AN ANALYSIS OF EXPERTISE IN AGRICULTURAL COMMUNICATIONS, EDUCATION, EXTENSION, AND LEADERSHIP RESEARCH

A Dissertation

by

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Submitted to the Office of Graduate and Professional Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

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December 2018

Major Subject: Agricultural Leadership, Education, and Communications

ABSTRACT

Expertise is dynamic, domain specific, and characterized by an individual's level of knowledge, experience, and problem-solving ability. Having expertise in the phenomenon of interest can be used as an indicator of an individual's aptitude to effectively serve as a coder in a content analysis or as a panelist in a Delphi study. The purpose of this study was to assess expertise as it related to research conducted in agricultural communications, education, extension, and leadership disciplines. The research was conducted in three phases. Phase one described the ways social scientists described the qualifications of expert coders and panelists. Findings revealed the majority of ACEEL researchers publishing in the premier agricultural education journals did not describe the qualifications content analysis coders possessed and did not provide a citation that supported the inclusion or exclusion of a description. A description of Delphi study panelists' qualifications was included in all of the Delphi studies analyzed, yet researchers were inconsistent in providing a citation. Phase two assessed 149 characteristics considered indicative of expertise to reduce the number of characteristics and identify constructs of expertise. A total of 827 social scientists from across the United States were invited to complete a psychometric instrument. As a result, 10 constructs that can be used to describe expertise were identified. Phase three of the study examined which constructs were most valued by the ACEEL social scientists. Three constructs—Specialized Knowledge and Assessment Ability, Source Evaluation, and Cognitive Processing—scored highly among participants indicating participants' positive feelings about these constructs as valuable. Two constructs—Academic

Credentials and Communication and Self-Importance—received lower scores, which indicated participants did not believe the constructs were strong indicators of expertise. Based on the results of this study, it was concluded that ACEEL researchers could use the constructs as a basis for consistently describing the characteristics of the experts retained to contribute to ACEEL research. Doing so could enhance the consistency, transparency, replicability, rigor, and integrity of ACEEL research.

CONTRIBUTORS AND FUNDING SOURCES

This work was supervised by a dissertation committee consisting of Drs. Tracy Rutherford, Billy McKim, and Tobin Redwine of the Department of Agricultural Leadership, Education, and Communications and Dr. Charles Conrad of the Department of Communication.

This work was also made possible by the Willie Mae Harris Fellowship for Outstanding Teaching Assistants. The Willie Mae Harris Fellowship was established by Mr. John Richard Harris to support graduate students in the College of Agriculture and Life Sciences.

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1. INTRODUCTION

The American Association for Agricultural Education, a professional society for faculty and graduate students in Agricultural Communications, Education, Extension, and Leadership (ACEEL) disciplines, created the National Research Agenda (Roberts, Harder & Brashears, 2016). The document was designed to be a guide for faculty and graduate student AAAE members, many of whom are in ACEEL disciplines. The agenda described six research priorities related to the complex problems in agriculture today (e.g., new technologies, practices, and product adoption decisions; efficient and effective agricultural education programs; Roberts et al., 2016). The agenda also stated:

> Members of the American Association for Agricultural Education (AAAE) have a long history of conducting high quality applied research focused on problems faced by a wide variety of stakeholders. Our [AAAE members] expertise allows us to address social science issues within food, agriculture, and natural resource systems. However, we are a relatively small profession that cannot be all things to all people. We must focus our efforts and work collaboratively to address the most pressing issues (Roberts et al., 2016, p. 7).

In the spirit of conducting “high quality applied research,” as well as maintaining the reputation and integrity of the AAAE organization, researchers in ACEEL disciplines should not only address the research priorities outlined in the agenda, but they should also address the ways in which the research is conducted. Ensuring consistency, transparency, replicability, rigor, and integrity in research across ACEEL disciplines is a research priority not explicitly stated in the agenda, but arguably implicit in all research studies. Adhering to the standards of the selected research method is one area deserving of focus. Fraenkel, Wallen, and Hyun (2012) said the research method is a way of "testing ideas in a public arena" (p. 5), so it stands to reason consistency, transparency, replicability, rigor, and integrity rests in researchers' diligent adherence to the parameters of the chosen research method.

Indeed, there are many research methods at ACEEL researchers' disposal (e.g., causal-comparative, case study, experiment); however, this study focused on the use of content analysis and Delphi study method in ACEEL disciplines. Content analysis is a widely used method for examining many forms of communication (Krippendorff, 2013; Redwine, Leggette & Prather, 2017; Williford, Edgar, Rucker & Estes, 2016). Fraenkel et al., (2012) noted content analysis is useful for gaining insight into problems that cannot be directly tested. In studies using content analysis, the data from the communication (e.g., newspaper article, television advertisement) is analyzed using a coding manual, which outlines the coding instructions developed by the researcher. Clear coding instructions ensure each coder is following the same set of rules to achieve high inter-rater reliability (e.g., level of agreement; Bryman, 2012). Krippendorff (2013) explained reliability is also substantiated by the qualifications possessed by those individuals retained to code the data. Coders with similar backgrounds (e.g., educational, cultural), professional proficiency, knowledge, experience and/or familiarity with the phenomenon under investigation work together to establish high reliability (Krippendorff, 2013; Peter & Lauf, 2002).

The Delphi method is a systematic data collection process for researchers to collect the beliefs, opinions, and judgements from a purposefully chosen, but geographically dispersed, panel of experts who must to achieve agreement on issues or questions over multiple survey rounds or interviews (Helmer, 1967; Ziglio, 1996). The panel interaction in a Delphi study is anonymous; responses to questions cannot be traced back to the originator, but the results of each round of study are presented to the panel so that the next study round may occur (Ziglio, 1996). The method can be modified to serve a variety of applications in ACEEL research (e.g., ranking issues in order of importance, defining an issue or concept, identifying best practices; Morgan, King, Rudd & Kaufman, 2013). Despite the varied applications of the Delphi study method, the key purpose for using it is to capture informed judgments on issues that are largely unexplored, difficult to define, highly contextual, expertise specific, or future-oriented (Helmer, 1967; Ziglio, 1995).

The need for experts, defined by Merriam-Webster (2017) as individuals "having, involving, or displaying special skill or knowledge derived from training or experience" or those individuals who are "highly trained and competent within the specialized area of knowledge related to the target issue" (Hsu & Sandford, 2007, p. 3) is addressed in both content analysis and Delphi methods. However, what is not address is how researchers should quantify expertise. Is expertise quantified through content knowledge? Years of experience? Level of education? In fact, some literature questions if calling on experts in the phenomenon of interest is even necessary. For example, Fraenkel et al., (2012) said:

> For all their study and training, what experts know is still based primarily on what they have learned from reading and thinking, from listening to and observing others, and from their own experiences. No expert, however, has studied or experienced all there is to know in a given field, and thus, even an expert can never be totally sure. All any expert can do is give us an opinion based on what he or she knows, and no matter how much this is, it is never all there is to know (p. 5).

Similarly, in reference to coders in a content analysis, Neuendorf (2002) said the "content analysis scheme needs to be usable by a wide variety of coders, not just a few experts." Bryman (2012) asserted as long as the content analyst had a set of rules to follow (e.g., coding manual) *anyone* could serve as a coder.

In a review of ACEEL studies using the Delphi study method, the term "expert" was used to describe the panelists. However, some literature fully described the criteria used in panel selection (Conner, Gates & Stripling, 2017; Warner, Stubbs, Murphrey & Huynh, 2017; Meals & Washburn, 2015) while other literature lacked a clear description of the level of expertise the panelists possessed (Roberts et al., 2016; Morgan et al., 2013; Shih & Gamon, 1997). One study noted exact criteria for how panelists should be chosen did not exist; thus, the research team deferred to using "nominations from the field in question" (Stewart, Lambert, Ulmer, Witt & Carraway, 2017, p. 284).

Indeed, a measure to quantify an expert or a level of expertise would assist ACEEL researchers in choosing coders for content analyses and panelists for Delphi studies, while at the same time ensuring consistency, transparency, replicability, rigor, and integrity in research across ACEEL disciplines. If researchers are choosing coders and panelists based on convenience or a nomination, they may be missing the opportunity of having someone participate who can bring a greater level of expertise to a study. Presently the only way to know what level of expertise an individual brings to a study is the way the researcher describes the expert. Therefore, investigating the ways ACEEL researchers are describing experts and/or the level of expertise the content analysis coders and Delphi panelists contribute to the research study would be beneficial in providing consistency, transparency, replicability, rigor, and integrity in research studies using content analysis and Delphi methods across ACEEL disciplines.

1.1. What is Expertise?

Before looking at the ways ACEEL researchers are describing the individuals they are using as content analysts and Delphi study panelists (e.g., experts), it is important to first conceptualize expertise. For decades, researchers have sought to conceptualize and define expertise; thus, the literature is filled with hundreds of iterations of what expertise *is*, and the characteristics constituting an expert. Seminal research in expertise substantiates the categorization of expertise in two ways: epistemic, or knowing *that,* and performative, or knowing *how* (Ryle, 1946). Epistemic expertise is a person's deep understanding of a construct, and performative expertise is the person's ability to perform a task with impeccable skill and accuracy (Weinstein, 1993).

Another way to look at expertise is from the perspective of knowledge and practice. Expertise is founded in both an individual's knowledge of a subject or issue and the ability to apply certain skills in professional or vocational contexts (Goldman, 2016; Winch, 2010). Scardamalia and Bereiter (1991) hypothesized expert knowledge was a product of striving beyond one's comfort zone:

> Experts acquire their vast knowledge resources not by doing what falls comfortably within their competence but by working on real problems that force them to extend their knowledge and competence. That is not only how they become experts, we suggest, but also how they remain experts and avoid falling into ruts worn by repeated execution of familiar routines. (pp. 173–174).

Similarly, Camerer and Johnson (1991) asserted an expert is "a person who is experienced in making predictions in a domain and has some professional or social credentials" (p. 196). In terms of defining expertise in relation to cognitive development, Hoffman (1998) said expertise could be understood in terms of the ways in which the expertise was developed, as well as experts' knowledge structures and reasoning processes. Ericsson (2006) posited the accumulation of experience was not sufficient for the development of expertise; experts must possess high levels of motivation, ability, talent, and reflective proficiency.

Schön (1984) believed professionals use a form of tacit experiential knowledge he called knowing-in-action. Reflection, Schön (1984) asserted, is a competency necessary to evaluate and learn from experience, which he said aids in the acquisition of expertise. Reflective proficiency, according to Schön (1984), is a product of reflecting *in* action and reflecting *on* action. In other words, experts reflect in the moments when events are occurring, as well as retrospectively using knowledge and experience gleaned from previous contexts and situations (Schön, 1984; Winch, 2010).

Looking at the acquisition of expertise in a different way, Collins and Evans (2002) asserted expertise exists at three distinct levels: no experience, interactional experience, and contributory experience. Individuals with no expertise lack any knowledge of a construct or practice (Collins & Evans, 2002). Those who have interactional expertise are not skilled practitioners; however, these individuals can verbalize expert-level knowledge of a construct or practice by way of linguistic cultural immersion (Collins, 2004). Collins (2004) explained linguistic cultural immersion in this way, "…it is possible to learn to say everything that can be said about bicycle riding, car-driving,[*sic*] or the use of a stick by a blind man without ever having ridden a bike, driven a car, or been blind and used as stick" (p. 127). The third level of expertise is contributory expertise; people with contributory expertise possess the knowledge and skills required to weigh in on the science or scholarship of the construct under examination (Collins & Evans, 2002).

1.2. Adult Skill Acquisition

In addition to defining and categorizing experts and expertise, theories and models have been developed to conceptualize expertise. Dreyfus and Dreyfus (1986) proposed a theoretical model of skill acquisition and asserted skill acquisition was a "progression *from* analytic behavior of a detached subject, consciously decomposing his environment into recognizable elements and following abstract rules, *to* involved skilled behavior based on an accumulation of concrete experiences and the unconscious recognition of new situations as similar to whole remembered ones" (p. 35).

Novice is the first stage of the adult skill acquisition model. Because beginners lack experience with the situations in which they are expected to execute, they will purposefully seek out rules to follow or individuals' behavior to model (Dreyfus, 2004). Advanced beginner is the second stage of the adult skill acquisition model. In this stage, learners can perceive similarities across situations because of their experience (Dreyfus, 2004). In other words, the advanced beginner's actions in this stage are based on knowledge gained from *past* experience applied in a similar *present* context. Competence, the third stage of the adult skill acquisition model, is characterized by the acquisition of considerable situational experience, giving learners the ability to fully understand and analyze problems and create logical solutions (Dreyfus, 2004).

Learners moving into stage four of adult skill acquisition—proficiency—rely on their intuition and ability to think analytically when making decisions (Dreyfus, 2004). In this stage, learners immediately recognize situations as contextually alike or different, resulting in behavior indicative of successful outcomes achieved in the past. Lastly, the fifth stage of the adult skills acquisition model is expertise. At the expert level, learners no longer look to rules or analytical principals to guide their understanding of the situation to an appropriate action. Because learners now have high amounts of experience and deep levels of understanding, they use their intuition to solve problems and recommend solutions (Dreyfus, 2004).

Ericsson and Smith (1991) proposed expertise is the result of skills obtained through stages of deliberate practice under the guidance of those who are themselves considered to be experts. For practice to be considered deliberate, it must involve high levels of effort, intensity, and concentration (Ericsson, 2006). Ericsson, Krampe, and Tesch-Romer (1993) said, "expert performance reflects the mastery of the available knowledge or current performance standards and relates to skills that master teachers and coaches know how to train" (p. 392). Expert status takes a minimum of 10 years to achieve (Ericsson & Smith, 1991), and it is recommended deliberate practice begin as early as possible because "Individuals who start early and practice at higher levels will have a higher level of performance throughout development than those who practice equally hard but start later" (Ericsson et al., 1993, p. 392).

Those who acquire expertise require adequate time to complete the four developmental phases of becoming an elite performer. Phase one is a discovery period within a certain domain (Ericsson, 2006). The second phase occurs when individuals show talent or promise in that domain. Following the assertion of aptitude, the individual begins participating in structured lessons and minimal amounts of practice until regular practice habits are formed (Ericsson, 2006). Throughout the second phase, individuals seek instructors or mentors who can aid in their continued progression and performance improvement (Ericsson, 2006).

Phase three begins with the individual making a major commitment to reaching the top levels possible in the domain. People seek the best instructors and mentors to ensure their continued performance mastery, and once they achieve mastery, they may continue to the fourth phase (Ericsson, 2006). However, not all individuals enter the fourth and final stage of eminent performance. Eminent performance goes beyond the existing knowledge in the domain to making a significant contribution to the existing knowledge. Major innovations required for this fourth phase exceed the skills and knowledge the master instructors and mentors possess and could impart to the learner (Ericsson et al., 1993; Ericsson, 2006).

1.2.1 Model of Expertise Redevelopment

In 2008, Grenier and Kehrhahn introduced the model of expertise redevelopment (MER) for use in human resource development. The goal of the model was to address flaws they perceived in linear models used to understand expertise. The circular MER model depicts the interaction between three states (e.g., independence, dependence, and transcendence) coexisting within three reciprocally deterministic territories (e.g., content, environment, and constituency). Expertise may necessitate redevelopment when context or job requirements change (Grenier & Kehrhahn, 2008).

1.2.2. Territory of Expertise

The territories of expertise are comprised of three corresponding contexts: content, environment and constituency. According to Grenier and Kehrhahn (2008), content represents the knowledge an individual possesses to perform a skill or function in a role. Environment denotes the surroundings and conditions in which a person functions (e.g., culture, organizational structure, geographical location, physical layout; Grenier & Kehrhahn, 2008). Constituency explains how people influence or are influenced by those who recognize their knowledge and skills as expertise (Grenier &

Kehrhahn, 2008). Further, the continuous flow indicated by the cyclical nature of the model illustrates the relationship of the three territories. Grenier and Kehrhahn (2008) said "significant alterations in one context within the territory can influence the development of expertise, as well as have bearing on preexisting expertise. These contexts continually impact the expansion of new expertise or the need for redevelopment relative to the degree of change in the territory of expertise and individual experiences" (p. 206). For example, a medical doctor working in the United States remains an expert in the field of medicine even when transferred to a hospital in Africa. However, differences in equipment or available resources (e.g., environment) in Africa may require a change in the application of expertise in the new environment, which is why the interaction between the territories of expertise represented in the model is important.

1.2.3. States to Expertise

Further, the interaction and changes that occur within the territories influences people's movement between three states: dependence, independence, and transcendence (Grenier, 2013). Dependence connotes a person's reliance on others for direction, support, information, or training. People in a dependent state do not "have the full capacity to take on tasks or challenges without drawing from outside sources" (Grenier & Kehrhahn, 2008, p. 208). As individuals acquire greater knowledge and skills from those around them, they gain confidence, which leads to autonomy. Once autonomy is achieved, people move into the independence state (Grenier, 2013). Here people begin to make decisions on their own with little input from others. Once individuals reach the point where they are fully autonomous and in charge of their own knowledge and skills, they have reached the transcendence state (Grenier, 2013). People in the state of transcendence are confident in their knowledge and abilities, and as a result, they begin to generate new knowledge, modify or change processes, and challenge existing norms and belief systems (Grenier & Kehrhahn, 2008).

The MER differs from previous explanations of expertise (e.g., novices progressing towards expertise and reaching a pinnacle) in its position that the territories of expertise (e.g., content, environment, and constituency) may influence existing expertise, resulting in the need for expertise transformation or the development of new expertise. Using the previous example, the medical doctor moving from the United States to Africa may revert to the state of dependence while he or she transitions into the new environment. Once the doctor learns the new processes and procedures, he or she will move back into the state of independence, and eventually get back to a state of transcendence.

