

Identifying Key Competencies for Extension Communication: A Delphi Analysis to Guide Program Development

Catherine Sanders

North Carolina State University at Raleigh

Kevan W. Lamm

University of Georgia

Elisabeth Ramsey

NC State University

Follow this and additional works at: <https://newprairiepress.org/jac>



Part of the [Agricultural Education Commons](#), and the [Other Communication Commons](#)



This work is licensed under a [Creative Commons Attribution-Noncommercial-Share Alike 4.0 License](#).

Recommended Citation

Sanders, Catherine; Lamm, Kevan W.; and Ramsey, Elisabeth (2024) "Identifying Key Competencies for Extension Communication: A Delphi Analysis to Guide Program Development," *Journal of Applied Communications*: Vol. 108: Iss. 3. <https://doi.org/10.4148/1051-0834.2537>

This Research is brought to you for free and open access by New Prairie Press. It has been accepted for inclusion in *Journal of Applied Communications* by an authorized administrator of New Prairie Press. For more information, please contact cads@k-state.edu.

Identifying Key Competencies for Extension Communication: A Delphi Analysis to Guide Program Development

Abstract

Developing communication capacities for extension professionals is key to effectively delivering relevant and impactful knowledge. Communication is used throughout extension; however, extension professionals often feel they have limited communication skills and struggle with integrating communication into their practice. The current study identified the communication competency needs of the North Carolina Cooperative Extension organization to inform professional development and training for state extension professionals. Using a three-round Delphi technique, North Carolina extension administrators and communications staff were surveyed for their perceptions of the key communication competencies needed for extension professionals. Key competencies identified by North Carolina extension professionals were categorized as interpersonal communication, cultural competence, and science communication, identified from 171 initial responses. Findings indicate that extension experts placed a high priority on engaging in science communication and the ability to translate science to the public, as well as being culturally competent. Thus, future professional development for extension professionals should focus on developing science communication strategies and fostering interpersonal and intercultural relationship building to support extension's role in a changing agricultural food system.

Keywords

Cooperative Extension; Delphi technique; science communication; interpersonal communication; intercultural competence

Introduction

Extension communication plays a pivotal role in disseminating relevant and impactful knowledge to diverse audiences (Kurtzo et al., 2019). It encompasses the various strategies and channels employed by extension professionals to bridge the gap between scientific expertise and community needs. However, despite its critical importance, many extension professionals express challenges in honing their communication skills and effectively integrating them into their practice (Beattie et al., 2022). Developing communication capacities for extension professionals is key for effectively delivering information, knowledge, and resources to communities and stakeholders across the land-grant system (Kurtzo et al., 2019). As a knowledge-based organization tasked with disseminating evidence-based research to the public (Argabright et al., 2012; Seevers & Graham, 2012), communication is a key aspect of the role of an extension professional (Beattie et al., 2022). Communication is used throughout many aspects of extension, including program development, implementation, and adoption (Kurtzo et al., 2019). Communication is a key facet of extension's unique ability to facilitate interpersonal connections with communities (Kurtzo et al., 2019), indicating a need to increase communication capacity development for extension professionals.

Research has demonstrated a few communication competencies needed by extension professionals at the county level, including “knowledge of communication experts in the extension organization who can assist with the communication aspect; knowledge of how to work with local media agents; and the ability to display professional interpersonal communication skills” (Caldwell, 2005, p. iv). However, these identified competencies were not established in the social media era, and extension professionals may need more development assistance to support and maintain the organization's reputation and public trust (Bowman et al., 2018).

Credibility is important for the maintenance and evolution of extension's role in the public sphere, especially with the changing population of the United States (Hains et al., 2021; Ruemenapp, 2017). Innovations and discoveries at the intersection of agricultural production and the food system have been underused due to poor public-facing communication or lack of trust in science and scientific organizations (McLeod-Morin et al., 2020). Extension's evolution involves using credible and actionable evidence, specifically scientific evidence, in the information dissemination and program development (Cummings & Silliman, 2019). University extension services are positioned as trusted information sources (Fortner et al., 2022), due to their interpersonal positioning and embeddedness within communities and are a strong avenue for science communication efforts (Brown et al., 2023). Extension professionals must develop and disseminate educational programs to local communities based on demonstrated needs (Seevers & Graham, 2012); thus, extension professionals must take an “active role in maintaining their credibility and communicating it appropriately” across different audiences (Fortner et al., 2022) (p. 1). According to findings from McLeod-Morin et al. (2020), “[c]ommunication is one of the three legs of the land-grant university system as extension tries to transfer information to the public” (p. 9) and is a key component for university-society communication. Additionally, extension professionals need skill and competency development to improve their ability to communicate and share knowledge (Jernigan et al., 2015). In recognition of the central role that extension services hold as trusted sources of information within communities (Fortner et al., 2022), there arises an urgent need for these professionals to proactively uphold their credibility and communicate effectively across a spectrum of audiences (Fortner et al., 2022). This

imperative is further emphasized by the global acknowledgment of communication competence as an essential attribute for extension professionals (Lamm et al., 2023). Yet, as the demands on extension professionals continue to grow while resources diminish, there arises a pressing need to develop communication capacities in a manner that is not only pertinent but also adaptable across diverse contexts (Bowman et al., 2018). This raises critical questions: What specific capacities are indispensable for the effective functioning of extension communication? How can we establish a consensus on the key components of communication competence in this domain? The present study represents an effort by a new extension specialist in communication to identify program priority areas by state extension leaders and key stakeholders to guide program development around communication capacity development in extension.

Conceptual Framework

The current study was guided by consensus building theory (Innes & Booher, 1999b, 1999a), a framework representing efforts for stakeholders to reach agreement among all members of a group (Harvard Law School, 2023; Lamm et al., 2023). Consensus-based project development can help outline strategic priority areas and shared goals for new programs within organizations through intentional collaboration (Briggs et al., 2005; Innes & Booher, 1999b). Consensus-building practices allow for the incorporation of diverse interests to contribute to collective planning efforts (Innes & Booher, 1999a). Many studies across the agricultural education and communication literature have used consensus-building strategies for understanding problem solving in teams (Lamm et al., 2016), identifying competencies needed by agricultural communication graduates (Morgan, 2010), exploring the role of consensus in risk communication (Evans & Heiberger, 2015), identifying strengths of state extension programs (Powell et al., 2021), identifying characteristics of an internationalized state extension system (Ludwig & Barrick, 1996), and exploring wildlife-friendly landscape maintenance practices (Kalauni et al., 2023).

