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Extension agents are a valuable source of information within their communities throughout the world. Tasked with sharing research-based information from the universities and serving as the land-grant university within their communities, agents are the face and voice of the university on daily basis. However, this research sought to determine how confident new agents in Georgia were in their ability to effectively communicate within their communities before and after attending a communication workshop. Using a retrospective pre- and post-test survey, the results indicated the agents were most confident in their abilities create high-quality promotional videos and write Public Service Announcements for radio after the training. The results indicated agents were least confident in their abilities to utilize the Extension data base and write effectively. Overall, the results indicated in increase in agents' perceived ability to effectively communicate in their communities after attending the training. Additionally, the results provide direction for future training and workshops to better prepare agents to effectively communicate information from land-grant universities to their communities and the world.

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Introduction

Effective communication is an essential skill for Extension agents as they fill the communication gap between researchers and the community (Gibson, 1994). Serving as university faculty members within their communities, agents are tasked with informing all stakeholders; including, the public, farmers, and community opinion leaders about the importance of topics like soil quality, locally-sourced produce, water conservation, family health, food safety, and the like (Brown, 2003), while being responsive to a community's needs as issues arise (Campbell, 1998).

Communication related to science and technology information have become growing and nebulous issues for the public (National Academy of Sciences, 2017). The public has been inundated with information from medical issues related to vaccinations, medication, and obesity, to food safety regulations, changing climates, water scarcity, and the like from a variety of sources (Davis, Irani, & Payson, 2004; National Academy of Sciences, 2017). Extension agents have the unique role to serve as communication liaisons between researchers at the university and farmers, the public, and legislative bodies. The agricultural knowledge agents share has a global impact on improving food security, reducing poverty, and developing a sustainable agriculture sector (McCole et al., 2014).

Considering Extension agents' role, the task of balancing the science developed at research institutions with community needs requires agents to effectively communicate science-based knowledge (Campbell, 1998; Robinson, 2013). These agents play a vital role in fulfilling the tripartite mission of the land-grant university, and as such, require proper and up-to-date training, specifically in

communication, to effectively share research related in agricultural and environmental science to stakeholders. "Being a member of the Extension Service is about human capacity, constantly engaging in human interaction as agents work to address challenges and issues within their home communities" (Bruce & Anderson, 2012, para. 15).

While the U.S. has 2% of its population involved in agriculture, globally, over a quarter (26.15%) of the 195 countries in the world have at least 40% of their total employment in agriculture, with about 55% of those being lower-middle income to low income (The World Bank, 2018). Socio-economic status, geographical location, language, culture, and access to technology are only a few factors that determine how agriculture impacts communities and how those communities receive information (Annor-Frempong, Kwarteng, Agunga, & Zinnah, 2006; McCole, Culbertson, Suvedi, & McNamara, 2014; Leal, 2017). The growth of the agriculture sector can influence the welfare and development of rural and lower income communities (Annor-Frempong et al., 2006), but many developing countries' infrastructural problems make it challenging for Extension agents to reach them, emphasizing the need for improved communication efforts (McCole et al., 2014).

Bruce and Anderson (2012) found that agents within the first three years of their career indicated communication skills for Extension agents to be of lesser importance than other skills such as human skills, emotional intelligence, and technical skills. The authors indicated this finding was surprising, but noted agents may hold this belief because they associate communication skills with public speaking and not day-to-day interactions. As such, the authors recommended for in-service training to be made available for agents in all proficiency

areas, not just those in the lowest level, as well as establishing an environment of learning throughout an agent's career (Bruce & Anderson, 2012). This echoes Donnellan and Montgomery's (2005) recommendation for Extension to have a more engaged policy for working with the public. Having a communication plan that served the public and accomplished the goals of the organization was seen as an avenue to connect the public with the land-grant institution. Without proper communication training, agents cannot establish an effective communication plan to engage with and serve the needs of the community and its stakeholders.

Additionally, while most agents may have basic communication training, today's agents are faced with answering questions and providing information to citizens about controversial or scientifically ambiguous topics: climate change, GMOs, and the like. Research has shown when communication messages, materials, and conversations are not conveyed appropriately, certain audiences can be isolated due to their personal beliefs or previously held attitudes about an issue (Hart & Nesbit, 2012). As agents are tasked with serving the needs of all citizens, it is important for agents to be able to develop unique, quality, and intentional messages conveying scientifically relevant information for stakeholders without further polarizing, amplifying, or attenuating issues.

The purpose of this research was to understand how a structured communication training workshop for new Extension agents in Georgia impacted their self-perceived ability to effectively communicate and engage with their community.

Literature Review/Conceptual Framework

Social Cognitive Theory

Bandura's (1977; 1986) social cognitive theory, specifically perceived self-efficacy, can play a critical role in how an individual psychologically processes their likelihood of completing a task in a satisfactory manner, based on the amount of effort expenditure needed to complete the task and their ability to persevere through obstacles and/or setbacks. "Not only can perceived self-efficacy have directive influence on choice of activities and settings, but, through expectations of eventual success, it can affect coping efforts once they are initiated" (Bandura, 1977, p. 194). Additionally, Bandura (1977) explained that self-efficacy to complete tasks was enhanced in the event of successful completion with a learned skill, rather than just luck or happenstance.

Furthermore, the stronger an individual's self-efficacy, the more active that individual will be in attaining the end goal. An individual's sense of self-efficacy to complete a task can impact their decision to complete a behavior, dictate the amount of effort expended to complete the behavior, and his/her mental fortitude to persevere to see the behavior completed (Bandura, 1977).