1.3. Dimensions of Individual and Group Expertise

Indeed, many explanations of expertise are founded in a specific discipline or research tradition. However, Garrett, Caldwell, Harris, and Gonzalez (2009) approached the study of expertise broadly to ensure the results could apply across many perspectives and research domains. Garrett et al., (2009) concluded expertise is the product of six interrelated dimensions applicable to individual and group expertise: subject matter, situational context, interface tool, expert identification, communication skill, and information flow path. Subject matter is knowledge that is specific to a particular topic or area of focus. Situational context is the capability to identify and understand the ways in which contexts (e.g., circumstances, environment) can change over time, and how changes in context affects goal-oriented strategic performance. Interface tool relates to the understanding of how to employ interface tools, which are used to author apps and macros in business, to achieve relevant task goals. Expert identification is knowing who is an expert in certain topic areas and what level of expertise they may contribute to ensure knowledge may be realized by way of discussion or the decision-making process. Communication skill is knowing the appropriate media channels to use to disseminate knowledge and information effectively to the correct audiences at the best times. Lastly, information flow includes the technical knowledge of what communication paths exist and which path is the most appropriate to use given the specific task and situational limitations.

1.4. Statement of the Problem

Currently, a measure to quantify an expert or a level of expertise does not exist in ACEEL literature. For this reason, it is possible some ACEEL studies using content analysis and Delphi study methods lack consistency, transparency, replicability, rigor, and integrity. If researchers are choosing content analysis coders and Delphi study panelists based on convenience or a nomination, they may be missing the opportunity of having someone participate who can bring a greater level of expertise to a study. Although not all studies require the contributions of an expert (Neuendorf, 2002; Fraenkel et al., 2012; Bryman, 2012), it is important that the level of expertise a coder or panelist provided to a study is clearly described in the literature so that researchers may replicate the study as precisely as possible in the future. Presently the only way to know what level of expertise an individual brings to a study is the way the researcher describes the expert in the literature. Investigating the ways ACEEL researchers are describing experts and/or the level of expertise the content analysis coders and Delphi study panelists contribute to the research study would be beneficial in providing consistency, transparency, replicability, rigor, and integrity in research studies using content analysis and Delphi study methods across ACEEL disciplines. Therefore, the purpose of this study is to describe the ways in which ACEEL researchers using content analysis and Delphi study methods are describing the qualifications of the people serving as expert coders and panelists. This study will serve as the first in a series of research studies aimed at creating a scale to measure an individual's level of expertise so that expertise may be consistently and accurately reported in all ACEEL research studies.

1.5. Purpose and Objectives

The purpose of this mixed method research study was to create a measurement scale to quantify an expert or the level of expertise of individuals used as coders in a content analysis or as panelists in a Delphi study. Developing a scale to quantify an expert or measure expertise will fill a void in ACEEL literature, as a scale of this type has not been developed for use in ACEEL disciplines. Moreover, the scale measurement could be used by researchers to report expertise, which will provide both efficiency and consistency in reporting across all ACEEL disciplines, and ensure ACEEL studies are rigorous, transparent, and replicable. The research was conducted in three phases, and the results of the research were reported in the three journal article format.

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2. EXPERT? WHAT DOES THAT MEAN? DESCRIBING THE TERM "EXPERT" IN AGRICULTURAL COMMUNICATIONS, EDUCATION, EXTENSION, AND LEADERSHIP RESEARCH*

2.1. Introduction

The *American Association for Agricultural Education National Research Agenda* (Roberts, Harder, & Brashears, 2016) is a guide for researchers in agricultural communications, education, extension, and leadership disciplines. It was created as a guide to assist ACEEL researchers address the complex problems that exist in agriculture. As such, ACEEL researchers are encouraged to design “high quality applied research” (Roberts et al., 2016, p. 7) programs with seven priorities in mind: public and policy maker understanding of agriculture and natural resources; new technologies, practices, and products adoption decisions; sufficient scientific and professional workforce that addresses the challenges of the 21st century; meaningful, engaged learning in all environments; efficient and effective agricultural education programs; vibrant, resilient communities; and addressing complex problems. In the spirit of conducting “high quality applied research” (Roberts et al., p. 7), researchers in ACEEL disciplines should not only address the research priorities outlined in the agenda, but they should also address the ways in which social science research studies are

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conducted. Ensuring consistency, transparency, replicability, rigor, and integrity in social science research studies in ACEEL disciplines is a research priority not explicitly stated in the agenda, but arguably implicit to all studies. A research method is a systematic plan for conducting research, which can be quantitative or qualitative in nature (Bryman, 2012). Fraenkel, Wallen, and Hyun (2012) said a research method is a way of “testing ideas in the public arena” (p. 5), so it stands to reason consistency, transparency, replicability, rigor, and integrity rests in researchers’ diligent adherence to the parameters of the chosen research method, and would therefore be a standard by which “high quality applied research” (Roberts et al., 2016, p. 7) is evaluated.

2.1.1. Content Analysis and Delphi Study Methods

There are many research methods at ACEEL researchers’ disposal (e.g., causal-comparative, case study, experiment). Content analyses and studies using the Delphi method are widely used for researching phenomenon that cannot be directly tested or observed and for which consensus or agreement is necessary. In content analysis, the data from the communication (e.g., newspaper article, students’ written reflections) are analyzed by coders, either the researchers themselves or people retained by the research team, who have been trained to follow an explicit set of instructions (e.g., codebook). Clear coding instructions ensure each coder is following the same processes and criteria to achieve an acceptable level of agreement (Bryman, 2012). Similarly, the primary objective of the Delphi method is to build consensus and consistency of opinion from a panel of experts regarding an area of interest or inquiry (Hasson, Keeney & McKenna, 2000; Winzenried, 1997; Yang, 2003). The Delphi method is based on multiple rounds of questions used to gather responses with the ultimate purpose to combine the responses into “one useful statement” (Saucier, McKim, & Tummons, 2012, p. 139). In both research methods, external reliability may be established, in part, on the expertise of the coders and panelists (Dalkey, 1969; Krippendorff, 2013; Linstone & Turoff, 1975). Expert coders and panelists are individuals who are chosen because they have specific backgrounds (e.g., educational, cultural) and possess professional proficiency, knowledge, experience, and/or familiarity with the phenomenon under investigation.

The term “expert” is defined by Merriam-Webster (2017) as individuals “having, involving, or displaying special skill or knowledge derived from training or experience.” Dalkey (1969), who originated the Delphi method, asserted at least 11 people were required to serve on the expert panel in a Delphi study to establish an acceptable level of external reliability. External reliability refers to the extent to which a study can be replicated with similar results to a preceding study (Bryman, 2012). For external reliability to be satisfied, procedures from the preceding study must be followed as closely as possible in the succeeding study, which is why debate exists on whether individuals serving as coders in a content analysis need to be experts. Krippendorff (2013), a leading developer of various content analysis techniques, emphasized the value coders with expert knowledge and experience bring to content analysis. Krippendorff (2013) also encouraged analysts to clearly describe why coders’ were selected so that future research teams could select coders with experiences and backgrounds similar to those of the original research (Krippendorff, 2013). Additionally, Krippendorff (2013) recommended researchers select coders who have high cognitive abilities, high familiarity with the phenomenon of interest, and who are accessible in the general population. Potter and Levine-Donnerstein (1999) said the expert standard of coders should be driven by the type of content being examined (e.g., manifest, latent, projective). In cases where the content is projective—that which relies on coder's to access their pre-existing mental schema to make interpretations and judgements of the meaning of the content—coders who have expertise or a higher level of cognitive ability should be retained (Potter & Levine-Donnerstein, 1999).

Some research professionals questioned whether or not calling on experts for content analysis coding was necessary. Bryman (2012) asserted as long as the content analyst was trained on how to code the content, and inter-coder reliability was established at an acceptable level, *anyone* could serve as a coder. Similarly, experts may not be readily found in a population (Neuendorf, 2002). Therefore, a coding scheme that was only usable by experts would limit the study. To resolve this issue, Neuendorf (2002) recommended researchers design coding schemes that could be "usable by a wide variety of coders," (p. 116). Fraenkel et al. (2012) agreed, and noted:

> For all their study and training, what experts know is still based primarily on what they have learned from reading and thinking, from listening to and observing others, and from their own experiences. No expert, however, has studied or experienced all there is to know in a given field, and thus, even an expert can never be totally sure. All any expert can do is give us an opinion based on what he or she knows, and no matter how much this is, it is never all there is to know (p. 5).

A uniform method for describing the expertise coders and panelists bring to a study could assist ACEEL researchers in choosing the individuals to serve in the role, while at the same time ensuring consistency, transparency, replicability, rigor, and integrity in research across ACEEL disciplines. If researchers are choosing coders and panelists based on convenience or a nomination, they may be missing the opportunity of having someone participate who can bring a greater depth, experience, skill, or content knowledge to a study. Presently, the only way to know what coders or panelists bring to a study is the way the researcher describes their credentials in the description of the methods or procedures. Therefore, investigating the ways ACEEL researchers are describing content analysis coders and Delphi study panelists would be beneficial in providing consistency, transparency, replicability, rigor, and integrity in research studies using content analysis and Delphi study methods across ACEEL disciplines.

2.1.2. Statement of the Problem

Currently, a uniform way to quantify expertise does not exist in ACEEL literature. For this reason, it is possible some ACEEL studies using content analysis and/or Delphi study methods lack consistency, transparency, replicability, rigor, and integrity. If researchers are choosing content analysis coders and Delphi study panelists based on convenience or a nomination, they may be missing the opportunity of having individuals participate who can bring a greater level of expertise to a study. Although not all studies require the contributions of an expert (Bryman, 2012; Fraenkel et al., 2012; Neuendorf, 2002), it is important that the level of expertise a coder or panelist provided to a study is clearly described in the literature so that researchers may replicate the study as precisely as possible in the future. Presently, the only way to know what level of expertise an individual brings to a study is the way the researcher describes the expert in the literature. Investigating the ways ACEEL researchers are describing experts and/or the level of expertise the content analysis coders and Delphi study panelists contribute to the research study would be beneficial in providing consistency, transparency, replicability, rigor, and integrity in research studies using content analysis and Delphi study methods across ACEEL disciplines. Therefore, the purpose of this study was to describe the ways in which ACEEL researchers using content analysis and Delphi study methods described the qualifications of the individuals who served as expert coders and panelists. This study will be the first in a series of studies aimed at creating a tool, model, or system of definitions to serve as an indication of an individual's level of expertise so that expertise may be consistently and accurately reported in all ACEEL research studies.

2.2. Literature Review and Conceptual Framework

There is no over-arching definition of an expert or expertise in the ACEEL literature. Therefore, before investigating the ways ACEEL researchers are describing the individuals they are using as content analysts and Delphi study panelists (e.g., experts), it is important to first conceptualize expertise.

Expertise is a complex, multifaceted phenomenon researchers have sought to define for decades (Goldman, 2015; Ericsson & Smith, 1991; Herling, 2000; Hoffman, 1998; Weinstein, 1993). As a result, the literature is filled with hundreds of iterations of expertise and the characteristics constituting an expert. In his seminal research in expertise, Ryle (1946) substantiated the categorization of expertise in two ways: epistemic, or knowing *that,* and performative, or knowing *how*. Epistemic expertise is an individual's deep understanding of a construct, and performative expertise is an individual's ability to perform a task with impeccable skill and accuracy (Weinstein, 1993). Ericsson and Smith (1991) believed expertise was a product of practicing a skill or studying a body of knowledge—guided by those who are themselves considered to be experts—for a minimum period of 10 years. According to Herling (2000), expertise implies proficiency or a level of knowledge gained from having experience or training in a particular phenomenon, and that proficiency can be recognized or observed by others.

Indeed, expertise is founded in both an individual's knowledge of a subject or issue and the ability to apply certain skills in professional or vocational contexts (Goldman, 2015; Winch, 2010). Scardamalia and Bereiter (1991) hypothesized expert knowledge was a product of striving beyond one's comfort zone:

> Experts acquire their vast knowledge resources not by doing what falls comfortably within their competence but by working on real problems that force them to extend their knowledge and competence. That is not only how they become experts, we suggest, but also how they remain experts and avoid falling into ruts worn by repeated execution of familiar routines (pp. 173-174).

Similarly, Camerer and Johnson (1991) asserted an expert is "a person who is experienced in making predictions in a domain and has some professional or social credentials" (p. 196). In terms of defining expertise in relation to cognitive development, Hoffman (1998) said expertise depended upon how the expertise was developed, as well as experts' knowledge structures and reasoning processes. Collins and Evans (2002) asserted expertise existed at three distinct levels: no experience, interactional experience, and contributory experience. Individuals with no experience lack any knowledge of a construct or practice. Those who have interactional experience are not skilled practitioners. However, these individuals can articulate knowledge of a construct or practice even if they have no personal experience with it. For example, a person may be able to explain the use of a baseball bat even if they have never played the sport. The third level of experience is contributory experience. Those who have contributory experience possess the both the high level knowledge and performance skills required to weigh in on the science or scholarship of the construct or practice under examination.

Schön (1984) believed professionals use a form of tacit experiential knowledge he called knowing-in-action. Reflection is a competency necessary to evaluate and learn from experience, which aids in the acquisition of expertise (Schön, 1984). Reflective proficiency is a product of reflecting *in* action and reflecting *on* action. Therefore, experts reflect in the moments when events are occurring, as well as retrospectively using knowledge and experience gleaned from previous contexts and situations (Schön, 1984; Winch, 2010).

In summary, expertise is dynamic, domain specific, and characterized according to an individual's level of knowledge, experience, and problem-solving ability. Expertise can be used as an indicator of an individual's ability to effectively serve as a coder in an analysis of content or on a panel in a Delphi study. Researchers' choice of coders and panelists could be a reflection of their commitment to following the guidelines of their selected research method and to producing results that are consistent, transparent, replicable, rigorous, and grounded in academic integrity.

In the spirit of producing “high quality applied research” (Roberts et al., 2016, p. 7), researchers in ACEEL disciplines should examine the ways research is conducted. Ensuring consistency, transparency, replicability, rigor, and integrity is crucial in all research studies. As such, the conceptual framework of this study was established in the previous scholarship of ACEEL research professionals who have analyzed the premier ACEEL journals (Edgar, Edgar, Briers, & Rutherford, 2008; Edgar & Rutherford, 2011) in the following areas: curriculum (Cannon, Specht, & Buck, 2016; Shinn, Wingenbach, Briers, Lindner, & Baker, 2009); research themes and trends (Edgar, Rutherford, & Briers, 2009; Naile, Robertson, & Cartmell, 2010; Rodriguez & Evans, 2016; Williford, Edgar, Rucker, & Estes, 2016), prolific authors (Edgar et al., 2008; Harder & Roberts, 2006); theories, models, and methodologies used (Baker & King, 2016; Edgar, Rutherford, & Briers, 2009), and cited literature (Edgar & Cox, 2010, Edgar & Rutherford, 2011). Conceptually this study was focused on the ways ACEEL researchers are describing the qualifications of the coders and panelists used in studies that employ content analysis or the Delphi method.

2.3. Method

As with all research endeavors, choosing a method that is best suited to the line of inquiry is crucial to eliciting useful results. Although there were a number of methods at our disposal (e.g., grounded theory, content analysis, case study), I used a qualitative descriptive study design. Qualitative description has been identified as appropriate for research that is explanatory in nature, to answer research questions that are focused phenomenon not be commonly understood, or when a straightforward description of phenomenon is desired (Sandelowski, 2000). Researchers using qualitative description generally draw from a naturalistic perspective, which contends reality is best understood when examined contextually and in everyday terms (Sandelowski, 2000). The naturalistic paradigm is comprised of five fundamental principles: (a) certainties are multiple, constructed, and holistic; (b) the knower and the known are interactive and inseparable; (c) only time and context-bound working hypotheses are possible; (d) all entities are in a state of mutual simultaneous shaping; and (e) inquiry is value bound. Further, the researcher in naturalistic inquiry serves as the research instrument used to study the phenomena because nonhuman instruments are unable to comprehend all of the certainties it can encounter; however, humans can interpret and understand the meaning and bias that may exist in text (Lincoln & Guba, 1985).

I reviewed studies published in the *Journal of Applied Communications, Journal of Agricultural Education, Journal of International Agriculture and Extension Education, Journal of Leadership Education, Journal of Extension,* and *North American Colleges and Teachers of Agriculture Journal* from 2007 to 2017. These journals were selected because they comprise the "premier journals identified in the agricultural education discipline" (Edgar & Rutherford, 2011, p. 2). These years were chosen because electronic versions of the journal for these years were available online. Thus, keywords could be easily input into the online search function for each journal, making the journals "accessible" (Williford et al., 2016, p. 66). Criteria for inclusion of articles in the population included publication in an ACEEL premier journal from 2007 – 2017 and using content analysis or Delphi study to gather data. Potential articles were obtained by accessing the online journal archives: newprairiepress.org/jac/, www.jae-online.org, www.aiaee.org, www.joe.org, www.jouralofleadership.org, www.nactateachers.org.

I conducted two separate keyword searches—first using the keywords content analysis and then using the word Delphi. Database searches combined for all journals yielded a population of 382 articles that contained the key words content analysis and 141 articles that included the key words Delphi. The paragraph that indicated where the key words appeared in the article were reviewed, and articles that came up in the search that contained the key words, but did not appear to use a content analysis or Delphi method as a research method to gather data, were eliminated. Next, I read the method sections of the remaining articles and removed any articles that did not use content analysis or Delphi study methods. For examples, in some articles, the authors mentioned content analysis or Delphi study as methods they considered using but did not select. In other instances, the keywords appeared in the references section of the article and not in the methods section. Therefore, 126 articles using content analysis and 56 articles using Delphi methods comprised the sample for this study. A breakdown of the number of articles included in this study, by journal, was displayed in Table 2.1.

Table 2.1

Summary of Articles Included in this Study by Journal

Method	JAC	JAE	JIAEE	JOE	JOLE	NACTA	Total
Content Analysis	40	15	9	53	4	5	126
Delphi	4	23	11	10	1	7	56

Note. JAC = *Journal of Applied Communications,* JAE = *Journal of Agricultural Education,* JIAEE = *Journal of International Agriculture and Extension Education,* JOLE = *Journal of Leadership Education,* JOE = *Journal of Extension,* NACTA = *North American Colleges and Teachers of Agriculture Journal*

As the focus of this paper was to describe the ways in which ACEEL researchers described the qualifications of the coders and panelists they used in their studies using content analysis and Delphi study methods, all articles were reviewed and the following items documented: journal, study title, author(s), method, identification of who coded the data, a description of the coders' and panelists' qualifications, and identification of the literature used to support the researchers' selection of coders and panelists.