Land-grant university systems, which house extension services in the U.S., are systems in which change and adaptation are critical to meet emerging needs of stakeholders (Lamm et al., 2018). In alignment with previous research identifying organizational capacity needs for North Carolina Cooperative Extension, the current study represents an effort to “continually assess, monitor, validate, and refine competencies needed for individual and organizational excellence” (Liles & Mustian, 2004, p. 80). These efforts echo needs for enhancing organizational development through developing the capacity to create a collectively shared vision, critical to the consensus building process within organizations (Innes & Booher, 1999b; Senge, 2006). Additionally, previous literature has highlighted needed communication capacities for extension organizations and rural advisory services internationally, including using social media, articulating a key message, demonstrating strong presentation, writing, and public relations skills, effectively communicating with the public, developing relationships with community partners, developing advocacy materials, and creatively reaching new audiences (Lamm et al., 2018).

Purpose & Objectives

While several studies have indicated the importance of communication for extension professionals (Beattie et al., 2022; Kurtzo et al., 2019), there has been no comprehensive exploration and identification of needed communication competency areas to guide extension capacity development priorities and strategies. The present study fills the gap in the literature by identifying the competencies identified as important for extension agents' success by national and statewide extension communication stakeholders. Identifying these competencies will help inform future outreach and strategic development efforts for extension nationwide. The study was guided by the following research objectives:

1. Create a comprehensive list of potential communication competencies needed by extension professionals in North Carolina.
2. Generate a consensus on the specific communication competencies needed by extension professionals in North Carolina.
3. Develop a heuristic thematic grouping of communication competency priorities for extension professionals in North Carolina.

Methods

The Delphi technique (Dalkey & Helmer, 1963) was selected for the current study due to its ability to generate consensus across stakeholders and groups (Borden et al., 2017; Lamm, Randall, & Diez-Gonzalez, 2021). The Delphi technique has been used to capture expert opinions and build consensus related to curriculum and program development (Sitlington & Coetzer, 2015), especially for agricultural and extension audiences (Clem, 2013; Harder et al., 2010; Lamm et al., 2017; Lamm, Randall, & Diez-Gonzalez, 2021; Lamm, Randall, Lamm, et al., 2021; Morgan et al., 2013; Warner et al., 2016). According to Habibi et al. (2014), the Delphi technique has been used to “gain consensus using a series of questionnaires and the provision of feedback to participants who have expertise in key areas” (p. 12). Within a Delphi study, “a group of experts work independently in rounds, where individual ideas are listed, reported to all, and individually ranked, followed by reconsideration of rankings” (SunWolf & Seibold, 1999, p. 400). The current study implemented the Delphi technique in order to obtain experts' opinions to develop and consensus listing regarding the communication capacity needs of extension professionals (Lamm et al., 2017), serving as a baseline for national and state-level priority areas for extension communication professional development.

Competency models are widely used within international practice to help aid capacity development for extension professionals (Diaz et al., 2020; Harder et al., 2010). Competencies can assist with organizational strategic planning (Gangani et al., 2006), and are often defined as “descriptive tool[s] that identif[y] the skills, knowledge, personal characteristics, and behaviors needed to effectively perform a role in the organization and help the business meet its strategic objectives” (Lucia & Lepsinger, 1999, p. 5). Several scholars have used competency-based frameworks to outline training and development needs for extension professionals around the globe (Berven et al., 2020; Diaz et al., 2020; Harder & Narine, 2020; Koundinya et al., 2018; Liles & Mustian, 2004; Nyamweru et al., 2023; Shimali et al., 2021). Historically, curriculum and program development has used the Delphi method to identify communication competencies across professional training settings (Caldwell, 2005; Edgar et al., 2012; Kiessling et al., 2010). However, communication competencies needed by extension professionals have not been updated to identify priorities that meet the needs of modern extension clients.

To address these crucial inquiries, a Delphi study was selected. The Delphi method, as expounded by Garson (2014), offers a structured approach to soliciting a consensus of opinions from a panel of experts, even when they are geographically dispersed (Humphrey-Murto et al., 2017). Its effectiveness in gathering a wide range of expert perspectives is particularly advantageous in a field as diverse and dynamic as extension communication. In this study, a panel of highly knowledgeable and experienced experts engaged in a three-round Delphi process, intentionally kept small to ensure the inclusion of the most proficient individuals (Skinner et al., 2015).

Through this process, the aim is to advance the existing body of research by pinpointing specific capacities that are paramount for the effective practice of extension communication. By gathering insights from experts with the ability to intertwine technical knowledge with an understanding of diverse perspectives (Skinner et al., 2015), this study endeavors to bridge gaps in the current understanding and practice of extension communication. The study methodology and data collection procedures were approved by the [University] Institutional Review Board with exempt status (Protocol #26001).

Data Collection

Data collection for the Delphi process begins with the selection of a panel of individuals identified as experts in the focus area of the Delphi. Validity of the Delphi process depends, in large part, on the knowledge, experience, and competence of the expert panel members (Lamm, Powell, & Lombardini, 2021). Thus, it is important to include a diverse set of experts who have a broad understanding of selected subject matter (Habibi et al., 2014; Vernon, 2009). Panel experts are those who have knowledge of the target issue and membership within a target group or community of practice (Powell et al., 2021). Seminal literature has asserted that there should be at least 11 experts on a Delphi panel to establish an acceptable level of external reliability for study replication (Dalkey, 1969). However, because expertise is a complex phenomenon (Costello & Rutherford, 2019), the expert identification method used in the current study followed Lamm et al.'s (2021) triangulation method between academic experts and practitioner experts. The current study aimed to identify the communication capacity and competency needs of the North Carolina Cooperative Extension organization to inform professional development and training for North Carolina extension professionals, using the three-round Delphi technique, considered adequate to generate consensus (Fan & Cheng, 2006). Data were collected between May and September 2023. A total of 90 panel experts were invited to participate in the study, considered experts in the area of interest (Habibi et al., 2014). Expert recruitment occurred through expert identification from the authors' professional networks and exploration of land-grant faculty websites, as well as snowball sampling methods to include any experts who were not included in the first recruitment effort (Warner et al., 2016). Two separate expert groups were recruited to participate as experts: North Carolina Extension administrators, specialists, and staff ($n = 41$), and national agricultural communication faculty ($n = 49$). North Carolina Extension administrators included administrative roles, specialists engaged in communication efforts through their programming, state program coordinators, and communications staff. Additionally, three extension agents who engage in communication practices as part of their extension programming were included in the sample. Other members of the sample included positional leaders (Powell et al., 2021), including district directors, program managers, and extension specialists. Academic faculty panelists included those engaged in agricultural

communications research and teaching across the national land-grant system (with the exception of one university that was not a land-grant but maintained a flagship agricultural communication program). For each round of the Delphi, respondent recruitment included an initial invitation email, followed by three follow-up emails for non-respondents (Dillman et al., 2014), approximately a week apart each time. A thank-you email was sent to participating respondents.

