct 4: Professional Approach to Instruction	
I have integrity.	.797
I am trustworthy.	.785
I dress appropriately.	.635
I am honorable.	.613
I honor the individuality of each learner.	.565
I demonstrate humility.	.501
I am responsible.	.472

Table 3 Continues

Table 3 Continued

Item	Loading
Construct 5: Applied Best Practices in Nonformal Teaching Methods	
I use experiential learning.	.638
I appeal to a variety of learning styles.	.561
I provide a variety of opportunities to learn.	.553
I encourage learner inquiry.	.543
I take advantage of opportunities to learn.	.525
I am flexible with teaching methods.	.461
I take opportunities to improve techniques.	.427
Construct 6: Technical Expertise	
I have experience with the topic.	.808
I am knowledgeable of the topic.	.794
I know how to apply topics to the real world.	.688
I show an evident interest in the topic.	.633
Construct 7: Program Management	
I understand leadership opportunities associated with youth development organizations.	.840
I integrate youth development organizations (e.g. 4-H, FFA, FCCLA, SkillsUSA, etc.).	.742
I communicate with parents/guardians.	.673
I understand how to manage volunteers.	.663
I clearly understand the rules and regulations of the organization.	.607
Construct 8: : Professional Collaboration	
I collaborate with colleagues.	.776
I share resources with colleagues.	.761
I consider advice from colleagues.	.722
I consider constructive criticism from colleagues.	.698
Construct 9: Desire to Teach	
I enjoy teaching.	.796
I want to teach.	.795
I love to teach.	.757
Construct 10: Pragmatic Philosophy of Teaching	
I make real-life connections to the subject matter.	.747
I help learners understand application of the material in the real world.	.725
I provide learners with an opportunity to apply subject matter in a practical way.	.714
Construct 11: Commitment to Learner Engagement	
I allow learners to ask questions.	.728
I encourage learners to ask questions.	.694
I encourage active participation.	.684

Individual items should measure the same underlying dimension (Field, 2009), in this case, competencies associated with effective teaching. Intercorrelations should range from "about .3" to no higher than .80 (Field, 2009, p. 648). "If any variables have lots of correlations below .3 then consider excluding them" (Field, 2009, p. 648). Intercorrelations greater than .80 could indicate issues related to multicolinearity; thus, those items should be removed as well (Field, 2009). Even if measuring different aspects of the same thing, constructs should correlate (Field, 2009). Eight of the 11 constructs had an associated correlation score greater than .30 and less than .80 (see Table 4). Three bivariate correlation scores were less than .30; however, three low correlation scores among 55 acceptable bivariate correlations were not sufficient cause to remove the associated constructs.

Table 4

Bivariate Correlations Between Constructs

Construct	1	2	3	4	5	6	7	8	9	10	11
1	—										
2	.574	—									
3	.553	.565	—								
4	.546	.553	.665	—							
5	.663	.647	.668	.597	—						
6	.485	.457	.538	.570	.549	—					
7	.489	.531	.481	.512	.557	.450	—				
8	.400	.350	.429	.384	.428	.313	.158	—			
9	.489	.558	.582	.486	.590	.379	.460	.320	—		
10	.505	.505	.515	.489	.516	.566	.440	.596	.216	—	
11	.440	.440	.471	.565	.606	.597	.488	.512	.212	.507	—

The purpose of research objective two was to describe extension educators' self-perceived ability to perform behaviors, characteristics, and techniques associated with effective teaching. Ability scores of the 1,470 extension educators in this study are proposed as multi-state benchmarks for ability levels in future studies of effective teaching. Summated mean and standard deviation for each construct are reported in Table 5, by construct and area of specialization. Extension educators believed they were most efficacious in their Commitment to Learner Engagement and Constructivist Approach to Instruction; they believed they were least efficacious in Applied Best Practices in Curriculum Development and Professional Collaboration. It is important to note that the proposed benchmarks are proposed as a point of comparison for future studies and cannot be inferred to extension educators beyond the scope of this study.

Table 5

Construct Benchmark Scores for Extension Educators' Ability to Perform Competencies (n =1, 470)

Construct	*M*	*SD*
Commitment to Learner Engagement	4.74	.392
Professional Approach to Instruction	4.65	.391
Program Management	4.53	.481
Respect for Learners	4.50	.474
Technical Expertise	4.50	.491
Desire to Teach	4.49	.633
Pragmatic Philosophy of Teaching	4.46	.553
Applied Best Practices in Nonformal Teaching Methods	4.40	.481
Instructional Communication Skills	4.20	.535
Applied Best Practices in Curriculum Development	3.99	.595
Professional Collaboration	3.91	.833

Note. 1 = *Strongly Disagree*, 5 = *Strongly Agree*.

Conclusions, Implications, and Recommendations

This study resulted in the development of 11 constructs that described effective teaching in extension education. Each construct was determined to be valid with acceptable estimates of reliability (Cronbach's $\alpha \geq .80$; Field, 2009). Prior to this study, benchmarks for effective teaching in extension education were not obvious in the literature. The construct benchmarks presented in this study are not proposed as normative data; instead, they are proposed as comparative measures for future studies of effective teaching in extension education, based on the responses of 1,470 extension educators from 30 states.

Many of the 11 constructs identified in the objectives of this study confirm or expand the findings of previous studies of effective teaching—in both formal (Allinder, 1994; Bandura, 1986; 1993; 1997; Berman, McLaughlin, Bass, Pauly, & Zellman, 1977; Rosenshine & Furst, 1971; Tschannen-Moran & Woolfolk Hoy, 2001) and nonformal settings (Etling, 1993; Feldman, 1976). Specifically, extension educators identified the planning and organizing of the instruction as meaningful characteristics of effective teaching. Newcomb et al. (1993) noted that subject matter must possess meaning, organization, and structure, also indicating the importance of planning and organization.