Further, my inductive analysis involved a two-cycle coding process (*Saldaña*, 2009). First cycle coding was descriptive and used to extract the verbiage that described the coder and panelist's qualifications from the methods sections of each journal article. Focused coding was used for the second cycle of coding to elicit a deeper understanding of the data corpus. Focused coding was initiated during the peer review process. The peer review process was designed to help establish dependability. During the peer review, participants served as a system of checks and balances to ensure dependability, consistency and quality in the coding (Creswell, 2007; Lincoln & Guba, 1985; Merriam & Tisdell, 2015). During the peer review, I provided each peer reviewer my codebook. Using my coding instructions, each peer reviewer randomly selected articles from each journal and checked my coding records to ensure that I had coded the data correctly and reported the descriptions accurately.

A doctoral candidate and a doctoral student in a college of agriculture and life sciences at a Southern land-grant institution participated in the peer review. In addition to participants' academic training in research principles and methods, each participant in the peer review had worked in industry for more than 15 years before attending graduate school. Therefore, each peer reviewer brought a unique blend of academic and industry knowledge, skill, and problem-solving abilities to the peer review process. Inconsistencies would have been discussed as a group and rectified as necessary. However, there were no inconsistencies between my coding and the peer reviewers' coding, which resulted in consensual validation. Consensual validation is often the product of a peer review when the opinion of others not involved in the initial research process is sought and agreement that the description, interpretation, and evaluation of the data among them is reached (Creswell, 2014). My reflection journal containing process notes (i.e., methodological notes, trustworthiness notes, and audit trail notes) established confirmability (Lincoln & Guba, 1985).

Findings From 2007 – 2017, in 126 articles researchers indicated using a content analysis to collect data and in 56 articles researchers indicated using the Delphi method to collect data. These articles came from the premier agricultural journals (Edgar & Rutherford, 2011): *Journal of Applied Communications, Journal of Agricultural Education, Journal of International Agriculture and Extension Education, Journal of Extension, Journal of Leadership Education,* and *North American Colleges and*

Teachers of Agriculture Journal. In each observation of articles published in JIAEE, JOLE, and NACTA analyzed for this study, no researchers provided an explanation of the coders' qualifications to perform a content analysis. Similarly, 92% (*n* = 49) of the articles published in JOE, 80% (*n* = 32) of the articles published in JAC, and 60% (*n* = 9) of the articles published in JAE in which researchers reported using content analysis method to gather data did not provide an explanation of the coders' qualifications. In summary, 86% (*n* = 108) of the total number of articles analyzed for this study that were published in the premier ACEEL journals where the study employed content analysis to gather the data did not include a description of the coders' qualifications. In contrast, 100% (*N* = 56) of the articles reviewed in the six premier journals that used the Delphi study method contained a description of the panelists' qualifications and/or the criteria used to select the people who served on the panel. A breakdown of the percentage of articles lacking a description of coders' and panelists qualifications by journal was presented in Table 2.2.

Table 2.2

Percent of Articles Lacking a Description of Coders'/Panelists' Qualifications by Journal

	JAC		JAE		JIAEE		JOE		JOLE		NACTA		Total	
Method	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*
Content Analysis	80	32	60	9	100	9	92	49	100	4	100	5	86	108
Delphi	0	11	0	23	0	11	0	10	0	1	0	7	0	56

Note. JAC = *Journal of Applied Communications,* JAE = *Journal of Agricultural Education,* JIAEE = *Journal of International Agriculture and Extension Education,* JOE = *Journal of Extension,* JOLE = *Journal of Leadership Education,* NACTA = *North American Colleges and Teachers of Agriculture Journal*.

Furthermore, 96% (*n* = 121) of the total number of articles using the content analysis method did not contain a citation (e.g., Krippendorff, 2013; Neuendorf, 2002) that would either support or refute an inclusion or lack of inclusion of a description of coders' qualifications. Of the total number of articles using the Delphi study method, 79% (*n*= 44) did not include a citation that supported the researchers' selection of individuals to serve on the panel of experts (e.g., Dalkey, 1969; Linstone & Turoff, 1975). A breakdown of articles lacking a citation to support the researchers' selection of coders' and panelists based on their qualifications by journal was presented in Table 2.3.

Table 2.3
Percent of Articles Lacking a Citation to Support Selection of Coders/Panelists by Journal

	JAC		JAE		JIAEE		JOE		JOLE		NACTA		Total	
Method	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*
Content Analysis	95	38	100	15	100	9	94	50	100	4	100	5	96	121
Delphi	100	4	61	14	0	11	80	8	100	1	86	6	79	44

Note. JAC = *Journal of Applied Communications,* JAE = *Journal of Agricultural Education,* JIAEE = *Journal of International Agriculture and Extension Education,* JOE = *Journal of Extension,* JOLE = *Journal of Leadership Education,* NACTA = *North American Colleges and Teachers of Agriculture Journal*

Examples of the qualification descriptions from the articles that provided a description of the coders' qualifications included:

Journal of Agricultural Communications

"Our research team was comprised of faculty members in agricultural communication programs located in the United States with varying years of experience in academics ranging from eight to less than one. All team members have been involved in developing coursework and curricula to some degree," (Cannon et al., 2016, p. 10).

"The primary researcher, a master's student in agricultural communications, coded every page. A co-coder, also a master's student in agricultural communications, was selected to code 20% of the pages to ensure inter-rater agreement," (Rogers, Rumble, & Lundy, 2016, p. 37).

Journal of Agricultural Education

"…two agricultural communications graduate students in the Department of Agricultural Education, Communications, and Technology at the University of Arkansas," (Pennington, Calico, Edgar, Edgar, & Johnson, 2015, p. 33)

"The researchers' professional backgrounds were beneficial during the content analysis process. One researcher had taught a preservice course that included instructional planning, and the other researcher had recently student taught," (Greiman & Bedtke, 2008, p. 51).

Journal of Extension

"A panel of expert reviewers made up of five Extension professionals, including 4-H and Family and Consumer Health Science agents, analyzed the data to identify emerging themes through content analysis," (Peterson & McDonald, 2009, para. 6).

“Two researchers, who were knowledgeable about recreation, fisheries, and related resource management issues, coded the data,” (Woosnam, Jodice, Von Harten, & Rhodes, 2008, para. 11).

2.4. Conclusions and Discussion

The majority of studies that noted using content analysis or Delphi methods in the premier agricultural journals did not describe the qualifications used to select coders or the credentials the coders possess that would make them qualified to code the data in a content analysis. Researchers were also inconsistent citing literature to support the inclusion or exclusion of a description of coders’ qualifications. Based on these findings, ACEEL researchers, agricultural education journal editors, and research professionals tasked with performing journal article reviews should consider how including a description of coder credentials could enhance the consistency, transparency, replicability, rigor, and integrity of ACEEL research. According to Roberts et al., (2011), “Researchers should clearly explain data collection processes and procedures for coding and analyzing data,” (p. 4) which includes a clear description of the qualifications of the individuals who coded the data. In many instances, an article may have multiple authors, but only one or two of the authors participated in coding. In other instances, individuals not at all affiliated with implementing the study may have coded the data, yet their background, skills, and problem-solving abilities relevant to the study are not described. Some researchers believe that as long as coders have the cognitive ability to complete training and follow a set of instructions, often required in a quantitative content analysis, they are suitable coders (Bryman, 2012). Indeed, cognitive ability is important.

However, researchers may not be able to account for such things as coding fatigue, poor work ethic, or negative attitude, and inconsistent adherence to the coding instructions after the interrater reliability coefficient was calculated. For content analysis studies to portray the same rigor as other research methods, researchers should give greater consideration to the level of expertise the coders bring to the study and thoroughly describe the level to increase transparency and replicability.

Also, all of the researchers whose studies were analyzed in this study described what qualifications were necessary for a potential panelist to possess to be suitable to serve on a Delphi study panel. Perhaps a reason is because the seminal authors (e.g., Dalkey, 1969; Linstone, & Turoff, 1975) made it very clear that panels in a Delphi study must be comprised of experts to reach consensus. Whereas, expertise or familiarity with the phenomenon under investigation is only a recommendation for researchers to consider when selecting coders for a content analysis.

There are several likely reasons researchers are not describing content analysis coders qualifications: (a) providing a description of a content analysis coder's qualifications is not a fundamental requirement of the methodology; (b) researchers may not be choosing coders who have experience in the phenomenon under investigation; (c) it was determined having experience in the phenomenon under investigation would not enhance the coder's ability to adequately code the data; (d) researchers may rely on convenience or their ability to delegate coding tasks to those with whom they may have authority over (e.g., undergraduate and graduate students); and (e) researchers may believe expertise is implied or implicit in the very nature of conducting research—those who conduct research are typically working towards achieving an advanced degree or are those who have already achieved advanced degrees. Further, members of the research teams' names and titles are included in the journal article either at the beginning or end of the manuscript. Perhaps researchers believe the title (e.g., assistant professor, graduate student) is suggestive of expertise. This belief is erroneous as it does not consider the differences that exist in coders' *level* of skill, cognitive ability, knowledge, and prior experience. For example, a traditional undergraduate student entering a master's program immediately following graduation would not possess the same level of prior experience or knowledge as a person entering a master's program after spending several years, or even decades, in industry. Yet, both types of individuals share the same "graduate student" title. Similarly, it is also possible that an assistant professor who has the cognitive ability and knowledge of a particular subject may not possess the same level of prior experience or skill in certain subject matter that an individual returning to school after spending decades in industry may possess. For example, it is possible that some faculty may possess interactional experience (e.g., not skilled practitioners but can articulate knowledge; Collins & Evans, 2002). Whereas, some graduate students may possess contributory experience (e.g., high level knowledge and performance skills; Collins & Evans, 2002), which is a reason relying on an individual's title to ascertain expertise is problematic. The assumption can be made that the person with the more prestigious title has more expertise than the individual with a title that might imply they are a novice when in fact the person could be considered an expert in certain contexts.

Including a more complete description of coders' credentials could increase transparency and alleviate the potential for misunderstandings, assumptions, or confusion.

In light of the findings of this study, it would be advantageous to consider possible reasons why researchers are not consistently describing the qualifications their content analysis coders bring to a study. Do they not deem providing a description of coders' qualifications important? The case could be made that describing the qualifications of a coder is of equal importance to justifying the methodology choice, describing the method itself, comparing the method to other methods that could have been used in the study, or providing an interrater reliability coefficient. Similarly, are there reasons researches are not consistently citing the literature to support their decision to provide an adequate description of the coders qualifications? It is possible the omission of a citation or a description of expertise is due to space limitations in some journals. It could also be cultural differences between the research training academics receive in different parts of the world. It is also possible coders were selected based on availability, convenience, or to provide the coder with research experience—all acceptable reasons, but a citation would provide support for those choices, as well as indicate to the audience whose methodology recommendation (e.g., Krippendorff, 2013; Neuendorf, 2002) is being followed. Consistent inclusion of a citation regarding coders' expertise in content analyses, similar to what many research professionals provide when describing their choices for Delphi study panelists, would enhance consistency, transparency, replicability, rigor, and integrity of the research published in the premier agricultural education journals.

Indeed, the findings provide reason to hold researchers in ACEEL disciplines accountable for not providing a citation that supports their decisions and selection of coders in a study using content analysis or Delphi study methods. However, journal editors and peer reviewers, who are the gatekeepers tasked with deciding which manuscripts are suitable for publishing, share in the responsibility of ensuring consistency, transparency, replicability, rigor, and integrity are ever present.

2.5. Recommendations

Based on the findings of this study, ACEEL researchers are encouraged to thoroughly describe the qualifications of their content analysis coders and should look to the ways researchers are describing the experts chosen for a Delphi study as an example of the level of detail to include. This will:

(a) Aid researchers in the decision-making process for future replication of the study.

(b) Improve consistency in the published work across all ACEEL disciplines.

(c) Ensure rigor by establishing the coders were able to fully generate data that is appropriate for the level of analysis required to answer the research question.

(d) Provide transparency with the intention of making the research process as clear, accessible, understandable, and replicable as possible.

(e) Establish integrity, as much of the misperception that surrounds social science research stems from researchers who veil their methods in secrecy and academic jargon.

(f) Ensure researchers include the relevant literature supporting their decision not to include a description of coders' qualifications.

Further, researchers using the Delphi study method should continue to provide detailed descriptions of the qualifications their panelists bring to a research study, but be more consistent about including an appropriate citation. All researchers who use content analysis and Delphi study methods should be cognizant of the impact their choices of coders and panelists truly have on the study results.

Recommendations for future research include opening up the discussion of expertise to a broader group of ACEEL researchers. The insight and opinions of a broader group of ACEEL researchers on the topic of expertise would be beneficial in generating an over-arching protocol specific to the ways ACEEL researchers report coders and panelists' qualifications in studies using content analysis and Delphi study methods. For example, it is possible that coders in studies using content analysis are being chosen based on a level of skill or knowledge possessed, but researchers may not be providing a complete description in their manuscripts because of space limitations in some journals, or because journal editors and peer reviewers have not set a consistent standard of detail needed to ensure publication.

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3. A PRELIMINARY EXPLORATION ON THE MEASUREMENT OF EXPERTISE: DEVELOPING A PSYCHOMETRIC SCALE FOR AGRICULTURAL EDUCATION DISCIPLINES

3.1. Introduction and Literature Review

Research methodology is a systematic way to solve a problem. From causal-comparative method to case study to experiment, social scientists have a wide variety of choices when it comes to selecting the best way to solve a problem. The *American Association for Agricultural Education National Research Agenda* (Roberts, Harder, & Brashears, 2016) was developed as a guiding document for research conducted in agricultural communications, education, extension, and leadership disciplines. The document states:

> Members of the American Association for Agricultural Education (AAAE) have a long history of conducting high quality applied research focused on problems faced by a wide variety of stakeholders. Our expertise allows us to address social science issues within food, agriculture, and natural resources systems. (Roberts et al., 2016, p. 7).

Indeed, expertise is an important concept in social science research. Two popular social science research methods—content analysis and Delphi—rely on the use of experts and individuals with certain levels of expertise. In content analysis, the data from communications (e.g., advertising campaigns, students' reflection journals) are analyzed by coders. Coders can be either the social scientists themselves or individuals selected and trained to follow a clear and precise coding scheme (i.e., a set of rules to guide coding). An unambiguous coding scheme ensures each independent coder is coding the materials the same way. Similar coding results yield a higher level of intercoder reliability—the extent to which multiple independent coders agree on the coding of the content of interest using the same coding scheme (Krippendorff, 2013; Neuendorf, 2002). Likewise, in studies employing the Delphi method, a level of agreement is achieved from a panel of experts regarding the phenomenon of interest (Hasson, Keeney & McKenna, 2000; Winzenried, 1997; Yang, 2003). After a panel of experts answers multiple rounds of questions, the answers are combined into "one useful statement" (Saucier, McKim, & Tummons, 2012, p. 139).

In studies using content analysis or Delphi to gather data, external reliability can be established, in part, using the expertise of the coders and panelists (Dalkey, 1969; Krippendorff, 2013; Linstone & Turoff, 1975). External reliability is the extent to which a study can be replicated with similar results to a preceding study (Bryman, 2012). Expert coders and panelists are selected to perform the function of coding or to answer multiple questionnaires based on pre-determined criteria stipulated by the research team. Coders and panelists should possess professional proficiency, knowledge, experience, and/or familiarity with the phenomenon of interest (Dalkey, 1969; Krippendorff, 2013; Neuendorf, 2002).

In a Delphi, a minimum of 11 experts are needed to serve on the panel to establish an acceptable level of external reliability (Dalkey, 1969). To achieve external reliability, procedures from the preceding study must be followed as closely as possible in the succeeding study. However, when considering a requirement that a person possess expertise to serve as a coder in an analysis of content, a divergence of opinion existed. Krippendorff (2013), who is considered a forerunner in content analysis development, emphasized the value coders with expert knowledge and experience bring to the content analysis process. Clearly describing why coders' were selected was emphasized as a way for future social scientists to achieve external reliability—knowing why coders were chosen would provide future researchers protocol to follow in their own selection of coders (Krippendorff, 2013). Moreover, social scientists should take care to select coders who can be easily found in the general population with high cognitive abilities and familiarity with the phenomenon of interest (Krippendorff, 2013; Potter & Levine-Donnerstein, 1999).

Although there are proponents of seeking experts for content analysis coding, there are others who contend coders need not possess expertise to perform the coding function. According to Bryman (2012), thorough coder training was the key requirement—as long as the coder was thoroughly trained on how to code the content, and a high enough level of inter-coder reliability was established, *anyone* could serve as a coder. Fraenkel, Wallen, and Hyun (2012) concurred:

> For all their study and training, what experts know is still based primarily on what they have learned from reading and thinking, from listening to and observing others, and from their own experiences. No expert, however, has studied or experienced all there is to know in a given field, and thus, even an expert can never be totally sure. All any expert can do is give us an opinion based

on what he or she knows, and no matter how much this is, it is never all there is to know (p. 5).

Neuendorf (2002) believed retaining experts for content analysis coding was problematic, as experts may not be readily found in a population and a coding scheme usable only by experts could limit the study.

Both sides of the debate on whether experts should be retained for content analysis coding make valid points. Protocol for the use of experts in a Delphi study does not diverge: an expert panel is mandatory to achieve consensus. Presently, the only way to know what qualifications, credentials, experience, or knowledge coders or panelists bring to a study is the way the social scientist describes those aspects in the description of the methods or procedures. If social scientists are choosing coders and panelists based on convenience or a nomination, they may be missing the opportunity to bring a greater level of depth, experience, skill, or content knowledge that would come from choosing coders and panelists who are experts or have expertise in the phenomenon of interest.