During round one, conducted in May of 2023, panel members were sent a Qualtrics survey and asked to respond to the following question: “In your opinion, what do you think are the five most important communication competencies needed for extension professionals?” Respondents were asked to provide up to five words or phrases to describe the competencies in a short-answer format. The inclusion of both extension professionals and faculty perspectives helped ensure a comprehensive set of competencies for subsequent Delphi rounds (Lamm et al., 2021). Results from round one were cleaned, combined, and sorted into one document. Initial qualitative open and axial coding was implemented to create categories to reduce cognitive load for respondents during round two. The response categories were reviewed by both authors as well as assessed for face and content validity by an external agricultural and science communication expert prior to disseminating round two, in addition to consultation by the primary author with the secondary author, who has expertise in survey development, Delphi methodology, and extension capacity development. While the categories were named internally by the research group, respondents in subsequent rounds did not see the titles of those categories – just the grouped items in the Qualtrics survey.

During round two, respondents were asked to review the list of capacities generated in round one as well as answering the following prompt: “Please indicate the level of importance you associate with each of the following communication competencies for extension professionals.” Only North Carolina extension experts were included in subsequent rounds to provide focused and strategic information for program planning efforts. Respondents rated the level of importance for each item on a five-point, Likert-type scale ranging from 1 = *not at all important* to 5 = *extremely important*. Data from round two were analyzed and the top 75% of answers were retained for round three, defined *ex post facto* as having a mean greater than 3.50. The exclusion criteria helped to reduce attrition in the final round due to survey length.

During round three, North Carolina extension respondents were asked to determine if the presented competencies should be prioritized. Respondents answered either “yes” or “no” to the following prompt: “Please indicate whether or not you believe the following communication competencies for extension professionals should be prioritized.” Response rates were calculated for each Delphi round and are displayed in Table 1.

Table 1*Delphi Panel Response Rates*

Delphi Round	NC Extension Experts (n, invited)	NC Extension Experts Panel Response Rate %	National Agricultural Communication Faculty (n, invited)	National Agricultural Communication Faculty Response Rate %
Round 1	41	82.93	49	57.14
Round 2	38	68.42	--	--
Round 3	38	60.53	--	--

Data Analysis

Data for each round were analyzed using SPSS v25. Items generated in round one were consolidated, removing duplicate items, resulting in 84 items retained for round two. During round two, mean importance scores were calculated for each competency (Hasson et al., 2000), with the bottom 25% of items removed for round three (defined *ex post facto* as having a mean less than 3.50). A total of 62 competencies were retained for round three. A consensus threshold of 65% was determined *a priori* based on the literature (Williams & Webb, 1994). A total of 59 responses met the 65% consensus criteria for inclusion in the final response list. The final 59 responses were thematically analyzed for commonalities and final data consolidation and organization by the primary author. Thematic analysis is a descriptive qualitative data segmentation approach to coalesce written or textual data into similar patterns or themes (Ayres, 2008). The primary author used peer debriefing strategies with the other authors and an external scholar to enhance the trustworthiness of the final response categories.

Results

The initial round of the Delphi resulted in 171 unique responses for needed extension communication capacities, with 85 items retained for round two based on categorical similarities (Table 2). Top capacities for North Carolina Extension professionals included active listening ($M = 4.71$), trust building ($M = 4.71$), being ethical ($M = 4.67$), communicating information clearly ($M = 4.58$), communicating/translating complex issues and research in easily understandable language ($M = 4.54$), critical thinking ($M = 4.42$), interpersonal communication ($M = 4.38$), verbal communication ($M = 4.38$), eliciting information/asking questions ($M = 4.33$), and engaging (inc. multi-way dialogue facilitation/two-way communication; $M = 4.33$).

Table 2

Delphi Round 2 Results: Level of Importance for Communication Capacities for Extension Professionals

Competency Identified in R1	Not at all Important	Somewhat Important	Important	Very Important	Extremely Important	Mean (SD)
Active listening	0	0	0	7	17	4.71 (.464)
Trust building ^a	0	0	0	7	17	4.71 (.464)
Being ethical ^a	0	0	2	4	18	4.67 (.637)
Communicating information clearly	0	0	0	10	14	4.58 (.504)
Communicating/translating complex issues and research in easily understandable language	0	0	0	11	13	4.54 (.509)
Critical thinking ^a	0	1	1	9	13	4.42 (.776)
Interpersonal communication	0	0	1	13	10	4.38 (.576)
Verbal communication	0	0	2	11	11	4.38 (.647)
Eliciting information/asking questions	0	0	2	12	10	4.33 (.637)
Engaging (ex. Multi-way dialogue facilitation, two-way communication)	0	0	2	12	10	4.33 (.637)
Sharing science with the public, press, funders, and extension clients	1	0	0	12	11	4.33 (.868)
Adaptability	0	0	3	11	10	4.29 (.690)
Relationship building ^a	0	1	3	8	12	4.29 (.859)
Cultural competence/awareness	0	0	3	11	10	4.29 (.690)
Communicating impact of programming to county residents/commissioners	0	0	5	7	11	4.26 (.810)
Subject matter knowledge	0	1	3	8	11	4.26 (.864)

Competency Identified in R1	Not at all Important	Somewhat Important	Important	Very Important	Extremely Important	Mean (SD)
Self-awareness	0	1	3	9	11	4.25 (.847)
Public speaking	0	1	3	9	11	4.25 (.847)
Oral communication	0	0	5	9	10	4.21 (.779)
Identifying a problem or concern	0	1	4	9	10	4.17 (.868)
Customer service	0	1	3	10	9	4.17 (.834)
Collaborative	0	1	3	12	8	4.13 (.797)
Presentations	0	1	5	8	9	4.09 (.900)
Empathy	0	0	4	14	6	4.08 (.654)
Professionalism ^a	0	1	5	9	9	4.08 (.881)
Timely and relevant message development	0	0	6	10	8	4.08 (.776)
Communicating stakeholder needs to higher ups (at county or state level)	0	1	6	8	8	4.00 (.905)
Intercultural/culture-centered communication ^a	0	0	8	9	7	3.96 (.806)
Promoting extension services and programs	0	3	4	7	9	3.96 (1.065)
One-on-one conversational communication	0	0	9	8	7	3.92 (.830)
Email	0	1	6	12	5	3.88 (.797)
Community-centered communication ^a	0	1	7	10	6	3.87 (.850)
Communicate common goals	0	1	7	9	6	3.87 (.869)
Identifying client needs and gaps in research ^a	1	2	2	11	6	3.86 (1.082)
Flexibility	0	1	4	9	10	3.83 (.816)