Considering the nonformal environment of this study, similar constructs to Young and Shaw (1999) including "effective communication, a comfortable learning atmosphere, concern for student learning, student motivation, and course organization" (Young & Shaw, 1999, p. 682) may relate to educator effectiveness, particularly as identified in the constructs of Instructional Communication Skills and Respect for Learners. Newcomb et al. (1993) stated, "Regardless of the ages of the persons to be taught, the successful teacher systematically makes an effort to become knowledgeable about the relevant attributes and circumstances of students "that impact directly on the students' motivations for instruction" (p. 31). Consistently, Cole (1981) also recommended that clientele audiences should be considered when developing extension teaching methods. This study confirms these principles in nonformal environments through the attributes found in Professional Approach to Instruction and Pragmatic Philosophy of Teaching.

Although items in the constructs of Professional Approach to Instruction, Professional Collaboration, and Desire to Teach were found in previous extension literature they were more broadly defined as interpersonal skills or professionalism (Benge, Harder, & Carter, 2011; Harder, Place, and Scheer, 2010). The constructs provided here, and the associated characteristics, behaviors and techniques may guide the training of extension educators to correlate these behaviors to effective teaching.

The constructs of Applied Best Practices in Nonformal Teaching Methods and Program Management, found to be related to effective teaching in this study, verified the importance of using experiential learning—in some cases through youth organizations—to make learning relevant to the participants. These results, and other constructs identified in this study, suggest many similarities with Roberts and Dyer's (2004) model of effective agriculture teachers which included instruction, FFA, SAE, building community partnerships, professional growth/professionalism, program planning, and personal qualities.

When considering the individual items associated with each competency, extension educators were most self-efficacious in competencies related to facilitation of programs and least self-efficacious in areas related to developing curriculum and collaborating with colleagues. Given that county-, parish-, or borough-level educators often possess a wide variety of technical knowledge, it is logical that they believed they were self-efficacious in Technical Expertise. Further, county-, parish-, or borough-level educators often turn to specialists to develop or help to develop curriculum; thus, it is to be expected that curriculum development is the second lowest of the extension educators' perceived abilities. Additionally, working with other county-, parish-, or borough-level educators to deliver technical programming and working with specialists to develop curriculum requires the ability to collaborate, which was the

lowest of the extension educators' perceived abilities.

Based on the 11 constructs identified in this study through factor analytic procedures, extension educators believed they were able to perform competencies associated with effective teaching, indicating that baseline competency is equal to, or above, the means proposed in this study. This study did not, however, study the importance of the competencies included in the 11 proposed constructs. Borich (1980) proposed three perspectives of competency—knowledge, performance, and consequence—to permit a more refined evaluation of educator need for professional development; all of which take into account the importance of each competency. Therefore, it is recommended that future studies use the 63 competencies identified in this study and the Borich (1980) needs assessment model to conduct needs assessments of extension educators.

Further, as suggested by Rosenshine and Furst (1971), observation protocols should be developed to complement the self-assessment protocol developed in this study. The observation protocols would likely help extension supervisors and administrators to provide effective feedback to extension educators. When self-assessment and observation-based assessment of effective teaching are considered collectively, the results are more likely to be valid; however, the validation of effective teaching is provided by measures of learner outcomes (Borich, 1979), i.e., direct improvement in performance or adoption of behavior resulting in achievement. Although some form of these measures may be widely available in formal settings (e.g., end of course exams, state-mandated standardized exams), measures of learner outcomes based on extension education are less prevalent in extension's nonformal settings. Thus, state-level extension administrators and specialists should work closely with county-, parish-, or borough-level extension educators to identify or develop standardized output or outcome measures on a state-by-state basis. Additionally, if proactively approached by multiple states, the Plan of Work mandated by the U.S. Department of Agriculture under the *Agricultural Research, Extension, and Education Reform Act of 1998*, may provide a starting point to develop widely used measures to correlate with self-assessments and observation-based assessments.

Collectively, self-assessed, observation-based, and output/outcome-based measures of effective teaching should be considered as a new model (see *Figure 1*) to assess effective teaching in extension education. This proposed triangulation of teacher effectiveness in extension education would provide more credible and valid evaluation data for extension educators and state administrators, and could provide long-term improvement in extension program delivery for local stakeholders.

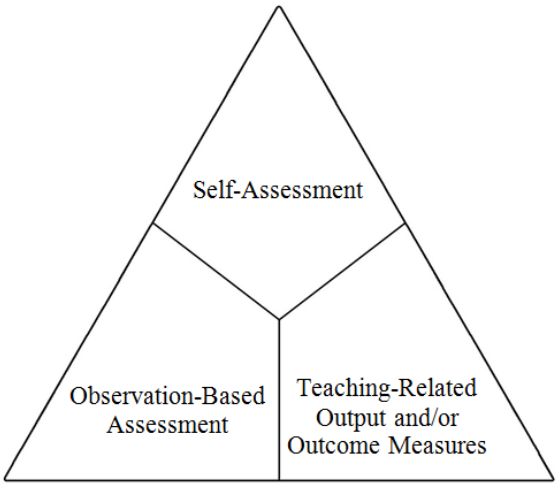

Figure 1. A three-component model to assess effective teaching in extension education.

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