Certainly the expertise of the coders and panelists selected to assist with ACEEL research complements the expertise of the social scientists tasked with addressing the complex problems associated with food, agriculture, and natural resources systems (Roberts et al., 2016). However, the only way to know this for sure is by looking at the ways the ACEEL social scientist describes the expertise of the coders and panelists. For this reason, Costello and Rutherford (in press) conducted a study to assess the ways social scientists were describing the level of expertise the individuals retained to code content or serve as an expert on a Delphi panel brought to a study. They examined 126 content analyses and 56 Delphi studies published from 2001 – 2017 in the premier agricultural journals (Edgar & Rutherford, 2011)—*Journal of Applied Communications, Journal of Agricultural Education, Journal of International Agriculture and Extension Education, Journal of Extension, Journal of Leadership Education,* and *North American Colleges and Teachers of Agriculture Journal*. In each analysis of articles published in JIAEE, JOLE, and NACTA, an explanation of the coders' qualifications to perform a content analysis was not described. In the analysis of articles published in JOE, 92% (n = 49) of the articles lacked a description of coders' qualifications. Similarly, 80% (n = 32) of the articles published in JAC did not contain a description of coders' qualifications, and 60% (n = 9) of the articles published in JAE did not describe the coders' qualifications. In summary, 86% (n = 108) of the total number of articles analyzed for this study that were published in the premier ACEEL journals where the study employed content analysis to gather the data did not include a description of the coders' qualifications. The opposite was true of the articles analyzed that employed the Delphi method to collect data. One hundred percent (N = 56) of the articles reviewed in the six premier journals that used the Delphi study method contained a description of the panelists' qualifications and/or the criteria used to select the people who served on the panel. A breakdown of the percentage of articles lacking a description of coders' and panelists qualifications by journal was presented in Table 3.1.

Table 3.1
Percent of Articles Lacking a Description of Coders'/Panelists' Qualifications by Journal

	JAC		JAE		JIAEE		JOE		JOLE		NACTA		Total	
Method	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*
Content Analysis	80	32	60	9	100	9	92	49	100	4	100	5	86	108
Delphi	0	11	0	23	0	11	0	10	0	1	0	7	0	56

Note. JAC = *Journal of Applied Communications,* JAE = *Journal of Agricultural Education,* JIAEE = *Journal of International Agriculture and Extension Education,* JOE = *Journal of Extension,* JOLE = *Journal of Leadership Education,* NACTA = *North American Colleges and Teachers of Agriculture Journal*.

Because the majority of researchers who used content analysis or Delphi methods and whose studies were published in the premier agricultural journals did not describe the qualifications used to select coders or the credentials the coders possess that would make them qualified to code the data in a content analysis, Costello and Rutherford (in press) recommended a thorough description of coder's and panelists qualifications be included in peer-reviewed articles published in the premier agricultural journals (Edgar & Rutherford, 2011). However, it is possible that the space limitations in some journals prohibit a full description. A uniform method for describing the level of expertise a content analysis coder or Delphi panelist may contribute to a study would make it easier for social scientists in ACEEL disciplines to report expertise consistently and concisely. It would also enhance the replicability for future research.

3.1.1. Purpose of the Study

The purpose of this study was to attempt to create a psychometric scale to measure expertise to assist ACEEL researchers report the level of expertise their chosen experts bring to a study. Developing a scale to measure expertise would provide ACEEL researchers with an efficient and consistent means of reporting the level of expertise experts bring to a study. As a result, ACEEL research will realize enhanced rigor, transparency, and replicability.

3.1.2. Conceptual Framework

Psychometric theory (Nunnally, 1967) and DeVellis' (2012) strategies for developing measurement scales provided the conceptual framework for this study. Psychometrics is a field of study centered on the theory and technique of psychological measurement. Psychometrics can be used to measure abstract concepts and phenomenon that cannot be directly observed (e.g., knowledge, attitudes, personality characteristics; Nunnally, 1967), which was why using psychometric theory in the creation of an instrument to measure expertise was particularly useful. The definition of measurement in the social sciences has been debated over the years. However, Stevens (1946) offered one of the first definitions of scale measurement many social scientists use today. He said "measurement, in the broadest sense, is defined as the assignment of numerals to objects or events according to rules" (p. 667). Subsequent definitions have been broadened to include the use of statements to "represent the quantities of attributes" (Rayfield, McKim, Lawrence, & Stair, 2014) in attempts to measure specific concepts. Many social scientists in agricultural education have used the tenets of psychometric theory (McKim, Lawver, Enns, Smith, & Aschenbrener, 2013; McKim & Saucier, 2011; Rayfield et al., 2014) as a primary or secondary study framework to bring procedural and analytical guidance to the analysis.

Further, DeVellis's (2012) steps for developing measurement scales were also used to guide this study. Those steps were: (1) defining the phenomenon of interest, (2) generating items, (3) creating the instrument, (4) item pool evaluation (5) administering the instrument to a development sample, and (6) evaluating the results. Figure 3.1 presents a visual representation of DeVellis's (2012) steps for developing measurement scales.

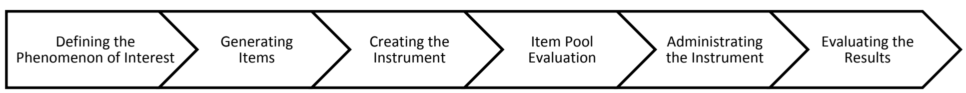

Figure 3.1: Scale Development Steps (adapted from DeVellis, 2012)

3.1.3. Step 1: Defining the Phenomenon of Interest

As shown in Figure 3.1, the first step of scale development is defining the phenomenon of interest. This step was accomplished by conducting a thorough review of the literature and secondary sources to determine how expertise was defined. Merriam-Webster (2017) defined expert as individuals "having, involving, or displaying special skill or knowledge derived from training or experience." Businessdirectory.com (2018) defined expert as a "professional who has acquired knowledge and skills through study and practice over the years, in a particular field or subject, to the extent that his or her opinion may be helpful in fact finding, problem solving, or understanding of a situation."

Looking at academic publications, it is clear that social scientists have sought to conceptualize and define expertise for decades; thus, the literature is filled with hundreds of iterations of what expertise *is*, and the characteristics constituting an expert. Expertise has been defined as both the content-specific knowledge about a certain subject matter, as well as necessary procedural knowledge about particular processes (Chi, Glaser, & Farr, 1988). According to Ericsson and Smith (1991), "the study of expertise seeks to understand and account for what distinguishes outstanding individuals in a domain from less outstanding individuals, as well as from the population in general," (p. 2). Seminal research in expertise substantiates the categorization of expertise in two ways: epistemic, or knowing *that,* and performative, or knowing *how* (Ryle, 1946). Epistemic expertise is a person's deep understanding of a construct, and performative expertise is the person's ability to perform a task with impeccable skill and accuracy (Weinstein, 1993). Similarly, Chi (2006) proposed two general ways to study the nature of expertise. The first research approach was to study "truly exceptional" people to gain an understanding of how they perform in their "domain of expertise," (p. 21). The second research approach was to study experts in comparison with novices in term of their proficiency level and their ability achieve the expert status. According to Chi (2006):

> Proficiency level can be grossly assessed by measures such as academic qualifications (such as graduate students vs. undergraduates), seniority or years performing the task, or consensus among peers. It can also be assessed at a more fine-grained level, in terms of domain-specific knowledge or performance tests. (p. 22–23)

It is true that expertise is founded in both individuals' knowledge of a subject or issue and in some cases their ability to apply certain skills in a professional or vocational context (Goldman, 2016; Winch, 2010). However, Scardamalia and Bereiter (1991) hypothesized expert knowledge was a product of striving beyond one's comfort zone:

> Experts acquire their vast knowledge resources not by doing what falls comfortably within their competence but by working on real problems that force them to extend their knowledge and competence. That is not only how they become experts, we suggest, but also how they remain experts and avoid falling into ruts worn by repeated execution of familiar routines. (p. 173–174).

Similarly, Camerer and Johnson (1997) asserted an expert is "a person who is experienced in making predictions in a domain and has some professional or social credentials" (p. 196). In terms of defining expertise in relation to cognitive development, Hoffman (1998) said expertise could be understood in terms of the ways in which the expertise was developed, as well as experts' knowledge structures and reasoning processes. Feltovich, Prietula, and Ericsson (2006) posited the accumulation of experience was not sufficient for the development of expertise; experts must possess high levels of motivation, ability, talent, and reflective proficiency.

Schön (1984) believed professionals use a form of tacit experiential knowledge he called knowing-in-action. Reflection, Schön (1984) asserted, is a competency necessary to evaluate and learn from experience, which he said aids in the acquisition of expertise. Reflective proficiency, according to Schön (1984), is a product of reflecting *in* action and reflecting *on* action. In other words, experts reflect in the moments when events are occurring, as well as retrospectively using knowledge and experience gleaned from previous contexts and situations (Schön, 1984; Winch, 2010).

Looking at expertise in a different way, Collins and Evans (2002) asserted expertise exists at three distinct levels: no experience, interactional experience, and contributory experience. Individuals with no expertise lack any knowledge of a construct or practice (Collins & Evans, 2002). Those who have interactional expertise are not skilled practitioners. However, these individuals can verbalize expert-level knowledge of a construct or practice by way of linguistic cultural immersion (Collins, 2004). Collins (2004) explained linguistic cultural immersion in this way, "…it is possible to learn to say everything that can be said about bicycle riding, car-driving, [*sic*] or the use of a stick by a blind man without ever having ridden a bike, driven a car, or been blind and used as stick" (p. 127). The third level of expertise is contributory expertise; people with contributory expertise possess the knowledge and skills required to weigh in on the science or scholarship of the construct under examination (Collins & Evans, 2002).

3.1.4. Theories and Models of Expertise

To understand and define expertise, theories have been presented regarding the role of experience in the development of expertise. Dreyfus (1984) proposed the Adult Skill Acquisition model for the development of expertise that described the journey from novice to expert. Novice is the first stage in the model. In the novice stage, beginners lack experience with the situations in which they are expected to execute, so they will purposefully seek out rules to follow or individuals' behavior to model (Dreyfus, 1984). Advanced beginner is the second stage of the adult skill acquisition model. In this stage, learners can perceive similarities across situations because of their experience (Dreyfus, 1984). In other words, the advanced beginner's actions in this stage are based on knowledge gained from *past* experience applied in a similar *present* context. Competence, the third stage of the adult skill acquisition model, is characterized by the acquisition of considerable situational experience, giving learners the ability to fully understand and analyze problems and create logical solutions (Dreyfus, 1984).

Learners moving into stage four of adult skill acquisition—proficiency—rely on their intuition and ability to think analytically when making decisions (Dreyfus, 1984). In this stage, learners immediately recognize situations as contextually alike or different, resulting in behavior indicative of successful outcomes achieved in the past. Lastly, the fifth stage of the adult skills acquisition model is expertise. At the expert level, learners no longer look to rules or analytical principals to guide their understanding of the situation to an appropriate action. Because learners now have high amounts of experience and deep levels of understanding, they use their intuition to solve problems and recommend solutions (Dreyfus, 1984).

Further expanding on the Dreyfus Adult Skill Acquisition model, Bereiter and Scardamalia (1993) proposed the theory of progressive problem solving. Progressive problem solving occurs when an individual attempts to solve increasingly complex problems. Once a simple problem is mastered, more difficult problems are presented. The premise of progressive problem solving is that the level of skill acquisition needed to achieve expertise does not rely on the number of hours of experience, but on the quality of the experience.

Similarly, Ericsson and Smith (1991) contended expertise is the result of skills obtained through stages of deliberate practice under the guidance of those who are considered to be experts. For practice to be considered deliberate, it must involve high levels of effort, intensity, and concentration. Expert status takes a minimum of 10 years to achieve, which is why proponents of the theory recommend deliberate practice begin as early as possible (Ericsson & Smith, 1991).

Those who acquire expertise require adequate time to complete the four developmental phases of becoming an elite performer. Phase one is a discovery period within a certain domain (Ericsson & Smith, 1991). The second phase occurs when individuals show talent or promise in that domain. Following the assertion of aptitude, the individual begins participating in structured lessons and minimal amounts of practice until regular practice habits are formed (Ericsson & Smith, 1991). Throughout the second phase, individuals seek instructors or mentors who can aid in their continued progression and performance improvement (Ericsson & Smith, 1991).

Phase three begins with the individual making a major commitment to reaching the top levels possible in the domain. People seek the best instructors and mentors to ensure their continued performance mastery, and once they achieve mastery, they may continue to the fourth phase (Ericsson & Smith, 1991). However, not all individuals enter the fourth and final stage of eminent performance. Eminent performance goes beyond the existing knowledge in the domain to making a significant contribution to the existing knowledge. Major innovations required for this fourth phase exceed the skills and knowledge the master instructors and mentors possess and could impart to the learner (Ericsson & Smith, 1991).

The Generalized expertise measure was developed by Germain and Tejeda (2012) as a way to measure the expertise of an individual as reported by others in the workplace. The procedures used to develop the scale and the sample used to conduct a preliminary validation of the scale items included employees from a variety of occupations and fields including education, management, and medicine. The results separated expertise characteristics into two categories: subjective and objective (Germain & Tejeda, 2012). Subjective items included being ambitious and driven, having inductive and deductive skills, having self-assurance and the ability to assess the importance of certain situations, and others. Objective items included having specific knowledge, education, qualifications, training, conducting research related to the field of interest, and others. The scales provided a basis for determining employee development needs and training interventions (Germain & Tejeda, 2012).

3.2. Method

Robinson (2016) said item generation in scale development "is the foundation of the entire process, so it is vital that it is theoretically driven," (p.742).

3.2.1. Step 2: Generating the Items

As shown in Figure 3.1, the second step of scale development is generating items. Social scientists can use several methods to identify item content, including literature reviews, focus groups, and content analysis of existing data sets and resources

(DeVellis, 2012; Hinkin, Tracey, & Enz, 1997; Robinson, 2018). Using the various definitions and descriptions of expertise discovered through our extensive literature review, we constructed statements that contained the characteristics of expertise. It should be noted that there are a number of basic guidelines we followed to ensure our items were properly constructed. First, items should address only a single construct (DeVellis, 2012; Hinkin, Tracey, & Enz, 1997; Robinson, 2018). Second, statements should be simple and as short as possible using language that participants can easily understand (DeVellis, 2012; Hinkin, Tracey, & Enz, 1997; Robinson, 2018). We chose not to include any negatively-worded or reverse-scored items because using these items within a measure can negatively affect its psychometric properties (DeVellis, 2012). According to Hinkin, Tracey, and Enz (1997), "Items must be understood by the respondent as intended by the researcher if meaningful responses are to be obtained," (p. 3). Lastly, the items we created were purposefully redundant to establish internal consistency reliability (DeVellis, 2012; Germain & Tejeda, 2012; Hinkin, Tracey, and Enz, 1997). Internal reliability is the degree to which the items in a scale are consistent (Bryman, 2012).

Further, the item pool should be large and all items should be relevant to the phenomenon of interest (DeVellis, 2012; Germain & Tejeda, 2012). To create a pool of items large enough to fulfill this requirement, redundancy is critical and necessary so that there are multiple items that represent the phenomenon in different ways. DeVellis (2012) said, "By using multiple and seemingly redundant items, the content that is common to the items will summate across items while their irrelevant idiosyncrasies will cancel out," (p. 56).

3.2.2. Step 3: Creating the Instrument

As shown in Figure 3.1, the third step in scale development is creating the instrument. Step 3 involves transforming the item pool resulting from step 2 into a pilot questionnaire. Our pilot questionnaire consisted of 135 items. The statements used to create the generalized expertise measure (Germain & Tejeda, 2012) were revised for conceptual fit and served as the foundation of items for our instrument. Conceptual fit is the extent to which the scale matches the variable that the social scientist intends to measure (DeVellis, 2012). The lack of an exact conceptual fit required that the scale items be modified. To be more specific, the statements taken from the GEM related to an employee's perception of expertise in the workplace. Because we were interested in social scientists' perception of expertise relating to the selection of experts to serve as a content analysis coder or Delphi panelist, additional items were added using the characteristics of experts gleaned from our extensive literature review.

3.2.3. Step 4: Item Pool Evaluation

As shown in Figure 3.1, the fourth step in scale development is item pool evaluation. In this step, the instrument was evaluated for face validity and the items for clarity of expression to ensure that the items were written in a way that was easily understandable and made sense to the audience. The pilot questionnaire was distributed via electronic mail to 407 social scientists at a southern land-grant university. The sample of social scientists from the population of social scientists at the southern land-grant university represented the following departments: agricultural economics; communications; recreational parks and tourism; educational administration and human resource development; educational psychology; health and kinesiology; and teaching, learning, and culture. These departments were chosen because the social scientists in these departments are highly experienced, possess the breadth of knowledge, skills, and abilities needed to assist in the initial development of a psychometric scale to measure expertise, and are familiar with the designs and methods used in conducting social science research. Each participant received 25 randomly selected statements generated by the randomization feature in Qualtrics® online survey software. Each participant was provided detailed instructions and examples to prepare them for completing the questionnaire.

The first step in the pilot questionnaire was to capture participants' personal feelings about a statement related to the characteristics generally attributed to experts. An example that depicted what the participant would see as they progressed through the questionnaire was provided to ensure participants understood and knew what to expect as they moved through the process. Participants were instructed to read each statement and select the option that best described their personal level of agreement with the statement. A 6-point rating scale was provided with each item. Participants were asked to rate each statement based on their level of agreement with the statement from 1 (Strongly Disagree) to 6 (Strongly Agree). For example, if participants were given the statement "An expert is intelligent," they were instructed that if they had a very low level of agreement with the statement, they should select "Strongly Disagree." However, if participants had a very high level of agreement with the statement, they should select “Strongly Agree.” If participants’ agreement with the statement was neither very low nor very high, they were instructed to select one of the other four options that best reflected their level of agreement with the statement.

The second step in the pilot questionnaire was to give participants an opportunity to determine whether the statement was understandable and made sense. After participants determined their level of agreement with the item statements, they were asked the question “Does this statement make sense?” Using the previous example, if participants believed the statement “An expert is intelligent,” did not make sense, they could select the “No” option. If participants believed the statement made sense, they could select the “Yes” option. And if participants could not make a determination as to whether or not the statement made sense, they could select the “Maybe” option. If participants selected “Yes,” they moved to the next questionnaire item. If the participants selected “No” or “Maybe,” they moved to a subsequent prompt. This prompt was designed to solicit participants input on ways the questionnaire item statements could be rewritten to be clearer, more easily understood, or to make sense. Participants who selected “Maybe” or “No” to the question “Does this statement make sense” were provided with a text area where they could provide helpful feedback, ask questions, provide edits or rewriting suggestions, or simply make any comments they believed would contribute to the improvement of the questionnaire items. At the conclusion of the questionnaire, the participant responses were evaluated and the questionnaire items were rewritten as needed. The revised questionnaire items were sent to a group of agricultural communications, education, extension, and leadership educators at a southern land grant university for pretesting and refinement. After this review, the number of questionnaire items increased from 135 items to 149 items. The final pilot questionnaire item statements were presented in Table 3.2. These statements comprised the final psychometric instrument.