Competency Identified in R1	Not at all Important	Somewhat Important	Important	Very Important	Extremely Important	Mean (SD)
Designing appropriate and effective messages	0	1	8	9	6	3.83 (.868)
Grammar	0	4	5	7	8	3.79 (1.103)
Written communication	0	1	8	10	5	3.79 (.833)
Demonstration skills	0	3	4	11	5	3.78 (.951)
Maintaining a relationship with research faculty to stay current in the field	0	3	5	9	6	3.78 (.998)
Digital Communication	0	1	7	13	3	3.75 (.737)
Audience/stakeholder analysis	0	2	8	8	6	3.75 (.944)
Media literacy ^a	0	4	4	9	6	3.74 (1.054)
Accommodating language differences (ex. Spanish vs. English) ^a	0	2	10	5	7	3.71 (.999)
Critically analyze communication messages	0	0	10	11	3	3.71 (.690)
Information literacy ^a	0	2	7	10	4	3.70 (0.876)
Communicating about controversial topics	1	1	6	12	3	3.65 (.935)
Needs assessment ^a	1	2	7	7	6	3.65 (1.112)
Explanatory writing	0	3	8	8	5	3.63 (.970)
Writing skills	0	4	6	9	5	3.63 (1.013)
Storytelling	1	2	6	11	4	3.63 (1.013)
Audience segmentation (ex. Developing messages for specific audiences)	0	3	7	10	4	3.63 (.924)
Writing for diverse audiences	0	3	7	10	4	3.62 (.924)

Competency Identified in R1	Not at all Important	Somewhat Important	Important	Very Important	Extremely Important	Mean (SD)
Strategic communication	0	2	9	9	4	3.62 (.875)
Writing for different platforms/formats (ex. Web, infographics) ^a	0	5	6	7	6	3.58 (1.100)
English speaking proficiency	0	2	12	4	6	3.58 (.974)
Intergenerational communication	0	3	8	9	4	3.58 (.929)
Conflict management/resolution	1	2	7	9	4	3.57 (1.037)
Risk communication	0	5	6	6	6	3.57 (1.121)
Technical communication ^a	0	3	7	11	2	3.52 (.846)
Public relations (including media relations) ^b	1	4	5	9	4	3.48 (1.123)
Evaluation skills ^b	1	3	8	7	4	3.43 (1.08)
Non-verbal communication ^b	1	3	9	5	5	3.43 (1.121)
Business communication (ex. reports) ^b	0	5	7	9	3	3.42 (.974)
Marketing and branding ^b	1	5	6	7	5	3.42 (1.176)
Crisis communication ^b	0	5	6	10	2	3.39 (.941)
Educational writing ^b	0	5	8	9	2	3.33 (.917)
Measuring impact of social media efforts, return on investment ^b	1	4	9	6	3	3.26 (1.054)
Persuasion and influence ^b	0	3	12	7	1	3.26 (.752)
Social media ^b	1	4	9	8	2	3.25 (.989)
Visual communication ^b	0	5	9	9	1	3.25 (.847)
Web ^b	0	7	8	5	4	3.25 (1.073)

Competency Identified in R1	Not at all Important	Somewhat Important	Important	Very Important	Extremely Important	Mean (SD)
Framing ^b	2	3	11	6	2	3.13 (1.035)
Data visualization ^b	0	6	11	5	2	3.12 (.900)
Technical/Software proficiency ^b	0	8	7	9	0	3.04 (.859)
Writing for publication ^b	1	5	12	5	1	3.00 (.885)
Event planning ^b	2	6	9	4	2	2.91 (1.083)
Developing a marketing plan ^b	2	6	10	5	1	2.88 (.992)
Newsletter development ^b	2	8	9	3	2	2.79 (1.062)
Graphic design ^b	2	12	6	4	0	2.50 (.885)
Use of AI technologies in writing ^b	6	6	8	4	0	2.42 (1.060)
Video production and editing ^b	5	10	4	5	0	2.38 (1.056)
Layout/design skills ^b	4	11	6	3	0	2.33 (.917)

Note. ^aIdentified only by National Agricultural Communication Faculty in R1; ^bExcluded from R3, fell within bottom 25% of responses.

For round three, respondents provided binary response items (“yes” or “no”) to determine which competencies could receive consensus (Table 3). For the final competencies, 59 items were retained from round three, having met the 65% agreement *a priori* threshold criteria. *Communicating information clearly* received 100% consensus from the North Carolina Extension experts. Three competencies, *English-speaking proficiency*, *critically analyze communication messages*, and *one-on-one conversational communication* received less than 65% agreement.

Table 3

Delphi Round Three results: Level of Importance for Communication Capacities for Extension Professionals (N = 22)

Competency	Yes	No
Communicating information clearly (<i>N</i> = 21)	100.0	0.0
Empathy	95.5	4.5
Communicating/translating complex issues and research in easily understandable language (<i>N</i> = 21)	95.2	4.8

Competency	Yes	No
Cultural competence/awareness	90.9	9.1
Engaging (ex. multi-way dialogue facilitation, two-way communication)	90.9	9.1
Intercultural/culture-centered communication	90.9	9.1
Interpersonal communication	90.9	9.1
Trust building	90.9	9.1
Communicating impact of programming to county residents/commissioners ($N = 21$)	90.0	9.5
Conflict management/resolution ($N = 21$)	90.0	9.5
Adaptability	86.4	13.6
Being ethical	86.4	13.6
Eliciting information/asking questions	86.4	13.6
Relationship building	86.4	13.6
Self-awareness	86.4	13.6
Written communication	86.4	13.6
Digital communication	86.4	13.6
Presentations	86.4	13.6
Public speaking	86.4	13.6
Intergenerational communication ($N = 21$)	85.7	14.3
Sharing science with the public, press, funders, and extension clients ($N = 21$)	85.7	14.3
Timely and relevant message development ($N = 21$)	85.7	14.3
Demonstration skills ($N = 21$)	85.7	14.3
Identifying client needs and gaps in research ($N = 21$)	85.7	14.3
Promoting extension services and programs ($N = 21$)	85.7	14.3
Subject matter knowledge ($N = 21$)	85.7	14.3
Accommodating language differences (ex. Spanish v. English)	81.9	18.2
Active listening	81.9	18.2
Critical thinking	81.9	18.2
Identifying a problem or concern	81.9	18.2
Writing skills	81.9	18.2
Oral communication	81.9	18.2
Verbal communication	81.9	18.2
Audience segmentation ($N = 21$)	81.0	19.0
Designing appropriate and effective messages ($N = 21$)	81.0	19.0
Strategic communication ($N = 21$)	81.0	19.0
Communicate common goals ($N = 21$)	81.0	19.0
Maintaining a relationship with research faculty to stay current in the field ($N = 21$)	81.0	19.0
Communicating about controversial topics ($N = 21$)	81.0	19.0
Media literacy ($N = 21$)	81.0	19.0
Collaborative(a)	77.3	22.7
Community-centered communication	77.3	22.7

Competency	Yes	No
Flexibility	77.3	22.7
Audience/stakeholder analysis ($N = 21$)	76.2	23.8
Communicating stakeholder needs to higher ups (at county or state level) ($N = 21$)	76.2	23.8
Technical communication ($N = 21$)	76.2	23.8
Information literacy ($N = 21$)	76.2	23.8
Risk communication ($N = 21$)	76.2	23.8
Writing for diverse audiences	72.7	27.3
Grammar	72.7	27.3
Writing for different platforms/formats (ex. Web, infographics)	72.7	27.3
Storytelling ($N = 21$)	71.4	28.6
Customer service ($N = 21$)	71.4	28.6
Needs assessment ($N = 21$)	71.4	28.6
Professionalism	68.2	31.8
Email	68.2	31.8
English-speaking proficiency ($N = 21$)	57.1	42.9
Critically analyze communication messages ($N = 21$)	57.1	42.9
One-on-one conversational communication	54.5	40.9

Following round three, all competencies were thematically heuristically analyzed using the constant comparative method. Table 4 provides the thematic codes for the 59 retained competencies.

Table 4

Thematic Groupings for 59 Retained Competencies by North Carolina Extension Experts

Competency	Number of Competencies	Number of Competencies with 90 to 100% Agreement
<i>Interpersonal</i>	14	5
Active listening		
Adaptability		
Being ethical		
Collaborative		
Conflict management/resolution ^a		
Eliciting information/asking questions		
Empathy ^a		
Engaging (ex. multi-way dialogue facilitation, two-way communication) ^a		
Flexibility		
Identifying a problem or concern		
Interpersonal communication ^a		

Competency	Number of Competencies	Number of Competencies with 90 to 100% Agreement
Professionalism		
Relationship building		
Trust building ^a		
Cultural Competence	5	2
Accommodating language differences (ex. Spanish v. English)		
Community-centered communication		
Cultural competence/awareness ^a		
Intercultural/culture-centered communication ^a		
Writing for diverse audiences		
Science Communication	5	2
Communicating about controversial topics		
Communicating information clearly ^a		
Communicating/translating complex issues and research in easily understandable language ^a		
Risk communication		
Sharing science with the public, press, funders, and extension clients		
Extension-specific skills/Organizational Communication	10	1
Communicate common goals		
Communicating stakeholder needs to higher ups (at county or state level)		
Communicating impact of programming to county residents/commissioners ^a		
Customer service		
Demonstration skills		
Identifying client needs and gaps in research		
Maintaining a relationship with research faculty to stay current in the field		
Promoting extension services and programs		
Subject matter knowledge		
Technical communication		
Written Communication	6	0
Digital communication		
Email		
Grammar		
Written communication		
Writing for different platforms/formats (ex. Web, infographics)		

Competency	Number of Competencies	Number of Competencies with 90 to 100% Agreement
Writing skills		
Cross-Cutting Competencies	5	0
Information literacy		
Media literacy		
Self-awareness		
Critical thinking		
Needs assessment		
Oral Communication	4	0
Oral communication		
Presentations		
Public speaking		
Verbal communication		
Strategic Communication	4	0
Designing appropriate and effective messages		
Storytelling		
Strategic communication		
Timely and relevant message development		
Audience-centric Communication	3	0
Audience/stakeholder analysis		
Audience segmentation		
Intergenerational communication		

Note. ^aReceived greater than 90% agreement.

The largest thematic grouping included interpersonal communication competencies, with five competencies receiving greater than or equal to 90% agreement (*conflict management/resolution, empathy, engaging [ex. multi-way dialogue facilitation, two-way communication], interpersonal communication, and trust building*). The grouping with the second most number of items receiving greater than or equal to 90% agreement included cultural competence (*cultural competence/awareness and intercultural/culture-centered communication*). The science communication grouping items received 90% agreement on two out of the three items (*communicating information clearly and communicating/translating complex issues and research in easily understandable language*) and contained the only item with 100% consensus from the North Carolina extension experts (*communicating information clearly*).

Discussion

The findings presented above were used to develop an understanding of the specific extension communication competencies North Carolina extension experts felt should be prioritized. In total, 59 competencies were identified within the Delphi process, categorized into

nine thematic groupings. This represents a critical consolidation, as 171 unique responses were identified in round one, indicating a diversity of priorities and perceptions around this topic from practitioner, administrative, and academic perspectives. From a final list of 59 priority competencies, three priority areas were identified based on the thematic coding of those competencies: *interpersonal communication*, *cultural competence*, and *science communication*. While these categories comprise the baseline vision for North Carolina extension communication capacity development programs, the 59 competencies organized across the three categories provide detailed items to guide evaluation and measurement of the eventual program efficacy.

Interpersonal communication, which had the highest number of competencies and the greatest number of competencies with more than 90% agreement, is a foundation of the extension system. According to Seevers and Graham (2012), Cooperative Extension “provides services to all people without discrimination... the people with whom it works are of supreme importance” (p. 4). Thus, the importance both academic and practitioner experts placed on the value of interpersonal communication is consistent with the founding mission of the organization.

Cultural competence is a concept gaining increased attention across national extension services, motivated by the need to meet the needs of increasingly diverse audiences (Diaz et al., 2023). Recent scholarship has emphasized the critical importance of cultural diversity in university-community engagement efforts like extension (Atilas, 2019). Universities and related institutions often do not maintain the same cultural value systems as their surrounding communities (Atilas, 2019); however, extension professionals can act as a cultural bridge due to their living and working within communities and likelihood of sharing sociocultural values with clientele. Working within homogenous communities, or communities that reflect the cultural background of the agent can be easier, however, than working in heterogenous and diverse communities. In recent decades, extension services have invested considerable time and resources into preparing extension professionals to be more culturally competent, including recognizing how different communities interact with scientific information as well as highlighting the importance of extension agent’s cultural self-awareness (Atilas, 2019; Diaz, Gusto, Jayaratne, et al., 2023; Diaz, Gusto, Narine, et al., 2023). The prioritization of cultural competence by North Carolina extension professionals indicates the importance of continuing to expand this work, and is supported by national scholarship (Diaz, Gusto, Jayaratne, et al., 2023).