Table 3.2

Final Pilot Questionnaire Item Statements

Item Statements
An expert is intelligent.
An expert is educated.
An expert is capable.
An expert is qualified.
An expert is motivated.
An expert is talented.
An expert is reputable.
An expert is credible.
An expert is charismatic.
An expert is respected.
An expert is decisive.
An expert is disciplined.
An expert is self-assured.
An expert is self-confident.
An expert is goal-oriented.
An expert is results-driven.
An expert is experienced.
An expert is emotionally intelligent.
An expert is a skilled practitioner.
An expert is a problem-solver.
An expert is an elite performer.
An expert is more intelligent than colleagues in the same field.

Table 3.2 (continued)

Item Statements
An expert is more intelligent than the average person.
An expert is successful in their job.
An expert is well organized.
An expert is highly experienced in their field of expertise.
An expert is an authority figure in their field of expertise.
An expert is aware that others believe they have expertise in their field.
An expert is knowledgeable in their field of expertise.
An expert is self-confident in their field of expertise.
An expert is ambitious about the work they do in their field of expertise.
An expert is driven to improve their contributions in their field of expertise.
An expert is competent in their field of expertise.
An expert is accountable to others in their field of expertise.
An expert is extensively trained in their field of expertise.
An expert can assess whether something is important related to their field of expertise.
An expert can assess whether something is not important related to their field of expertise.
An expert can train others in their area of expertise.
An expert sees patterns in situations found in their area of expertise.
An expert has an academic degree.
An expert has a professional degree.
An expert has at least a master's degree level of education.
An expert has a doctoral degree.
An expert has 10 years of experience, or more, in their field of expertise.
An expert has achieved a pinnacle in their field of expertise.
An expert has self-confidence because they are an expert in their field.
An expert has reflective proficiency.
An expert has strong reasoning skills.
An expert can convey what they know orally.
An expert can convey what they know in writing.
An expert continuously tries to be better in their field of expertise.

Table 3.2 (continued)

Item Statements
An expert does not need to achieve more than what they have already achieved in their field of expertise.
An expert is good at assessing problems related to their field of expertise.
An expert is good at asking the right questions to find solutions to problems in their field of expertise.
An expert is good at making complex material easy to understand.
An expert is able to apply knowledge.
An expert is able to make predictions.
An expert is able to reason.
An expert is able to reflect in action.
An expert is able to reflect on action.
An expert is able to judge what is important when it comes to their area of expertise.
An expert is able to judge what is not important when it comes to their area of expertise.
An expert is able to strive beyond their comfort zone.
An expert is able to solve problems.
An expert is willing to learn new things.
An expert has high levels of cognitive development.
An expert has knowledge that is specific to a chosen field.
An expert has knowledge of a number of related subjects.
An expert has knowledge of one particular subject.
An expert has knowledge that is specific to a construct of interest.
An expert has well developed reasoning processes.
An expert has a proven track record of success.
An expert has a high level of knowledge in their field of expertise.
An expert has written articles or books in their field of expertise.
An expert has the qualifications required to be an expert in their field.
An expert has a good professional reputation in their field.
An expert has completed education beyond high school.
An expert has academic degrees.
An expert has social credentials.
An expert has professional credentials.

Table 3.2 (continued)

Item Statements
An expert has more professional credentials than their colleagues in the same field.
An expert has more professional credentials than the average person.
An expert has personality traits characteristic of someone who has a great amount of experience.
An expert has a good professional reputation among their colleagues.
An expert has influence over others.
An expert has the drive to become what they are capable of becoming in their field.
An expert has both experience and an academic degree.
An expert has both knowledge and experience.
An expert has experience, knowledge, and an academic degree.
An expert has a substantial depth of knowledge about a specific subject.
An expert has been formally or informally trained by other experts in their field of expertise.
An expert has to be the best in their field to be considered an expert.
An expert can formally or informally train others to be experts in their field of expertise.
An expert can educate others in their field of expertise.
An expert can convey relevant information in writing.
An expert can convey relevant information verbally.
An expert can identify problems in their field of expertise.
An expert can identify solutions to problems in their field of expertise.
An expert can influence others in their field of expertise.
An expert can be relied upon to know everything about their field of expertise.
An expert can reflect in the moment.
An expert can reflect after the fact.
An expert can acknowledge that their expertise has limitations.
An expert's experience can be equivalent to an academic degree.
An expert possesses practical knowledge.
An expert possesses subject matter knowledge.
An expert must have at least a master's degree.
An expert must have a terminal degree.
An expert conducts research related to their field.
An expert is recognized by superiors as being an expert in their field.

Table 3.2 (continued)

Item Statements
An expert is recognized by peers as being an expert in their field.
An expert is recognized by subordinates as being an expert in their field.
An expert is recognized by colleagues as being an expert in their field.
An expert shows others that they motivated to learn more in their area of expertise.
An expert shows others that they have the formal education necessary to be an expert in their field.
An expert does things so that the attention of others is drawn to their high level of expertise.
An expert does not need to be the best at something to be perceived as an expert by others.
An expert does not care what others think about them.
An expert uses intuition to make decisions in their field of expertise.
An expert says good things about themselves.
An expert says good things about their achievements.
An expert lets others know why they are an expert.
An expert knows almost everything in their field of expertise.
An expert knows more than the average person about a particular subject in their field of expertise.
An expert relies on their intuition when making decisions.
An expert uses inductive reasoning.
An expert uses deductive reasoning.
An expert thinks logically about things related to their field of expertise.
An expert demonstrates they have the education needed to be an expert in their field.
An expert is experienced in making predictions related to their field of expertise.
An expert is recognized by others as being an expert in their field.
People believe what an expert has to say.
People believe an expert is more intelligent than others.
People believe an expert is more educated than others.
People believe an expert is more capable than others.
People believe an expert is more qualified than others.
People believe an expert is more motivated than others.
People believe an expert is more talented than others.
People believe an expert is more reputable than others.
People believe an expert is more credible than others.

Table 3.2 (continued)

Item Statements
People believe an expert is more charismatic than others.
People believe an expert is more respected than others.
People believe an expert is more decisive than others.
People believe an expert is more disciplined than others.
People believe an expert is more self-assured than others.
People believe an expert is more self-confident than others.
People believe an expert is more goal-oriented than others.
People believe an expert is more results-driven than others.
People believe an expert is more experienced than others.

3.2.4. Step 5: Administering the Instrument

As shown in Figure 3.1, step 5 is administering the instrument. Researchers at 25 universities were invited to participate in this study. The 25 universities were selected based on the following criteria: (a) the university offered undergraduate and graduate degree programs or areas of emphasis in one or more of the following agricultural disciplines: communications, education, extension, and/or leadership, (b) the social scientists engaged in research in communications, education, extension, and/or leadership were identified as having been published or the potential to be published in the premier agricultural education journals (Edgar & Rutherford, 2011): *Journal of Applied Communications, Journal of Agricultural Education, Journal of International Agriculture and Extension Education, Journal of Leadership Education, Journal of Extension,* and *North American Colleges and Teachers of Agriculture Journal,* and (c) the social scientists were highly experienced and possessed the breadth of knowledge, skills, and abilities needed to assist in the initial development of a psychometric scale to measure expertise.

A modified version of Dillman, Smyth, and Christian's (2014) five compatible contacts system was implemented. Dillman et al. (2014) recommend a pre-notification announcement to potential participants as the first point of contact. In lieu of a pre-notification announcement to potential participants, we sent a letter to the department head of each of the 25 universities identified asking the department head to endorse our study by using their social influence (Kelman, 1958) to encourage their faculty to participate in our study. A template for the endorsement was provided to each department head. A complete list of the 25 universities where researchers were invited to participate in our study was presented in Table 3.3. An asterisk indicated the universities we were informed endorsed our study. It is possible more department heads endorsed the study but did not inform us of their endorsement.

Table 3.3

Universities Invited to Participate in the Study

University Name
California Polytechnic State University
Clemson University
Illinois State University
Iowa State University
Kansas State University
Mississippi State University*
Montana State University*
North Carolina State University
Oklahoma State University
Pennsylvania State University
Purdue University
The Ohio State University
Texas A&M University*
Texas Tech University
University of Arizona
University of Arkansas
University of Florida
University of Georgia*
University of Idaho
University of Illinois*
University of Missouri
University of Nebraska*
University of Tennessee
University of Wisconsin
Virginia Tech

Note. Universities whose department heads endorsed the study are indicated with an asterisk.

The second point of contact was an electronically mailed invitation to social scientists at the 25 universities identified to participate in our study. The invitation included a personalized link to the electronic questionnaire, a link to a document containing a formal description of our study, and a link to a document containing a summary of the study for those individuals who required less detailed information. Because the protocol for scale development could have been unfamiliar to some social scientists, the invitation included a link to a short video describing scale development procedures. Additionally, the authors of the articles that were content analyzed by Costello and Rutherford (in press) were also included in the study. Any duplications—individuals who were both social scientists at the 25 selected universities and authors of studies from the content analysis (Costello and Rutherford, in press)—were removed.

The questionnaire invitation was sent to 827 unique potential participants at the 25 selected universities. Email addresses were obtained from the departmental websites of the 25 selected universities and from the biographical information included in the published studies content analyzed in a previous study (Costello & Rutherford, in press). Seven hundred and thirty one electronically mailed invitations were delivered to the intended recipients and 96 invitations were returned as undeliverable.

The third and fourth points of contact included reminders sent to the participant on the third and sixth days after the initial email invitation was sent. In an effort to increase response rate, an additional reminder was sent to participants who had partially completed the questionnaire. Of the 731 invitations that were delivered successfully, 180 useable responses were received, yielding an overall 24.6% response rate. The fifth point of contact was a follow-up thank you to individuals who completed the questionnaire.

3.2.4.1 Instrumentation

The primary goal of the instrument was to capture participants' personal feelings about a statement related to the characteristics generally attributed to experts. An example that depicted what the participant would see as they progressed through the questionnaire was provided to ensure participants understood and knew what to expect as they moved through the process. Participants were instructed to read each statement and select the option that best described their personal level of agreement with the statement. A 6-point rating scale was provided with each item. Participants were asked to rate each statement based on their level of agreement with the statement from 1 (Strongly Disagree) to 6 (Strongly Agree). If participants' agreement with the statement was neither very low nor very high, they were instructed to select one of the other four options that best reflected their level of agreement with the statement.

The second step in administering the questionnaire was to give participants an opportunity to provide additional feedback. After participants determined their level of agreement with the item statements, they were posed the question "Additional feedback?" If participants selected "Yes", the statement was presented again and a text box was provided so that the participant could provide additional input. If participants selected "No" or did not answer the question, they moved on to the next statement. This process continued until the participant finished the questionnaire.

3.3. Results

Responses to the expertise questionnaire items were analyzed using the Principal Component Analysis (PCA) function in IBM® SPSS® statistical software. PCA was chosen because unlike common factor analysis, which assumes variance in a variable can be divided into common and unique components, PCA makes no assumptions about unique or error variance in the data (Raven, 1994). PCA has proven useful in identifying linear components in a data set and how the variables may relate to each component (Field, 2009; Rayfield et al., 2014). To maximize high correlations between factors and reduce low correlations, the 149 original scale items from the questionnaire were included in the PCA with varimax rotation (as described by Rayfield et al., 2014). SPSS® offers three methods of orthogonal rotation to maximize variance. Varimax was chosen for this study because of the way it disperses loadings among factors, resulting in more interpretable clusters of factors (Field, 2009). Factors with a minimum of three loadings greater than .40 and not cross loaded with any other factors were retained (Field, 2009; Stevens, 2012). The Kaiser-Meyer-Olkin measure of sampling adequacy was .538; .5 is the acceptable minimum score for factor analytic procedures (Field, 2009; Kaiser, 1974; Rayfield et al., 2014; Samuels, 2016). The descriptive statistics for the 10 constructs that emerged from the PCA are presented in Table 3.4.

Table 3.4
Construct Descriptive Statistics

	N	Min.	Max.	*M*	*SD*
Construct 01	69	1.00	5.36	2.44	1.10
Construct 02	69	2.53	6.00	4.84	0.78
Construct 03	69	4.13	6.00	5.36	0.46
Construct 04	69	2.75	6.00	4.31	0.82
Construct 05	69	1.38	6.00	4.75	0.86
Construct 06	69	1.25	6.00	4.15	1.06
Construct 07	69	1.00	6.00	4.15	1.30
Construct 08	69	1.25	5.25	3.27	0.88
Construct 09	69	2.33	6.00	4.92	0.87
Construct 10	69	2.00	6.00	4.64	0.99

Note. 1 = Strongly Disagree, 6 = Strongly Agree

A list of the PCA results (scale items listed by factor loading) was presented to faculty at a southern land-grant university representing the agricultural communications, education, and leadership disciplines. The researcher and the faculty member discussed what the items collectively measured, resulting in the names for each construct. The named constructs and the construct loadings from the PCA with Varimax rotation are presented in Table 3.5.

Table 3.5
Construct Loadings from Principal Component Analysis with Varimax Rotation

Item	Loading
Construct 1: Academic Credentials	
An expert has academic degrees.	.857
An expert has an academic degree.	.837
An expert has a professional degree.	.810
An expert has both experience and an academic degree.	.799
An expert has a doctoral degree.	.796
An expert has experience, knowledge, and an academic degree.	.791
An expert must have at least a master's degree.	.789
An expert must have a terminal degree.	.787
An expert has at least a master's degree level of education.	.764
An expert has completed education beyond high school.	.749
An expert has written articles or books in their field of expertise.	.633
An expert shows others that they have the formal education necessary to be an expert in their field.	.615
An expert has professional credentials.	.542
An expert has more professional credentials than the average person.	.526
Construct 2: Cognitive Processing	
An expert is a problem-solver.	.732
An expert is good at asking the right questions to find solutions to problems in their field of expertise.	.727

Table 3.5 (continued)

Item	Loading
An expert is able to reflect on action.	.720
An expert is able to solve problems.	.675
An expert can reflect after the fact.	.672
An expert is a skilled practitioner.	.648
An expert is able to reflect in action.	.614
An expert has well developed reasoning processes.	.614
An expert is able to reason.	.567
An expert possesses practical knowledge.	.552
An expert thinks logically about things related to their field of expertise.	.542
An expert is able to apply knowledge.	.532
An expert can identify solutions to problems in their field of expertise.	.508
An expert is results-driven.	.491
An expert has reflexive proficiency.	.451
Construct 3: Specialized Knowledge and Assessment Ability	
An expert has a substantial depth of knowledge about a specific subject.	.748
An expert has knowledge that is specific to a chosen field.	.745
An expert has a high level of knowledge in their field of expertise.	.704
An expert is able to judge what is not important when it comes to their area of expertise.	.679
An expert can assess whether something is important related to their field of expertise.	.659
An expert is good at assessing problems related to their field of expertise.	.651
An expert can identify problems in their field of expertise.	.645
An expert can assess whether something is not important related to their field of expertise.	.644
An expert is knowledgeable in their field of expertise.	.644
An expert is able to judge what is important when it comes to their area of expertise.	.602
An expert possesses subject matter knowledge.	.559
An expert has knowledge that is specific to a construct of interest.	.550
An expert is credible.	.526
An expert is competent in their field of expertise.	.523
An expert sees patterns in situations found in their area of expertise.	.511
An expert has both knowledge and experience.	.472
Construct 4: Perceptions of Expert Characteristics	
People believe an expert is more motivated than others.	.748
People believe an expert is more goal-oriented than others.	.696
People believe an expert is more decisive than others.	.689
People believe an expert is more self-assured than others.	.671
People believe an expert is more results-driven than others.	.622
People believe an expert is more self-confident than others.	.617
People believe an expert is more educated than others.	.567
People believe an expert is more respected than others.	.566
People believe an expert is more disciplined than others.	.533
People believe an expert is more intelligent than others.	.519
People believe an expert is more charismatic than others.	.503
People believe an expert is more capable than others.	.503
People believe an expert is more talented than others.	.473
Construct 5: Recognition and Reputation	
An expert is recognized by colleagues as being an expert in their field.	.806
An expert is recognized by peers as being an expert in their field.	.774
An expert is recognized by others as being an expert in their field.	.705
An expert is respected.	.615
An expert is recognized by superiors as being an expert in their field.	.615
An expert has a good professional reputation among their colleagues.	.549
An expert is recognized by subordinates as being an expert in their field.	.544
An expert has a good professional reputation in their field.	.528
Construct 6: Self-Confidence	
An expert is self-assured.	.798

Table 3.5 (continued)

Item	Loading
An expert is self-confident.	.686
An expert has self-confidence because they are an expert in their field.	.686
An expert is self-confident in their field of expertise.	.602
Construct 7: Training	
An expert can train others in their area of expertise.	.790
An expert can educate others in their field of expertise.	.754
An expert can formally or informally train others to be experts in their field of expertise.	.700
Construct 8: Communication of Self-Importance	
An expert says good things about their achievements.	.722
An expert says good things about themselves.	.667
An expert does things so that the attention of others is drawn to their high level of expertise.	.555
An expert lets others know why they are an expert.	.551
Construct 9: Source Evaluation	
People believe an expert is more qualified than others.	.722
People believe an expert is more reputable than others.	.613
People believe an expert is more credible than others.	.610
People believe what an expert has to say.	.501
Construct 10: Reasoning	
An expert uses deductive reasoning.	.724
An expert uses inductive reasoning.	.567
An expert has strong reasoning skills.	.460

The three constructs with the highest scores were Specialized Knowledge and Assessment Ability ($M = 5.36$; $SD = 0.46$), Source Evaluation ($M = 4.92$; $SD = 0.87$), and Cognitive Processing ($M = 4.84$; $SD = 0.78$). High scores on these constructs indicated participants had overall positive scores for items related to experts' depth of knowledge in a specialized field or area, how people perceive experts as credible, qualified sources, and items relating to experts' assessment and judgement abilities. The two constructs with lowest scores were Academic Credentials ($M = 2.44$; $SD = 1.10$) and Communication and Self-Importance ($M = 3.27$; $SD = 0.88$). Low scores on these constructs indicated participants did not have overall positive scores for items related to evidence of higher education as indicative of expertise and one's personal communication to others about of their professional achievements or expertise.