Finally, *science communication* was the competency with the third largest percent agreement. Extension aims to provide research-based information in partnership with research initiatives at the land-grant university system (Seevers & Graham, 2012), making it an organization grounded in the communication of scientific information. North Carolina extension expert respondents underscored the importance of science communication by achieving 100% consensus on the item *communicating information clearly*. Previous studies have highlighted the importance, and expectation, of extension professionals engaging in science communication efforts, while also indicating this is an area of needed research (McLeod-Morin et al., 2020). The current study supports the need for increased exploration into the science communication capacities of extension practitioners, especially specialists and agents, to determine needed training opportunities to expand on this identified priority. Both cultural competence and science communication are of critical and intersectional importance, because different communities have been impacted in various ways by science; thus, navigating the science communication landscape with empathy and cultural sensitivity remains a needed competency for extension professionals (Atilas, 2019).

Limitations

Limitations of the current research should be considered in relation to the interpretation of results. First, there was a lower than ideal response rate from North Carolina extension experts in rounds two and three (68% and 61% respectively) and a relatively low response rate from national academic experts in round one (57%). Recommendations in the literature identify 70% response rate as acceptable (Keeney et al., 2011); however, this threshold was unattainable for the current study, despite adherence to the Dillman et al. (2014) method and relying on personal professional connections, through the form of individualized email reminders, to encourage responses. For future studies, the authors recommend using an even smaller sample (less than 30 respondents) comprised of individual experts who are brought into the area of interest of the Delphi study. While we took a broader approach to have a variety of stakeholders included in the sample, some respondents might not have seen themselves as a valuable voice for the topic of extension communication; thus, whittling down the sample to a smaller list of directly involved stakeholders may increase the response rate as well as the sheer number of raw responses received through the round one Delphi process. While the authors attempted to follow Skinner et al.'s (2015) recommendation of keeping the sample small, results indicate that a sample of greater than 40 respondents might not include the most relevant individuals to answer the research questions or generate an ideal response rate.

An additional limitation includes the fact that the authors did not collect demographic responses from Delphi respondents; thus, they were unable to discern differences between responses based on demographics (including race/ethnicity, gender, and age). Because of the anonymous data collection method, while the authors knew the program area of invited respondents, they did not see if responses differed across program area/role. This may play a role in the implementation of the eventual program development models created from the results and the uptake of the program resources by extension agents, depending on various demographics and program areas.

A final limitation includes categorizing responses between rounds one and two to reduce respondent cognitive load. While the need to reduce cognitive load was important to reduce respondent attrition mid-way through the survey (something observed with a few respondents in the current study), the groupings within the survey interface could have potentially biased respondents' interpretation of whether a competency should be a priority. Having a smaller sample size at the outset may help resolve this issue, as fewer respondents would provide a smaller initial response list, limiting the degree to which categorization in subsequent survey rounds is needed.

Implications for Practice and Future Research

The results of the Delphi provide needed input and direction for an emerging extension communication program in North Carolina. Based on the top five competencies identified by North Carolina extension professionals, the emerging program is centering science communication by creating a series of online training modules introducing extension agents (as well as program educators) on the basics of science communication. Threaded through the training modules is how to communicate with diverse audiences (*cultural competence/awareness*) in participatory manners (*engaging [ex. multi-way dialogue facilitation,*

two-way communication]). Emphasis is also placed on the importance of trust and relationship building, which received 90.9% agreement and 86.4% agreement respectively from North Carolina extension experts.

As new extension programs emerge nationally, especially those related to communication, Delphi studies can provide needed direction from an evidence-based perspective for new specialists. As an illustrative example, the lead author, when starting her position as a new communication specialist at NC State Extension, assumed that identified needs for communication for extension professionals would be more skills-based and technical, such as graphic design, software proficiency, and social media, as outlined in the academic agricultural communication competency literature (Corder & Irlbeck, 2018; Leal et al., 2020). However, consistent with emerging literature on the competencies desired of agricultural communication graduates, many important and prioritized competencies are in the realm of interpersonal communication as well as character-based competencies, such as ethics, responsibility, and trustworthiness (Corder & Irlbeck, 2018). Thus, the direction of the emerging North Carolina extension communication program has taken a drastically different direction, and one that correlates more strongly with the lead author's training, than was originally anticipated.

Future research emerging from this study will include an agent-focused needs assessment, looking at their perceived self-efficacy for the priorities identified by the North Carolina extension expert group. This needs assessment will be focused on the intended audience of future extension training, the agents and educators working across North Carolina communities, providing a nuanced perspective on any potential gaps between extension expert priorities and agents' self-perceived capacity to implement these competencies. Additionally, many respondents in the extension expert group work at the university level; an agent-focused needs assessment will allow for emergent, community-based needs agents identify as important in their daily extension activities. In this way, the Delphi and future needs assessment will provide a comprehensive direction for iterative program development; one that should be revisited as new and emerging communication technologies and issues, such as artificial intelligence, complexify the extension and communication landscape.

References

- Argabright, K., McGuire, J., & King, J. (2012). Extension through a new lens: Creativity and innovation now and for the future. *The Journal of Extension*, 50(2). <https://tigerprints.clemson.edu/joe/vol50/iss2/39>
- Atiles, J. H. (2019). Cooperative Extension competencies for the community engagement professional. *Journal of Higher Education Outreach and Engagement*, 23(1), 107–127. <https://openjournals.libs.uga.edu/jheoe/article/view/1431>
- Beattie, P., Benge, M., Telg, R., & Lundy, L. (2022). Assessing Florida early career extension faculty's adoption of design principles to communicate messages. *Journal of Applied Communications*, 106(3). <https://doi.org/10.4148/1051-0834.2425>
- Berven, B., Franck, K., & Hastings, S. (2020). Investing in extension's workforce: Assessing and developing critical competencies of new agents. *The Journal of Extension*, 58(2). <https://tigerprints.clemson.edu/joe/vol58/iss2/28>
- Borden, D. S., Shaw, G., & Coles, T. (2017). Consensus building in social marketing campaigns through the Delphi method. *Social Marketing Quarterly*, 23(4), 354–367. <https://doi.org/10.1177/1524500417732772>

- Bowman, B., Settle, Q., North, E., & Lewis, K. (2018). Comparison of extension personnel and supervisor perceptions of communications activities. *Journal of Applied Communications*, 102(4). <https://doi.org/10.4148/1051-0834.2229>
- Briggs, R. O., Kolfshoten, G. L., & de Vreede, G.-J. (2005). *Toward a theoretical model of consensus building*. [Conference Presentation]. Americas Conference on Information Systems, AMCIS, Omaha, NE.
- Brown, V., Bowie, M., Bales, D., Scheyett, A., Thomas, R., & Cook, G. (2023). Cooperative Extension offices as mental health hubs: A social ecological case study in rural Georgia, United States. *SSM - Mental Health*, 3, 100191. <https://doi.org/10.1016/j.ssmmh.2023.100191>
- Caldwell, C. D. (2005). *Identification of strategic communication competencies for county Extension educators: A Delphi study* [Doctoral dissertation, The Ohio State University]. <https://www.proquest.com/docview/305429288/abstract/B1DD070ADDC34DC2PQ/1>
- Clem, C. A. (2013). *Exploring the competencies, skills, and abilities needed by agricultural communications students: A Delphi study*. [Doctoral dissertation, Texas Tech University]. <https://ttu-ir.tdl.org/handle/2346/58458>
- Corder, J., & Irlbeck, E. (2018). Agricultural communications skills, abilities and knowledge desired by employers compared to current curriculum: A literary review. *Journal of Agricultural Education*, 59(4), 177–193. <https://doi.org/10.5032/jae.2018.04177>
- Costello, L., & Rutherford, T. (2019). Expert? What does that mean? Describing the term “expert” in agricultural communications, education, extension, and leadership research. *Journal of Applied Communications*, 103(1). <https://doi.org/10.4148/1051-0834.2211>
- Cummings, S., & Silliman, B. (2019). Where do we go from here?: Credible and actionable evidence in extension. *Journal of Human Sciences and Extension*, 7(2). <https://doi.org/10.54718/NCRU8603>
- Dalkey, N. C. (1969). *The Delphi Method: An experimental study of group opinion*. RAND Corporation. https://www.rand.org/pubs/research_memoranda/RM5888.html
- Dalkey, N., & Helmer, O. (1963). An experimental application of the Delphi method to the use of experts. *Management Science*, 9(3), 458–467. <https://doi.org/10.1287/mnsc.9.3.458>
- Diaz, J. M., Gusto, C., Jayaratne, K. S. U., Narine, L., Silvert, C., Suarez, C., & Wille, C. (2023). Intercultural competency development model for extension professionals: Expert consensus using the Delphi technique. *The Journal of Extension*, 61(3), Article 2. <https://doi.org/10.34068/joe.61.03.02>
- Diaz, J. M., Jayaratne, K. S. U., & Kumar Chaudhary, A. (2020). Evaluation competencies and challenges faced by early career extension professionals: Developing a competency model through consensus building. *The Journal of Agricultural Education and Extension*, 26(2), 183–201. <https://doi.org/10.1080/1389224X.2019.1671204>
- Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed mode surveys: The tailored design method, 4th ed* (pp. xvii, 509). John Wiley & Sons Inc.
- Edgar, L. D., Edgar, D. W., McGuire, A., Rutherford, T. A., Doerfert, D. L., & Murphrey, T. P. (2012). Crisis communication needs assessment: A Delphi study to enhance instruction for agricultural communicators and other stakeholders. *NACTA Journal*, 56(4), 52–62. <https://www.jstor.org/stable/10.2307/nactajournal.56.4.52>
- Evans, J., & Heiberger, S. (2015). Fitting farm safety into risk communications teaching, research, and practice. *Journal of Applied Communications*, 99(3). <https://doi.org/10.4148/1051-0834.1060>

- Fan, C. K., & Cheng, C.-L. (2006). A study to identify the training needs of life insurance sales representatives in Taiwan using the Delphi approach. *International Journal of Training and Development*, 10(3), 212–226. <https://doi.org/10.1111/j.1468-2419.2006.00255.x>
- Fortner, A., Lamm, A., Borron, A., Holt, J., & Moore, A. (2022). Exploring source credibility when communicating about agricultural science on Twitter. *Journal of Applied Communications*, 106(3). <https://doi.org/10.4148/1051-0834.2436>
- Gangani, N., McLean, G. N., & Braden, R. A. (2006). A competency-based human resource development strategy. *Performance Improvement Quarterly*, 19(1), 127–139. <https://doi.org/10.1111/j.1937-8327.2006.tb00361.x>
- Habibi, A., Sarafrazi, A., & Izadyar, S. (2014). Delphi technique theoretical framework in qualitative research. *International Journal of Engineering and Science*, 3(4), 8–13.
- Hains, K., Young, J., Reinhard, A., & Hains, B. (2021). Reconsidering extension: Defining urban extension in Kentucky. *Journal of Human Sciences and Extension*, 9(2). <https://doi.org/10.54718/CPUU8372>
- Harder, A., & Narine, L. (2020). Personal health, role, and time management competency training needs of extension agents in Florida. *The Journal of Extension*, 58(1). <https://tigerprints.clemson.edu/joe/vol58/iss1/19>
- Harder, A., Place, N., & Scheer, S. (2010). Towards a competency-based extension education curriculum: A Delphi study. *Journal of Agricultural Education*, 51(3), 44–52. <https://doi.org/10.5032/jae.2010.03044>
- Harvard Law School. (2023, December 12). *Consensus building*. PON - Program on Negotiation at Harvard Law School. <https://www.pon.harvard.edu/tag/consensus-building/>
- Hasson, F., Keeney, S., & McKenna, H. (2000). Research guidelines for the Delphi survey technique. *Journal of Advanced Nursing*, 32(4), 1008–1015. <https://doi.org/10.1046/j.1365-2648.2000.t01-1-01567.x>
- Innes, J. E., & Booher, D. E. (1999a). Consensus building and complex adaptive systems. *Journal of the American Planning Association*, 65(4), 412–423. <https://doi.org/10.1080/01944369908976071>
- Innes, J. E., & Booher, D. E. (1999b). Consensus building as role playing and bricolage. *Journal of the American Planning Association*, 65(1), 9–26. <https://doi.org/10.1080/01944369908976031>
- Jernigan, H., Edgar, L. D., Miller, J. D., & Cox, C. K. (2015). Communication technology training beyond the university campus: A case study of skill development in the Arkansas Cooperative Extension Service. *NACTA Journal*, 59(2), 122–129.
- Kalauni, D., Warner, L. A., Silvert, C. J., Gusto, C., Diaz, J. M., & Daniels, J. (2023). Green industry experts' consensus about wildlife-friendly landscape maintenance: Delphi-informed implications for agricultural and extension educators. *Journal of Agricultural Education*, 64(3), 109-134. <https://doi.org/10.5032/jae.v64i3.115>
- Keeney, S., McKenna, H., & Hasson, F. (2011). *The Delphi technique in nursing and health research*. Wiley. <https://www.wiley.com/en-us/The+Delphi+Technique+in+Nursing+and+Health+Research-p-9781405187541>
- Kiessling, C., Dieterich, A., Fabry, G., Hölzer, H., Langewitz, W., Mühlhlinghaus, I., Pruskil, S., Scheffer, S., & Schubert, S. (2010). Communication and social competencies in medical education in German-speaking countries: The Basel Consensus Statement: Results of a Delphi survey. *Patient Education and Counseling*, 81(2), 259–266. <https://doi.org/10.1016/j.pec.2010.01.017>