Responses to the expertise questionnaire items were also analyzed using the Q technique. Q technique is a factor analytical procedure employed in situations where there are many individual points of view. Because of the multi-faceted nature of expertise, it was likely that many viewpoints existed across participants. Therefore, Q technique served in this study to reduce the participants varied viewpoints into “factors” that representing participants’ like-mindedness (Gorsuch, 2015). Q technique produced four perspectives used to identify groups of participants who possessed similar perspectives of what characteristics established expert qualifications. The four perspectives of expert qualifications are presented in Table 3.6.

Table 3.6
Perspectives of Expert Qualifications

Perspective	*N*	Construct Perspective %	Min.	Max.	*M*	*SD*
Construct 01: Academic Credentials	44	63.77	1.00	4.07	1.92	0.71
Construct 02: Cognitive Processing	44	63.77	3.20	6.00	4.81	0.66
Construct 03: Specialized Knowledge and Assessment Ability	44	63.77	4.13	6.00	5.30	0.48
Construct 04: Perceptions of Expert Characteristics	44	63.77	2.75	5.83	4.44	0.78
Construct 05: Recognition and Reputation	44	63.77	2.75	6.00	4.78	0.81
Construct 06: Self-Confidence	44	63.77	1.25	6.00	4.14	1.09
Construct 07: Training	44	63.77	1.00	6.00	3.88	1.34
Construct 08: Communication and Self-Importance	44	63.77	1.50	5.00	3.21	0.81
Construct 09: Source Evaluation	44	63.77	2.33	6.00	4.94	0.96
Construct 10: Reasoning	44	63.77	2.33	6.00	4.49	0.81
Construct 01: Academic Credentials	13	18.84	1.00	5.36	3.05	1.05
Construct 02: Cognitive Processing	13	18.84	3.93	6.00	5.24	0.58
Construct 03: Specialized Knowledge and Assessment Ability	13	18.84	4.25	6.00	5.47	0.49
Construct 04: Perceptions of Expert Characteristics	13	18.84	3.08	6.00	4.31	0.69
Construct 05: Recognition and Reputation	13	18.84	1.38	5.50	4.33	1.05
Construct 06: Self-Confidence	13	18.84	3.50	5.00	4.17	0.57
Construct 07: Training	13	18.84	3.33	6.00	4.69	0.78
Construct 08: Communication and Self-Importance	13	18.84	1.25	5.25	3.37	1.07
Construct 09: Source Evaluation	13	18.84	3.33	6.00	4.74	0.75
Construct 10: Reasoning	13	18.84	4.33	6.00	5.44	0.64

Table 3.6 (continued)

Perspective	*N*	Construct Perspective %	Min.	Max.	*M*	*SD*
Construct 01: Academic Credentials	07	10.14	2.21	5.14	3.72	1.20
Construct 02: Cognitive Processing	07	10.14	2.53	4.60	3.71	0.64
Construct 03: Specialized Knowledge and Assessment Ability	07	10.14	5.00	5.75	5.33	0.29
Construct 04: Perceptions of Expert Characteristics	07	10.14	2.83	3.83	3.22	0.39
Construct 05: Recognition and Reputation	07	10.14	3.63	5.50	4.83	0.67
Construct 06: Self-Confidence	07	10.14	2.25	4.50	3.18	0.73
Construct 07: Training	07	10.14	2.33	6.00	3.95	1.43
Construct 08: Communication and Self-Importance	07	10.14	2.75	4.00	3.29	0.47
Construct 09: Source Evaluation	07	10.14	4.00	5.67	4.88	0.55
Construct 10: Reasoning	07	10.14	2.00	4.67	3.48	1.14
Construct 01: Academic Credentials	05	07.25	2.43	4.50	3.63	0.90
Construct 02: Cognitive Processing	05	07.25	4.80	6.00	5.65	0.53
Construct 03: Specialized Knowledge and Assessment Ability	05	07.25	5.44	6.00	5.69	0.24
Construct 04: Perceptions of Expert Characteristics	05	07.25	3.42	5.67	4.75	0.96
Construct 05: Recognition and Reputation	05	07.25	5.13	6.00	5.55	0.42
Construct 06: Self-Confidence	05	07.25	4.75	6.00	5.55	0.54
Construct 07: Training	05	07.25	4.33	6.00	5.47	0.69
Construct 08: Communication and Self-Importance	05	07.25	1.75	4.75	3.55	1.44
Construct 09: Source Evaluation	05	07.25	4.00	6.00	5.27	0.83
Construct 10: Reasoning	05	07.25	4.00	6.00	5.53	0.87

Note. 1 = Strongly Disagree, 6 = Strongly Agree

Perspective 1 garnered the highest number of like-minded participants (*N* = 44), which means 67.77% of the total number of participants shared similar perspectives about what constructs comprise expertise. The two constructs with the highest scores within Perspective 1 were Specialized Knowledge and Assessment Ability (*M* = 5.30; *SD* = 0.48) and Cognitive Processing (*M* = 4.81; *SD* = 0.66). The two constructs with lowest scores in Perspective 1 were Academic Credentials (*M* = 1.92; *SD* = .71) and Communication and Self-Importance (*M* = 3.21; *SD* = 0.81), which means 67.77% of the total number of participants shared similar perspectives about what constructs should not comprise expertise.

Looking at Perspective 2, Specialized Knowledge and Assessment Ability had the highest scores (*M* = 5.47; *SD* = .49) followed by Reasoning (*M* = 5.44; *SD* = .64). Similarly, Specialized Knowledge and Assessment Ability had the highest scores in Perspective 3 (*M* = 5.33; *SD* = .29) followed by Source Evaluation (*M* = 4.88; *SD* = .55). Lastly, Specialized Knowledge and Assessment Ability had the highest scores in Perspective 4 (*M* = 5.69; *SD* = .24) followed by Recognition and Reputation (*M* = 5.55; *SD* = .42).

3.4. Conclusions and Discussion

This exploratory quantitative study was an attempt to create a psychometric scale to measure expertise so that social scientists in ACEEL disciplines would have an efficient and consistent means of reporting the level of expertise their chosen experts bring to a study. The goal was to enhance the rigor, transparency, and replicability of research across all ACEEL disciplines as suggested by Costello and Rutherford (in press). To summarize, it was concluded that the majority of studies that indicated using content analysis or Delphi methods in the premier agricultural journals did not describe the qualifications used to select coders and panelists (Costello & Rutherford, in press). Because the majority of researchers who used content analysis or Delphi methods and whose studies were published in the premier agricultural journals did not describe the qualifications used to select coders or the credentials the coders possess that would make them qualified, Costello and Rutherford (in press) recommended a thorough description of coder's and panelists qualifications be included in peer-reviewed articles published in the premier agricultural journals (Edgar & Rutherford, 2011). Space limitations in some journals may deter some authors from providing a complete description, which is why uniform method for describing the level of expertise a content analysis coder or Delphi panelist may contribute to a study would make it easier for social scientists in ACEEL disciplines to report expertise consistently and concisely. It would also enhance the replicability for future research. The creation of the psychometric scale used to gather data for this study was an attempt to discover exactly what social scientists in ACEEL disciplines believe are the characteristics of expertise. However, to study expertise, one must start with the help of experts. As such, using the expertise of university faculty members and graduate students at a southern land-grant university, an instrument of 149 items was created and tested. The instrument was then sent to more than 827 faculty and graduate students in departments offering courses in agricultural communications, education, extension, and leadership at 25 land-grant universities nationwide to capture their thoughts and opinions regarding the characteristics of experts retained for studies in social sciences. Using principal component analysis with Varimax rotation, the instrument yielded 10 constructs that can be used to describe expertise: academic credentials, cognitive processing, specialized knowledge and assessment ability, perceptions of expert characteristics, recognition and reputation, self-confidence, training, communication and self-importance, source evaluation, and reasoning. Of those 10 constructs, two constructs—Specialized Knowledge and Assessment Ability and Cognitive Processing—scored highly among participants indicating participants positive feelings regarding an experts' depth of knowledge in a specialized field or area and items relating to experts' assessment and judgement abilities as indicative of expertise.

Of the 10 constructs, two constructs fell short as indicated by lower scores: Academic Credentials and Communication and Self-Importance. The lower scores on these constructs indicated participants did not believe higher education and one's personal communication to others about of their professional achievements or expertise were strong indicators of expertise.

Using Q technique, the instrument yielded four perspectives that indicated the like-mindedness of groups of participants. Specialized Knowledge and Assessment Ability was the highest scoring area as indicated by the high scores within the four perspectives.

The constructs that emerged from this study may provide social scientists in ACEEL disciplines with the foundation for describing the level of expertise experts retained in social science research bring to a study. However, there are two sampling issues associated with psychometric scale development that limit this study. The first issue is related to the sampling of content and the other issue is related to the sampling of people (Nunnally, 1967). The sampling of content is concerned with the generalization of findings to populations of test items and the sampling of people is related to the generalization of findings to populations of individuals. Due to the exploratory nature of this study, the primary focus was given to the development of the psychological measures' internal validity and not to the ability to infer results outside of the confines of this study. Future research could address the both sampling issues such that findings could be generalized.

Similarly, data must be collected from an adequate sample size to appropriately conduct any type of factorial analysis (Hinkin et al., 1997; DeVellis, 2012). The expertise questionnaire was distributed to 827 faculty member and graduate students across the country. However, 180 completed questionnaires were received. Of the 180 completed questionnaires, the responses from 69 participants provided sufficient factorial loadings. Although the minimum Kaiser-Meyer-Olkin measure of sampling adequacy was .538, which is the acceptable minimum score for factor analytic procedures (Field, 2009; Kaiser, 1974; Rayfield et al., 2014; Samuels, 2016), a higher KMO score is the general preference. Therefore, proceeding with the minimum KMO score limits the study.

Based on the findings of this study, we invite ACEEL researchers to use the 10 constructs in their efforts to thoroughly describe the qualifications of their content analysis coders, Delphi panelists, and any expert retained for social science studies in agriculture. This will …

(a) Help social scientists select experts with highly relevant qualifications that maintain the quality, integrity, and rigor of the study.

(b) Improve the overall consistency in how expertise is reported in all of the published work in the premier agricultural journals, other journals relevant to a social scientists' area of study, and other types of academic publications.

(c) Uphold a systematic approach for reporting expertise, making it easier for social scientists to succinctly describe the qualifications of coders and panelists

(d) Assist journal editors and reviewers in giving higher priority to the description of expertise as a condition for publication.

(e) Establish integrity, as much of the misperception that surrounds social science research stems from researchers who veil their methods in secrecy and academic jargon.

(f) Enhance the future of ACEEL research.

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4. A FACTOR-ANALYTIC AND PSYCHOMETRIC EVALUATION OF EXPERTISE IN AGRICULTURAL COMMUNICATIONS, EDUCATION, EXTENSION, AND LEADERSHIP DISCIPLINES

4.1. Introduction and Literature Review

> Members of the American Association for Agricultural Education (AAAE) have a long history of conducting high quality applied research focused on problems faced by a wide variety of stakeholders. Our expertise allows us to address social science issues within food, agriculture, and natural resources systems. (Roberts, Harder, & Brashears, 2016, p. 7).

Expertise—it is an attribute that some people possess while others do not. How does a person know if they are an expert? In some fields of study, there are specific and absolute criteria for describing experts, whereas in agricultural communications, education, extension, and leadership disciplines, the criteria for determining expertise is not formally defined. However, the literature is replete with conceptual research studies that have identified common themes or dimensions associated with the concept. For example, Ericsson and Smith (1991) believed experts possessed the characteristics, skills, and knowledge that distinguished them from novices. According to Chi (2006), academic qualifications, seniority, years of practice, or agreement among colleagues of superior qualities are all indicative of an expert classification. Expertise can be a product of an individual's knowledge of a subject or issue and his or her ability to apply a higher than average level of skill (Goldman, 2016; Winch, 2010). Expertise can also be acquired when one extends their knowledge and competence by working on problems outside of one's comfort zone (Bereiter and Scardamalia, 1993). Camerer and Johnson (1997) asserted experts were people with professional or social credentials capable of successfully identifying and solving problems.

Considering the vast amount of research conducted about expertise (Bereiter & Scardamalia, 1993; Camerer & Johnson, 1991; Chi, 2006; Collins & Evans, 2002; Feltovich, Prietula, & Ericsson, 2006; Germain & Tejeda, 2012; Goldman, 2015; Winch, 2010), it is clear expertise is a concept researchers and practitioners want to understand. However, the understanding of expertise without the ability to quantify it has limited usefulness. Two widely utilized social science research methods—content analysis and Delphi—recommend the procurement of individuals with expertise to contribute to studies. For those conducting an analysis of content, the content (e.g., advertising campaigns, students' reflection journals) are analyzed by individuals who are referred to as coders. Members of the research team can serve as coders, or the research team selects people outside of the study to train. An important factor in coding content is a person's ability to follow a clear and precise coding scheme (i.e., a set of rules to guide coding). An explicit coding scheme (code book) is created to ensure each independent coder is coding the content exactly the way as the other coders. Comparable coding results elicit high intercoder reliability. Intercoder reliability is the extent to which two or more independent coders code the same content similarly (Krippendorff, 2013; Neuendorf, 2002). The protocol for conducting a Delphi study calls for obtaining a panel of experts who have the ability to provide insight in regards to a phenomenon of interest

(Hasson, Keeney & McKenna, 2000; Winzenried, 1997; Yang, 2003). The panel of experts is tasked with answering a series of questions at varying points in time in an effort to reach group consensus (Dalkey, 1969).

External reliability is the extent to which a study can be repeated yielding the same outcomes as a preceding study (Bryman, 2012). Social scientists who choose content analysis or Delphi as a method for data collection can use the expertise of their coders and panelists to establish external reliability (Dalkey, 1969; Krippendorff, 2013; Linstone & Turoff, 1975) if the coders and panelists possess expertise. Krippendorff (2013), who is considered a forerunner in content analysis development, emphasized the value coders with expert knowledge and experience bring to the content analysis process. Clearly describing why coders' were selected was emphasized as a way for social scientists to achieve external reliability because knowing why coders were chosen would provide future researchers protocol to follow in their own selection of coders (Krippendorff, 2013). In addition to providing clear descriptions of coder qualifications, it is also recommended that researchers select coders who can be easily found in the general population, as well as those who have high cognitive abilities and familiarity with the phenomenon of interest (Krippendorff, 2013; Potter & Levine-Donnerstein, 1999).

Although there are proponents of seeking experts for content analysis coding, there are others who contend coders need not possess expertise to perform the coding function. According to Bryman (2012), as long as the coder was thoroughly trained on how to code the content, and a high enough level of inter-coder reliability was established, *anyone* could serve as a coder. Similarly, Fraenkel, Wallen, and Hyun (2012) said:

> For all their study and training, what experts know is still based primarily on what they have learned from reading and thinking, from listening to and observing others, and from their own experiences. No expert, however, has studied or experienced all there is to know in a given field, and thus, even an expert can never be totally sure. All any expert can do is give us an opinion based on what he or she knows, and no matter how much this is, it is never all there is to know (p. 5).

Neuendorf (2002) believed retaining experts for content analysis coding was problematic, as experts may not be readily found in a population and a coding scheme usable only by experts could limit the study.

Both sides of the debate on whether experts should be retained for content analysis coding make valid points. However, there is little debate when it comes to retaining experts for a Delphi— a panel consisting of a minimum of 11 experts was highly recommended as a means for achieving consensus. Presently, the only way to know what qualifications, credentials, experience, or knowledge content analysis coders or panelists obtained for a Delphi possess is the way the social scientist describes those qualifications and credentials. If social scientists choose coders and panelists based on convenience or a nomination, they may be missing the opportunity to bring a greater level of depth, experience, skill, or content knowledge to their research that would come from choosing coders and panelists who are experts or have expertise in the phenomenon of interest.

Certainly the expertise of the coders and panelists selected to assist with ACEEL research complements the expertise of the social scientists tasked with addressing the complex problems associated with food, agriculture, and natural resources systems (Roberts et al., 2016). However, the only way to know what qualifications the coders and panelists possess is through the descriptions provided by ACEEL social scientists. For this reason, Costello and Rutherford (in press) performed a descriptive study focused on the ways ACEEL social scientists described the level of expertise the individuals retained to code content or serve as an expert on a Delphi panel possessed. The researchers identified 380 unique authors in their review of content analyses (n = 126) and Delphi studies (n = 56) published in the premier agricultural journals from 2010 – 2017. The premier agricultural journals (Edgar & Rutherford, 2011) included the *Journal of Applied Communications, Journal of Agricultural Education, Journal of International Agriculture and Extension Education, Journal of Extension, Journal of Leadership Education,* and *North American Colleges and Teachers of Agriculture Journal*. In each analysis of articles published in JIAEE, JOLE, and NACTA, an explanation of the coders' qualifications to perform a content analysis was not described. In the analysis of articles published in JOE, 92% (n = 49) of the articles lacked a description of coders' qualifications. Similarly, 80% (n = 32) of the articles published in JAC did not contain a description of coders' qualifications, and 60% (n = 9) of the articles published in JAE did not describe the coders' qualifications. In summary, 86%

(*n* = 108) of the total number of articles analyzed for this study that were published in the premier ACEEL journals where the study employed content analysis to gather the data did not include a description of the coders' qualifications. The opposite was true of the articles analyzed that employed the Delphi method to collect data. One hundred percent (*N* = 56) of the articles reviewed in the six premier journals that used the Delphi study method contained a description of the panelists' qualifications and/or the criteria used to select the people who served on the panel. A breakdown of the percentage of articles lacking a description of coders' and panelists qualifications by journal was presented in Table 4.1.

Table 4.1

Percent of Articles Lacking a Description of Coders'/Panelists' Qualifications by Journal

	JAC		JAE		JIAEE		JOE		JOLE		NACTA		Total	
Method	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*
Content Analysis	80	32	60	9	100	9	92	49	100	4	100	5	86	108
Delphi	0	11	0	23	0	11	0	10	0	1	0	7	0	56

Note. JAC = *Journal of Applied Communications,* JAE = *Journal of Agricultural Education,* JIAEE = *Journal of International Agriculture and Extension Education,* JOE = *Journal of Extension,* JOLE = *Journal of Leadership Education,* NACTA = *North American Colleges and Teachers of Agriculture Journal*.

Because the majority of authors employing content analysis or Delphi methods, and whose studies were published in the premier agricultural journals, did not describe the qualifications used to select coders or the credentials the coders possess that would make them qualified to code the data in a content analysis, Costello and Rutherford (in press) recommended a thorough description of coder's and panelists qualifications be included in peer-reviewed articles published in the premier agricultural journals. However, it is possible that the space limitations in some journals prohibit a full description.

4.1.1. Purpose and Objectives

A uniform method for describing the level of expertise a content analysis coder or Delphi panelist may contribute to a study would make it easier for social scientists in ACEEL disciplines to report expertise consistently and concisely. It would also enhance the replicability for future research. To create a uniform method, the components needed to measure expertise must first be identified (Gorsuch, 2015). Factor analytic and psychometric analyses can assist in identifying the appropriate constructs that would guide the development of a uniform method for describing the level of expertise a coder or panelist possesses. Therefore, the purpose of this study was twofold: (1) create an instrument to measure expertise, and (2) administer the instrument to ACEEL social scientists to collect their perceptions and insight regarding the characteristics of an expert.

4.1.2. Conceptual Framework

Psychometric theory (Nunnally, 1967) provided the conceptual framework for this study. Psychometrics is a scientific discipline focused on the development of assessment tools and measurement instruments that may help connect observable phenomenon (e.g., test scores) to phenomenon that cannot be directly observed (e.g., knowledge, attitudes, personality characteristics; Nunnally, 1967). Therefore, using psychometric theory to inform the construction of a scale to measure expertise was a solid choice.

Over the years, there have been many definitions of measurement in the social sciences; however, the definition Stevens (1946) provided is one social scientists use time after time: “measurement, in the broadest sense, is defined as the assignment of numerals to objects or events according to rules" (p. 667). Many social scientists in agricultural education have used the tenets of psychometric theory (McKim, Lawver, Enns, Smith, & Aschenbrener, 2013; McKim & Saucier, 2011; Rayfield, McKim, Lawrence, & Stair, 2014) as a primary or secondary study framework to bring procedural and analytical guidance to their analyses.

4.2. Method

This study is the product of a larger body of work that assessed expertise as it related to the selection of individuals who possess expertise to serve in studies conducted by social scientists in agricultural communications, education, extension, and leadership disciplines.

4.2.1. Step 1: Item Generation

The scale development process begins with the creation of items to assess a phenomenon of interest. Robinson (2016) said item generation in scale development “is the foundation of the entire process, so it is vital that it is theoretically driven,” (p.742). This process can be conducted inductively by first generating items from which the scale is derived, or deductively, beginning with a theoretical definition from which items are generated (Hinkin, Tracey, & Enz, 1997; DeVellis, 2012; Peterson, Gischlar, &

Peterson, 2017). The inductive approach is useful for exploring unfamiliar phenomenon that may lack theoretical support (Nunnally, 1967). When using an inductive approach, it is sometimes necessary to seek the perspectives of those who have experience or knowledge of the phenomenon of interest (Hinkin et al., 1997; DeVellis, 2012). Comparatively, deductive scale development uses a theoretical definition of the phenomenon and that definition serves as a foundation for the creation of items (Hinkin et al., 1997). The deductive approach requires an understanding of the relevant literature and of the phenomenon of interest, which ensures content adequacy in the final scales (Peterson et al., 2017). We chose the deductive approach and conducted an extensive review of the literature (Bereiter & Scardamalia, 1993; Camerer & Johnson, 1991; Chi, 2006; Chi, Glaser, & Farr, 1988; Collins, 2004; Collins, 2004; Collins & Evans, 2002; Ericsson & Smith, 1991; Feltovich, Prietula, & Ericsson, 2006; Germain & Tejeda, 2012; Goldman, 2015; Hoffman, 1998; Ryle, 1945; Schön, 1984; Weinstein, 1993; Winch, 2010).

Once a detailed description of the phenomenon of interest is created, there are a number of basic guidelines that should be followed to ensure that the items are properly constructed. First, item statements should be brief and concisely written using straightforward language participants will understand (Hinkin, 1998; Jarvis, Mackenzie, & Podsakoff, 2003; DeVellis, 2012). Also, items should address only a single idea rather than multiple ideas to avoid potentially confusing respondents, which could lead to inaccurate results. Similarly, leading questions should also be avoided, as they may bias responses and will generate lower variance among items (Hinkin, 1998; DeVellis, 2012).

To maintain internal consistency reliability, DeVellis (2012) recommended using writing techniques that capture the construct in as many different, yet relevant, ways as possible. Although the items may appear redundant, "when irrelevant redundancies are avoided, relevant redundancies will yield more reliable item sets," (DeVellis, 2012, p. 78). Peterson et al., (2017) suggested redundancy was risky and could lead to the exclusion of other important and relevant items worded less similarly. We opted for purposeful redundancy in our instrument to better establish internal consistency reliability.

On the topic of writing techniques, it is important to note the pros and cons of negatively worded items that would require reverse scoring. Some researchers endorse the use of reverse-scored items to lower response bias (Holt, Armenakis, Feild, & Harris, 2007; DeVellis, 2012). Others, however, caution against using negatively-worded items within a measure as the negatively worded items may have harmful consequences on the psychometric properties of a measure (Hinkin, 1998; Kaiser, 1974; Robinson, 2018). For this reason, we did not use any negatively-worded or reverse-scored items in our instrument.

In terms of formatting the questions, we had many choices. We considered several formats—Thurstone's equal-appearing scaling method, Guttman's cumulative scaling method, Likert scaling method, and Semantic differential scaling method, just to name a few. We chose the Likert scaling method because of our desire to design an instrument to measure a concept reliant on individuals' opinions, attitudes, and beliefs. When a Likert scale is used, the items are presented as declarative statements, which are followed by response options indicative of varying points of agreement with the statement (DeVellis, 2012).

4.2.2. Step 2: Content Adequacy Assessment

The next step in the scale development process is pretesting items for content adequacy. Content adequacy defines the degree to which the content (e.g., items) of the measurement instrument reflects the construct to be measured (Creswell, 2013). Essentially, this evaluation works as a pretest so that items that are not consistent with the construct can be reworded, replaced with other more relevant items, or removed (Hinkin, 1998). To establish content adequacy, we created a pilot questionnaire comprised of 135 items. The statements used to create the Generalized Expertise Measure (Germain & Tejeda, 2012) were revised for conceptual fit and served as the foundation of items for our instrument. Conceptual fit is the extent to which the scale matches the variable that the social scientist intends to measure (DeVellis, 2012). The lack of an exact conceptual fit required that the scale items be modified. To be more specific, the statements taken from the GEM related to an employee's perception of expertise in the workplace. Because we were interested in social scientists' perception of expertise relating to the selection of experts to serve as a content analysis coder or Delphi panelist, additional items were added using the characteristics of experts gleaned from our extensive literature review.

The pilot questionnaire was distributed via electronic mail to 407 social scientists at a southern land-grant university. The sample of social scientists from the population of social scientists at the southern land-grant university represented the following departments: agricultural economics; communications; recreational parks and tourism; educational administration and human resource development; educational psychology; health and kinesiology; and teaching, learning, and culture. These departments were chosen because the social scientists in these departments are highly experienced, possess the breadth of knowledge, skills, and abilities needed to assist in the initial development of a psychometric scale to measure expertise, and are familiar with the designs and methods used in conducting social science research. Each participant received 25 randomly selected statements generated by the randomization feature in Qualtrics® online survey software. Each participant was provided detailed instructions and examples to prepare them for completing the questionnaire.

The first step in the pilot questionnaire was to capture participants' personal feelings about a statement related to the characteristics generally attributed to experts. An example that depicted what the participant would see as they progressed through the questionnaire was provided to ensure participants understood and knew what to expect as they moved through the process. Participants were instructed to read each statement and select the option that best described their personal level of agreement with the statement. A 6-point Likert rating scale was provided with each item. Participants were asked to rate each statement based on their level of agreement with the statement from 1 (Strongly Disagree) to 6 (Strongly Agree). For example, if participants were given the statement "An expert is intelligent," they were instructed that if they had a very low level of agreement with the statement, they should select "Strongly Disagree." However, if participants had a very high level of agreement with the statement, they should select

“Strongly Agree.” If participants’ agreement with the statement was neither very low nor very high, they were instructed to select one of the other four options that best reflected their level of agreement with the statement.

The second step in the pilot questionnaire was to give participants an opportunity to determine whether the statement was understandable and made sense. After participants determined their level of agreement with the item statements, they were asked the question “Does this statement make sense?” Using the previous example, if participants believed the statement “An expert is intelligent,” did not make sense, they could select the “No” option. If participants believed the statement made sense, they could select the “Yes” option. And if participants could not make a determination as to whether or not the statement made sense, they could select the “Maybe” option. If participants selected “Yes,” they moved to the next questionnaire item. If the participants selected “No” or “Maybe,” they moved to a subsequent prompt. This prompt was designed to solicit participants input on ways the questionnaire item statements could be rewritten to be clearer, more easily understood, or to make sense. Participants who selected “Maybe” or “No” to the question “Does this statement make sense” were provided with a text area where they could provide helpful feedback, ask questions, provide edits or rewriting suggestions, or simply make any comments they believed would contribute to the improvement of the questionnaire items. At the conclusion of the questionnaire, the participant responses were evaluated and the questionnaire items were rewritten as needed. The revised questionnaire items were sent to a group of agricultural communications, education, extension, and leadership educators at a southern land grant university for pretesting and refinement.

4.2.3. Step 3: Questionnaire Administration

Selection of an appropriate type of sample is very important to ensure enough variance in responses. Hinkin (1998) suggested the sample used for the data collection should be as large as possible to ensure statistical significance and be representative of the population of interest. Our population (N = 827) was comprised of the authors (n = 380) of the studies analyzed in Costello and Rutherford's (in press) descriptive study and social scientists (n = 447) from 25 universities across the United States. The authors were chosen because they: (a) had proven experience collecting data using content analysis and Delphi methods, (b) they had a proven track record of publishing in the premier agricultural journals (Edgar & Rutherford, 2011), (c) there was a high likelihood they helped choose the expert coders and panelists for the studies they authored or co-authored, (d) they were either currently or formerly involved at some level in an ACEEL discipline, and (e) they would possess the knowledge, skills, and abilities needed to assist in the initial development of a psychometric scale to measure expertise.

We selected the 25 universities based on the offering of undergraduate and graduate degree programs or areas of emphasis in one or more of the following agricultural disciplines: communications, education, extension, and/or leadership. The universities were selected because there was a high likelihood that the social scientists in the selected departments engaged in research in communications, education, extension, and/or leadership and published or the potential to be published in the premier agricultural education journals (Edgar & Rutherford, 2011). These social scientists (n = 447) had similar demographics and psychographics as the authors identified in the previous expertise study, as well as the knowledge, skills, and abilities needed to assist in the initial development of a psychometric scale to measure expertise.

A modified version of Dillman, Smyth, and Christian's (2014) five compatible contacts system was implemented. Dillman, Smyth and Christian (2014) recommend a pre-notification announcement to potential participants as the first point of contact. In lieu of a pre-notification announcement to potential participants, we sent a letter to the department head of each of the 25 universities identified asking the department head to use their social influence (Kelman, 1958) to encourage their faculty to participate in our study. To make it easy for the department head to endorse our study, we created a template that the department head could modify. A complete list of the 25 universities invited to participate in our study was presented in Table 4.2. An asterisk indicated the universities we were informed endorsed our study. It is possible more department heads endorsed the study but did not inform us of their endorsement.

Table 4.2

Universities Invited to Participate in the Study

University Name
California Polytechnic State University
Clemson University
Illinois State University
Iowa State University
Kansas State University
Mississippi State University*
Montana State University*
North Carolina State University
Oklahoma State University
Pennsylvania State University
Purdue University
The Ohio State University
Texas A&M University*
Texas Tech University
University of Arizona
University of Arkansas
University of Florida
University of Georgia*
University of Idaho
University of Illinois*
University of Missouri
University of Nebraska*
University of Tennessee
University of Wisconsin
Virginia Tech

Note. Universities whose department heads endorsed the study are indicated with an asterisk.

The second point of contact was an electronically mailed invitation to the population. The invitation included a personalized link to the electronic questionnaire, a link to a document containing a formal description of our study, and a link to a document containing a summary of the study for those individuals who required less detailed information. Because the protocol for scale development could have been unfamiliar to some social scientists, the invitation included a link to a short video describing scale development procedures.

The questionnaire invitation was sent to 827 unique potential participants at the 25 selected universities. Email addresses were obtained from the departmental websites of the 25 selected universities and from the biographical information included in the published studies content analyzed in a previous study (Costello & Rutherford, in press). Seven hundred and thirty one electronically mailed invitations were delivered to the intended recipients and 96 invitations were returned as undeliverable.

The departments within the 25 universities selected were identified based on the following criteria: (a) the department offered undergraduate and graduate degree programs in one or more of the following agricultural disciplines: communications, education, extension, and/or leadership, (b) the social scientists engaged in research that has the potential to be published in the premier agricultural education journals (Edgar & Rutherford, 2011): *Journal of Applied Communications, Journal of Agricultural Education, Journal of International Agriculture and Extension Education, Journal of Leadership Education, Journal of Extension,* and *North American Colleges and Teachers of Agriculture Journal,* and (c) the social scientists were highly experienced and possessed the breadth of knowledge, skills, and abilities needed to assist in the initial development of a psychometric scale to measure expertise.

The third and fourth points of contact included reminders sent to the participant on the third and sixth days after the initial email invitation was sent. In an effort to increase response rate, an additional reminder was sent to participants who had partially completed the questionnaire. Of the 731 invitations that were delivered successfully, 180 useable responses were received, yielding an overall 24.6% response rate. The fifth point of contact was a follow-up thank you to individuals who completed the questionnaire.

4.2.3.1. Instrumentation

The primary goal of the instrument was to capture participants' personal feelings about a statement related to the characteristics generally attributed to experts. An example that depicted what the participant would see as they progressed through the questionnaire was provided to ensure participants understood and knew what to expect as they moved through the process. Participants were instructed to read each statement and select the option that best described their personal level of agreement with the statement. A 6-point rating scale was provided with each item. Participants were asked to rate each statement based on their level of agreement with the statement from 1 (Strongly Disagree) to 6 (Strongly Agree). If participants' agreement with the statement was neither very low nor very high, they were instructed to select one of the other four options that best reflected their level of agreement with the statement.

The second step in administering the questionnaire was to give participants an opportunity to provide additional feedback. After participants determined their level of agreement with the item statements, they were posed the question "Additional feedback?" If participants selected "Yes", the statement was presented again and a text box was provided so that the participant could provide additional input. If participants selected "No" or did not answer the question, they moved on to the next statement. This process continued until the participant finished the questionnaire.

The third step in administrating the questionnaire was a personalized section designed specifically for those participants who had authored or co-authored the journal articles identified in the previous study. We wanted to find out which authors were responsible for selecting the experts who served as coders and panelists. We created a database of information about each study the author was involved in. The data base when then used to populate the customized section of the questionnaire. Only those 380 authors were able to complete this section of the questionnaire. Participants were asked if they recalled being an author on a study. If the person said no, they moved on to the next study, or they only authored one study, they were finished with the questionnaire. If the person said yes, they moved to the next question. Next, the person was asked if they recalled the person or people responsible for choosing the expert coders and panelists. If the participant selected "Yes," they were presented with a list of authors and they could then select the person or persons responsible for choosing the experts. If the person who selected the experts was not listed, the participant could provide their name and contact information. If the participant did not recall who chose the experts, they could select "No," in which case they moved on to the next study or to the end of the questionnaire.

4.2.4. Step 4: Factor Analysis

Responses to the expertise questionnaire items were analyzed using the Principal Component Analysis (PCA) function in IBM® SPSS® statistical software. PCA is a factor analytical procedure that makes no assumptions about unique or error variance in the data (Raven, 1994). PCA has proven useful in identifying linear components in a data set and how the variables may relate to each component (Field, 2009; Rayfield et al., 2014). To maximize high correlations between factors and reduce low correlations, the 149 original scale items from the questionnaire were included in the PCA with varimax rotation (as described by Rayfield et al., 2014). SPSS® offers three methods of orthogonal rotation to maximize variance. Varimax was chosen for this study because of the way it disperses loadings among factors, resulting in more interpretable clusters of factors (Field, 2009). Factors with a minimum of three loadings greater than .40 and not cross loaded with any other factors were retained (Field, 2009; Stevens, 2012). The Kaiser-Meyer-Olkin measure of sampling adequacy was .538; .5 is the acceptable minimum score for factor analytic procedures (Field, 2009; Kaiser, 1974; Rayfield et al., 2014; Samuels, 2016).

4.3. Results

The descriptive statistics for the 10 constructs that emerged from the PCA are presented in Table 4.3.

Table 4.3

Construct Descriptive Statistics

	N	Min.	Max.	*M*	*SD*
Construct 01	69	1.00	5.36	2.44	1.10
Construct 02	69	2.53	6.00	4.84	0.78
Construct 03	69	4.13	6.00	5.36	0.46
Construct 04	69	2.75	6.00	4.31	0.82
Construct 05	69	1.38	6.00	4.75	0.86
Construct 06	69	1.25	6.00	4.15	1.06
Construct 07	69	1.00	6.00	4.15	1.30
Construct 08	69	1.25	5.25	3.27	0.88
Construct 09	69	2.33	6.00	4.92	0.87
Construct 10	69	2.00	6.00	4.64	0.99

Note. 1 = Strongly Disagree, 6 = Strongly Agree

A list of the PCA results (scale items listed by factor loading) was presented to faculty at a southern land-grant university representing the agricultural communications, education, extension, and leadership disciplines. The researcher team and the faculty members discussed what the items collectively measured, resulting in the names for each construct. The named constructs and the construct loadings from the PCA with Varimax rotation are presented in Table 4.4.