- Koundinya, V., Baird, A., Klink, J., Wolfson, L., Frankenberger, J., Bonnell, J., & Power, R. (2018). Core competencies for successful watershed management practitioners. *The Journal of Extension*, 56(1). <https://tigerprints.clemson.edu/joe/vol56/iss1/12>
- Kurtzo, F., Edgar, L., Edgar, D., Graham, D., & Russell, M. (2019). Exploring communication tendencies of program facilitators. *Journal of Applied Communications*, 103(1). <https://doi.org/10.4148/1051-0834.1415>
- Lamm, A. J., Carter, H. S., Settle, Q., & Odera, E. (2016). The influence of problem solving style on team dynamics when building consensus. *Journal of Human Sciences and Extension*, 4(1), Article 2. <https://doi.org/10.54718/EMHV5968>
- Lamm, K., Lamm, A., Davis, K., & Bommidi, J. S. (2017). Identifying knowledge management capacity needs of rural advisory service networks. *Journal of International Agricultural and Extension Education*, 24, 93–106. <https://doi.org/10.5191/jiaee.2017.24207>
- Lamm, K., Powell, A., & Lombardini, L. (2021). Identifying critical issues in the horticulture industry: A Delphi analysis during the COVID-19 pandemic. *Horticulturae*, 7(11), Article 11. <https://doi.org/10.3390/horticulturae7110416>
- Lamm, K., Sapp, R., & Lamm, A. (2018). Organizational change in the land-grant system: A qualitative evaluation. *Journal of Agricultural Education*, 59(1), 204–222. <https://doi.org/10.5032/jae.2018.01204>
- Lamm, K. W., Lamm, A. J., & Swaroop, B. J. (2018). Effective advocacy for extension networks: An evaluation of critical capacities. *Journal of International Agricultural and Extension Education*, 25(2), 43–56. <http://dx.doi.org/10.5191/jiaee.2018.25204>
- Lamm, K. W., Pike, L., Griffeth, L., Park, J., & Idun, A. (2023). Critical issues facing the agriculture, forestry, and natural resources industries in the state of Georgia. *Agriculture*, 13(6), Article 6. <https://doi.org/10.3390/agriculture13061194>
- Lamm, K. W., Randall, N. L., & Diez-Gonzalez, F. (2021). Critical food safety issues facing the food industry: A Delphi analysis. *Journal of Food Protection*, 84(4), 680–687. <https://doi.org/10.4315/JFP-20-372>
- Lamm, K. W., Randall, N., Lamm, A. J., & Sapp, L. R. (2021). Extension organizational strengths: A Delphi analysis. *Journal of Agricultural Education*, 62(2), 53–65. <https://doi.org/10.5032/jae.2021.02053>
- Leal, A., Lawson, K., Telg, R., Rumble, J., Stedman, N., & Treise, D. (2020). Technically speaking: Technical skills needed for agricultural communication baccalaureate graduates. *Journal of Applied Communications*, 104(3). <https://doi.org/10.4148/1051-0834.2339>
- Liles, R. T., & Mustian, R. D. (2004). Core competencies: A systems approach for training and organizational development in extension. *The Journal of Agricultural Education and Extension*, 10(2), 77–82. <https://doi.org/10.1080/13892240485300121>
- Lucia, A. D., & Lepsinger, R. (1999). *The art and science of competency models: Pinpointing critical success factors in organizations* (1st ed.). Pfeiffer.
- Ludwig, B. G., & Barrick, R. K. (1996). Internationalization of extension: What does it mean? *Journal of Agricultural Education*, 37(2), 40–46. <https://doi.org/10.5032/jae.1996.02040>
- McLeod-Morin, A., Telg, R., & Rumble, J. (2020). Describing interdisciplinary agricultural research center directors' perceptions of science communication through goals and beliefs. *Journal of Applied Communications*, 104(1). <https://doi.org/10.4148/1051-0834.2300>
- Morgan, A. C. (2010). Competencies needed by agricultural communication graduates: An industry perspective. *Journal of Applied Communications*, 94(1). <https://doi.org/10.4148/1051-0834.1184>

- Morgan, A. C., King, D. L., Rudd, R. D., & Kaufman, E. K. (2013). Elements of an undergraduate agricultural leadership program: A Delphi study. *Journal of Leadership Education*, 12(1). <https://doi.org/10.12806/V12/I1/R10>
- Nyamweru, J. C., Ndayitwayeko, W. M., Kessler, A., & Biemans, H. (2023). Fostering sustainable agriculture in Burundi: Which competencies for change-agents should vocational agriculture education prioritize? *The Journal of Agricultural Education and Extension*, 0(0), 1–21. <https://doi.org/10.1080/1389224X.2023.2205395>
- Powell, A., Scaduto, J., & Lamm, K. (2021). Perceived strengths of the Georgia 4-H Program: A Delphi analysis. *Journal of Human Sciences and Extension*, 9(3), Article 3. <https://doi.org/10.54718/PZTF2977>
- Ruemenapp, M. (2017). America's changing urban landscape: Positioning extension for success. *Journal of Human Sciences and Extension*, 5(2). <https://doi.org/10.54718/SHDR3948>
- Seevers, B., & Graham, D. (2012). *Education through Cooperative Extension* (3rd ed.). Thomson Delmar Learning.
- Senge, P. M. (2006). *The fifth discipline: The art and practice of the learning organization*. Doubleday/Currency.
- Shimali, F., Najjingo Mangheni, M., & Kabahenda, M. (2021). Nutrition education competencies of agricultural extension workers in Uganda. *The Journal of Agricultural Education and Extension*, 27(4), 535–552. <https://doi.org/10.1080/1389224X.2021.1880451>
- Sitlington, H., & Coetzer, A. (2015). Using the Delphi technique to support curriculum development. *Education + Training*, 57(3), 306–321. <https://doi.org/10.1108/ET-02-2014-0010>
- SunWolf, & Seibold, D. R. (1999). The impact of formal procedures on group processes, members and task outcomes. In L. R. Frey (Ed.), D. S. Gouran, & M. S. Poole (Assoc. Eds.), *The handbook of group communication theory and research* (pp. 395–431). Sage.
- Vernon, W. (2009). The Delphi technique: A review. *International Journal of Therapy and Rehabilitation*, 16(2), 69–76. <https://doi.org/10.12968/ijtr.2009.16.2.38892>
- Warner, L., Stubbs, E., Murphrey, T., & Huynh, P. (2016). Identification of the competencies needed to apply social marketing to extension programming: Results of a Delphi study. *Journal of Agricultural Education*, 57(2), 14–32. <https://doi.org/10.5032/jae.2016.02014>
- Williams, P. L., & Webb, C. (1994). The Delphi technique: A methodological discussion. *Journal of Advanced Nursing*, 19(1), 180–186. <https://doi.org/10.1111/j.1365-2648.1994.tb01066.x>