Table 4.4

Construct Loadings from Principal Component Analysis with Varimax Rotation

Item	Loading
Construct 1: Academic Credentials	
An expert has academic degrees.	.857
An expert has an academic degree.	.837
An expert has a professional degree.	.810
An expert has both experience and an academic degree.	.799
An expert has a doctoral degree.	.796
An expert has experience, knowledge, and an academic degree.	.791
An expert must have at least a master's degree.	.789
An expert must have a terminal degree.	.787
An expert has at least a master's degree level of education.	.764
An expert has completed education beyond high school.	.749
An expert has written articles or books in their field of expertise.	.633
An expert shows others that they have the formal education necessary to be an expert in their field.	.615
An expert has professional credentials.	.542
An expert has more professional credentials than the average person.	.526
Construct 2: Cognitive Processing	
An expert is a problem-solver.	.732
An expert is good at asking the right questions to find solutions to problems in their field of expertise.	.727

Table 4.4 (continued)

Item	Loading
An expert is able to reflect on action.	.720
An expert is able to solve problems.	.675
An expert can reflect after the fact.	.672
An expert is a skilled practitioner.	.648
An expert is able to reflect in action.	.614
An expert has well developed reasoning processes.	.614
An expert is able to reason.	.567
An expert possesses practical knowledge.	.552
An expert thinks logically about things related to their field of expertise.	.542
An expert is able to apply knowledge.	.532
An expert can identify solutions to problems in their field of expertise.	.508
An expert is results-driven.	.491
An expert has reflexive proficiency.	.451
Construct 3: Specialized Knowledge and Assessment Ability	
An expert has a substantial depth of knowledge about a specific subject.	.748
An expert has knowledge that is specific to a chosen field.	.745
An expert has a high level of knowledge in their field of expertise.	.704
An expert is able to judge what is not important when it comes to their area of expertise.	.679
An expert can assess whether something is important related to their field of expertise.	.659
An expert is good at assessing problems related to their field of expertise.	.651
An expert can identify problems in their field of expertise.	.645
An expert can assess whether something is not important related to their field of expertise.	.644
An expert is knowledgeable in their field of expertise.	.644
An expert is able to judge what is important when it comes to their area of expertise.	.602
An expert possesses subject matter knowledge.	.559
An expert has knowledge that is specific to a construct of interest.	.550
An expert is credible.	.526
An expert is competent in their field of expertise.	.523
An expert sees patterns in situations found in their area of expertise.	.511
An expert has both knowledge and experience.	.472
Construct 4: Perceptions of Expert Characteristics	
People believe an expert is more motivated than others.	.748
People believe an expert is more goal-oriented than others.	.696
People believe an expert is more decisive than others.	.689
People believe an expert is more self-assured than others.	.671
People believe an expert is more results-driven than others.	.622
People believe an expert is more self-confident than others.	.617
People believe an expert is more educated than others.	.567
People believe an expert is more respected than others.	.566
People believe an expert is more disciplined than others.	.533
People believe an expert is more intelligent than others.	.519
People believe an expert is more charismatic than others.	.503
People believe an expert is more capable than others.	.503
People believe an expert is more talented than others.	.473
Construct 5: Recognition and Reputation	
An expert is recognized by colleagues as being an expert in their field.	.806
An expert is recognized by peers as being an expert in their field.	.774
An expert is recognized by others as being an expert in their field.	.705
An expert is respected.	.615
An expert is recognized by superiors as being an expert in their field.	.615
An expert has a good professional reputation among their colleagues.	.549
An expert is recognized by subordinates as being an expert in their field.	.544
An expert has a good professional reputation in their field.	.528
Construct 6: Self-Confidence	
An expert is self-assured.	.798

Table 4.4 (continued)

Item	Loading
An expert is self-confident.	.686
An expert has self-confidence because they are an expert in their field.	.686
An expert is self-confident in their field of expertise.	.602
Construct 7: Training	
An expert can train others in their area of expertise.	.790
An expert can educate others in their field of expertise.	.754
An expert can formally or informally train others to be experts in their field of expertise.	.700
Construct 8: Communication of Self-Importance	
An expert says good things about their achievements.	.722
An expert says good things about themselves.	.667
An expert does things so that the attention of others is drawn to their high level of expertise.	.555
An expert lets others know why they are an expert.	.551
Construct 9: Source Evaluation	
People believe an expert is more qualified than others.	.722
People believe an expert is more reputable than others.	.613
People believe an expert is more credible than others.	.610
People believe what an expert has to say.	.501
Construct 10: Reasoning	
An expert uses deductive reasoning.	.724
An expert uses inductive reasoning.	.567
An expert has strong reasoning skills.	.460
Construct 11: Type in the name of the construct	
An expert can be relied upon to know everything about their field of expertise.	.741
An expert knows almost everything in their field of expertise.	.662
Construct 12: Type in the name of the construct	
An expert relies on their intuition when making decisions.	.782
An expert uses intuition to make decisions in their field of expertise.	.769

The descriptive statistics for all study participants are presented in Table 4.5. This included the authors of the journal articles identified in Costello and Rutherford (in press). The three constructs with the highest scores were Specialized Knowledge and Assessment Ability (M = 5.18; SD = 0.62), Source Evaluation (M = 4.72; SD = 0.83), and Cognitive Processing (M = 4.66; SD = 0.82). High scores on these constructs indicated participants had overall positive scores for items related to experts' depth of knowledge in a specialized field or area, items related to the beliefs that people have that experts are more credible, qualified and reputable than the average person, and items relating to experts' assessment and judgement abilities. The two constructs with lowest scores were Academic Credentials (M = 2.64; SD = 1.10) and Communication and Self-

Importance (*M* = 3.23; *SD* = 1.00). Low scores on these constructs indicated participants did not have overall positive scores for items related to evidence of higher education as indicative of expertise and one's personal communication to others about of their professional achievements or expertise.

Table 4.5
Descriptive Statistics for All Participants

	N	Min.	Max.	*M*	*SD*
Construct 01: Academic Credentials	201	1.00	5.64	2.65	1.08
Construct 02: Cognitive Processing	201	1.00	6.00	4.66	0.82
Construct 03: Specialized Knowledge and Assessment Ability	201	2.00	6.00	5.18	0.62
Construct 04: Perceptions of Expert Characteristics	205	1.00	6.00	4.08	0.88
Construct 05: Recognition and Reputation	201	1.00	6.00	4.58	0.82
Construct 06: Self Confidence	196	1.00	6.00	4.13	1.03
Construct 07: Training	188	1.00	6.00	4.33	1.19
Construct 08: Communication and Self-Importance	192	1.00	6.00	3.23	1.01
Construct 09: Source Evaluation	196	1.75	6.00	4.73	0.83
Construct 10: Reasoning	192	1.00	6.00	4.49	1.00

The descriptive statistics for the authors of the journal articles identified in Costello and Rutherford (in press) and the authors who were identified as being responsible for selecting the experts for the study are presented in Table 4.6. The three constructs with the highest scores as indicated by the authors identified were Specialized Knowledge and Assessment Ability (*M* = 5.28; *SD* = 0.61), Source Evaluation (*M* = 4.82; *SD* = 0.68), and Cognitive Processing (*M* = 4.71; *SD* = 0.82). Similarly, the three constructs with the highest scores as indicated by the authors who were responsible for choosing the experts for their studies were Specialized Knowledge and Assessment Ability (*M* = 5.35; *SD* = 0.54), Source Evaluation (*M* = 4.86; *SD* = 0.68), and Cognitive Processing (*M* = 4.72; *SD* = 0.78). High scores on these constructs indicated participants had overall positive scores for items related to experts' depth of knowledge in a specialized field or area, items related to the beliefs that people have that experts are more credible, qualified and reputable than the average person, and items relating to experts' assessment and judgement abilities. The two constructs with lowest scores as indicated by the authors identified were Academic Credentials (*M* = 2.81; *SD* = 1.06) and Communication and Self-Importance (*M* = 3.30; *SD* = 1.08). Similarly, the two constructs with the lowest scores as indicated by the authors who were responsible for choosing the experts for their studies were Academic Credentials (*M* = 2.82; *SD* = 1.10) and Communication and Self-Importance (*M* = 3.35; *SD* = 1.03). Low scores on these constructs indicated participants did not have overall positive scores for items related to evidence of higher education as indicative of expertise and one's personal communication to others about of their professional achievements or expertise.

Table 4.6

Construct Benchmark Scores for Authors and Authors Responsible for Selecting Experts

Construct	Authors					Authors Responsible for Selecting Experts				
	N	Min	Max	*M*	*SD*	*N*	Min	Max	*M*	*SD*
Construct 01: Academic Credentials	084	1.11	5.64	2.81	1.06	055	1.11	5.36	2.82	1.10
Construct 02: Cognitive Processing	083	2.53	6.00	4.71	0.82	055	2.67	6.00	4.72	0.78
Construct 03: Specialized Knowledge and Assessment Ability	084	3.00	6.00	5.28	0.61	055	3.92	6.00	5.35	0.54
Construct 04: Perceptions of Expert Characteristics	084	1.00	6.00	4.10	0.82	055	2.17	6.00	4.15	0.77
Construct 05: Recognition and Reputation	082	1.00	6.00	4.67	0.93	054	3.00	6.00	4.71	0.82
Construct 06: Self Confidence	080	1.25	6.00	4.17	1.05	053	2.25	6.00	4.19	1.00
Construct 07: Training	077	1.67	6.00	4.36	1.06	053	1.67	6.00	4.37	1.01
Construct 08: Communication and Self-Importance	078	1.00	6.00	3.30	1.08	054	1.25	6.00	3.35	1.03
Construct 09: Source Evaluation	081	3.00	6.00	4.82	0.68	053	3.25	6.00	4.86	0.68
Construct 10: Reasoning	081	1.67	6.00	4.62	0.95	054	1.67	6.00	4.53	1.02

4.4. Conclusions and Discussion

This exploratory quantitative study was an attempt to create a psychometric scale to measure expertise so that social scientists in ACEEL disciplines would have an efficient and consistent means of reporting the level of expertise their chosen experts bring to a study. The goal was to enhance the rigor, transparency, and replicability of research across all ACEEL disciplines as suggested by Costello and Rutherford (in press). To summarize, it was concluded that the majority of studies that indicated using content analysis or Delphi methods in the premier agricultural journals did not describe the qualifications used to select coders and panelists (Costello & Rutherford, in press). Because the majority of researchers who used content analysis or Delphi methods and whose studies were published in the premier agricultural journals did not describe the qualifications used to select coders or the credentials the coders possess that would make them qualified, Costello and Rutherford (in press) recommended a thorough description of coder's and panelists qualifications be included in peer-reviewed articles published in the premier agricultural journals (Edgar & Rutherford, 2011). Space limitations in some journals may deter some authors from providing a complete description, which is why uniform method for describing the level of expertise a content analysis coder or Delphi panelist may contribute to a study would make it easier for social scientists in ACEEL disciplines to report expertise consistently and concisely. It would also enhance the replicability for future research. The creation of the psychometric scale used to gather data for this study was an attempt to discover exactly what social scientists in ACEEL disciplines believe are the characteristics of expertise. However, to study expertise, one must start with the help of experts. As such, using the expertise of university faculty members and graduate students at a southern land-grant university, an instrument of 149 items was created and tested. The instrument was then sent to 827 faculty and graduate students in departments offering courses in agricultural communications, education, extension, and leadership at 25 land-grant universities nationwide to capture their thoughts and opinions regarding the characteristics of experts retained for studies in social sciences. Three hundred and eighty faculty members in the population served as authors and co-authors on the content analyses and Delphi studies examined by Costello and Rutherford (in press).

Using Principal Component Analysis with Varimax rotation, the instrument yielded 10 constructs that can be used to describe expertise: academic credentials, cognitive processing, specialized knowledge and assessment ability, perceptions of expert characteristics, recognition and reputation, self-confidence, training, communication and self-importance, source evaluation, and reasoning. Of those 10 constructs, three constructs—Specialized Knowledge and Assessment Ability, Source Evaluation, and Cognitive Processing—scored highly among every group of participants analyzed (e.g., social scientists, authors, and authors responsible for selecting experts) indicating participants positive feelings regarding an experts' depth of knowledge in a specialized field or area, items related to the beliefs that people have that experts are more credible, qualified and reputable than the average person, and items relating to experts' assessment and judgement abilities as indicative of expertise. Of the 10 constructs, two constructs fell short as indicated by lower scores from all three groups:

Academic Credentials and Communication and Self-Importance. The lower scores on these constructs indicated participants did not believe higher education and one's personal communication to others about of their professional achievements or expertise were strong indicators of expertise.

The constructs that emerged from this study may provide social scientists in ACEEL disciplines with the foundation for describing the level of expertise experts retained in social science research bring to a study. However, there are two sampling issues associated with psychometric scale development that limit this study. The first issue is related to the sampling of content and the other issue is related to the sampling of people (Nunnally, 1967). The sampling of content is concerned with the generalization of findings to populations of test items and the sampling of people is related to the generalization of findings to populations of individuals. Due to the exploratory nature of this study, the primary focus was given to the development of the psychological measures' internal validity and not to the ability to infer results outside of the confines of this study. Future research could address the both sampling issues such that findings could be generalized.

Similarly, data must be collected from an adequate sample size to appropriately conduct any type of factorial analysis (Hinkin et al., 1997; DeVellis, 2012). The expertise questionnaire was distributed to 827 faculty member and graduate students across the country; however, 180 completed questionnaires were received. Of the 180 completed questionnaires, the responses from 69 participants provided sufficient factorial loadings. Although the minimum Kaiser-Meyer-Olkin measure of sampling adequacy was .538, which is the acceptable minimum score for factor analytic procedures (Field, 2009; Kaiser, 1974; Rayfield et al., 2014; Samuels, 2016), a higher KMO score is the general preference. Therefore, proceeding with the minimum KMO score limits the study.

Based on the findings of this study, we invite ACEEL researchers to use the 10 constructs in their efforts to thoroughly describe the qualifications of their content analysis coders, Delphi panelists, and any expert retained for social science studies in agriculture. However, the three constructs identified by the social scientists, the authors, and the authors responsible for choosing the experts for their studies should be used above all others as it was clear from the research results that social scientists in ACEEL disciplines, whether they have authored studies using content analysis or Delphi or had been part of the expert selection process deemed these constructs as most valuable. We recommend social scientists in ACEEL disciplines familiarize themselves with the items from the Specialized Knowledge and Assessment Ability, Source Evaluation, and Cognitive Processing constructs so that they can use the concepts presented when describing the experts they chose to serve as experts for a content analysis or Delphi study.

This will:

(a) Help social scientists select experts with highly relevant qualifications that maintain the quality, integrity, and rigor of the study.

(b) Improve the overall consistency in how expertise is reported in all of the published work in the premier agricultural journals, other journals relevant to a social scientists' area of study, and other types of academic publications.

(c) Uphold a systematic approach for reporting expertise, making it easier for social scientists to succinctly describe the qualifications of coders and panelists

(d) Assist journal editors and reviewers in giving higher priority to the description of expertise as a condition for publication.

(e) Establish integrity, as much of the misperception that surrounds social science research stems from researchers who veil their methods in secrecy and academic jargon.

(f) Enhance the future of ACEEL research.

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5. CONCLUSIONS

5.1. Expertise in ACEEL Research

This body of work discusses the conceptualization of an expert within social science research conducted in agricultural communications, education, extension, and leadership disciplines. Experts are multi-faceted, making expertise as it related to the individuals selected to participate in social science research difficult to quantify. This research was conducted as a way to alleviate the difficulties in describing expert selection criteria so that social scientists could easily justify the choices made to enhance consistency, transparency, rigor, integrity, and ease of replication in ACEEL research. Conclusions and discussion specific to each individual study are reported in sections 2.4., 3.4., and 4.4.

Looking at the body of work holistically, incongruence between how social scientists in ACEEL disciplines are reporting expertise and what aspects they believe comprise expertise was evident. For example, the results of the descriptive study indicated social scientists were not providing detailed descriptions of content analysis coder credentials, and those descriptions that were provided focused primarily on academic credentials:

> "The primary researcher, a master's student in agricultural communications, coded every page. A co-coder, also a master's student in agricultural communications, was selected to code 20% of the pages to ensure inter-rater agreement," (Rogers, Rumble, & Lundy, 2016, p. 37).

> **"…**two agricultural communications graduate students in the Department of Agricultural Education, Communications, and Technology at the University of Arkansas," (Pennington, Calico, Edgar, Edgar, & Johnson, 2015, p. 33)

Yet he results of the principal component analysis provided evidence that social scientists value specialized knowledge and assessment ability, source evaluation, and cognitive processing above academic credentials. The incongruence revealed in this study of expertise in ACEEL disciplines brings visibility to an area of opportunity for agricultural social scientists, agricultural journal editors, and social scientists serving as reviewers.

5.1.1. Opportunity for Agricultural Social Scientists

- Help social scientists select experts with highly relevant qualifications that maintain the quality, integrity, and rigor of the study.
- Uphold a systematic approach for reporting expertise, making it easier for social scientists to succinctly describe the qualifications of coders and panelists
- Establish integrity, as much of the misperception that surrounds social science research stems from social scientists who veil their methods in secrecy and academic jargon.
- Enhance the future of ACEEL research by making it easier to replicate a study.

5.1.2. Opportunity for Journal Editors and Reviewers

- Improve the overall consistency in how expertise is reported in all of the published work in the premier agricultural journals, other journals relevant to a social scientists' area of study, and other types of academic publications.
- Uphold a systematic approach for reporting expertise, potentially saving time in the article review process, which may translate into quicker turn-around times on article reviews.
- Assist journal editors and reviewers maintain integrity and quality by reprioritizing the need to include a more specific and robust description of the attributes of expertise as a condition for publication when appropriate.

5.2 Implications for Future Research

This study has shown that an instrument to measure expertise as perceived by social scientists in ACEEL disciplines can be developed, and that the outcome of the measurement was 10 unique constructs that may be used to describe the expertise of coders and panelists. Although the number of items decreased from the initial 149 declarative statements to 84, further reduction is necessary. Future research should involve performing a confirmatory factor analysis to further reduce the number of items. The result could provide even more precise constructs that could be used to describe expertise.

Additionally, quantitatively analyzing the data could prove beneficial. Because respondents had the opportunity to provide additional feedback, using content analysis or grounded theory to analyze the respondents' open-ended feedback could provide another level of understanding. It would also be advantageous to interview respondents to get deeper insight regarding their thoughts and opinions about expertise, especially those individuals who were responsible for selecting the experts for their studies. Finally, the constructs could be shared with social scientists working in other agricultural disciplines who use content analysis and Delphi methods to gather data.