Communicating Agricultural & Environmental Science

Many believe communicating about scientific topics is a simple and non-specialized field; however, communicating science to the public is not the same as educating the public. Science communication is focused on providing information and facts for the public's consideration, not just on knowledge gain (National Academies for Sciences, Engineering, and Medicine, 2017; Robson & Robinson, 2012; Nisbet & Scheufele, 2009).

How the public interprets, utilizes, and organizes that information within the framework of their life is unique to each individual, community, and culture (National Academies for Sciences, Engineering, and Medicine, 2017; Robson & Robinson, 2012). Although topics of interest may differ when crossing boundaries and borders, effective science communication is global, and the need and impact of having trained science communicators is universal (Nisbet & Scheufele, 2009). Agents can increase the reach and scope by competently communicating with the public about research that impacts their communities, solves potential issues, and provides sound knowledge about topics of interest. While Extension agents communicate a variety of information to their communities, they will have instances that rely upon their ability to effectively locate, decipher, and share university and government resources to provide scientifically accurate and relevant information to their constituents (Campbell, 1998; Donnellan & Montgomery, 2005).

The communication role within the Extension system has been evaluated and discussed over the years (Donnellan & Montgomery, 2005; Kern, 1978; Miller, 1995), with recommendations for Extension agents' training to match the evolving agricultural industry and communication pace. Donnellan and Montgomery (2005) discussed the changing role of communication specialists within the Extension system over the years and recommended the inclusion of communication planning and strategies to be implemented in the beginning of all programs and/or initiatives to develop measurable outcomes that can strategically be communicated to the public to demonstrate the impacts on the community. Additionally, the researchers encouraged the mindset of communication to be more in line with a public relations mentality rather

than approaching communication as a journalistic method of sharing the work of Extension (Donnellan & Montgomery, 2005). Communication efforts were recommended to be focused on the needs of the public to understand the information provided through the Extension system, rather than simply reporting on programs and initiatives completed by Extension agents.

Milburn, Mulley, and Kline (2010) stressed the need for the training or retraining of Extension experts in education, interpretation, communication, basic research skills, leadership, and management. Additionally, Milburn et al. (2010) indicated Extension services needed to be more creative in its use of technology and develop more interactive methods for stakeholders to receive information. When communicating about climate change, James, Estwick, and Bryant (2014) emphasized the need for Extensions agents to limit technical jargon and to develop messages that were "simple, concise, accurate, and clear" (p. 4). Robinson (2013) recommended Extension agents utilize applied theory in science communication when warranted. Specifically, the researcher focused on the use of framing as a way to develop content that was customized to stakeholders. Robinson (2013) noted that using relevant frames in science communication took stakeholders' core values and beliefs into consideration, resulting in better acceptance of information.

Empirically, researchers have examined Extension agents' communication needs when interacting with stakeholders. Among several needs identified for Extension agents, Vijayaragavan, Singh, and Wason (2005) found that Extension professionals sought training in communication, creativity management, problem solving and decision making, planning, and information management.

When assessing the communication needs of international and domestic Extension agents, while facilitating discussions about agricultural biotechnology, Davis et al. (2004) found domestic agents were interested in media training and international agents sought additional communication skills training. Some of this research serves as a guide in determining the needed content for Extension training programs, and several researchers have implemented and measured the effectiveness of those efforts (Allen, Huff, Kelly, Bearon, & Behnke, 2014; Garst et al., 2007; Lelekacs, Bloom, Leach, Wymore, & Mitchell, 2016; Vijayaragavan et al., 2005).

Historic Communication Training

Training programs for Extension agents have been shown to increase agents' knowledge and preparedness for handling different situations in their counties (Garst, Hunnings, Jamison, Hairston, & Meadows, 2007). During major budget cuts, Virginia Extension implemented a training program for agents to learn about 4-H youth development. Program benefits included: interacting with experienced agents, interacting with state-level specialists, responsive teaching, providing relevant resources, and understanding program expectations (Garst et al., 2007). Lelekacs et al. (2016) created an Extension in-service training program about local food systems, based on a prior needs assessment that was completed. Beyond just a significant increase in Extension agents' content knowledge from the workshop, over 33% of the agents indicated they planned to implement their own program to share information with their communities around this topic (Lelekacs et al., 2016).

Another study conducted training focused on Extension agents' use of social media to more effectively reach families (Allen et al., 2014). Agents generally

reported the training as useful for their jobs. Additionally, agents comfort level with social media increased and their use of different social media platforms increased as a result of the training (Allen et al., 2014). A post experience analysis with participants showed 90% agreed or strongly agreed technology and social media knowledge were gained, 71% agreed or strongly agreed their skill level had increased, 76% agreed or strongly agreed their attitude toward social media and technology improved, and 76% agreed or strongly agreed they could use this content to serve stakeholders (Allen et al., 2014). A qualitative assessment showed Extension agents chose to use the technology and social media platforms for a number of different reasons: capitalize on families' use of social media, more easily disseminate information, and increase professional impact. Respondents reported using the technology and social media to promote/market Extension events; share articles, tips, and information; and upload photos from Extension activities (Allen et al., 2016).

Vijayaragavan et al. (2005) created 13 training modules for Extension professionals ranging from leadership to communications to personal improvement areas. Participants showed an average increase of 59.4% in knowledge from the training. Participants self-reported a high level of increase in knowledge, high relevance of the content for their needs, high usefulness of the content for improving work productivity, and high usefulness of the content to work with clientele. Vijayaragavan et al. (2005) generally reported positive and significantly positive impacts as a result of the Extension training.

Several studies have shown the effectiveness of implementing training programs for Extension agents (Allen, Huff, Kelly, Bearon, & Behnke, 2014; Garst et al., 2007; Lelekacs et al., 2016; Vijayaragavan

et al., 2005). However, Garst et al. (2007) emphasized the need for training programs to be intentionally developed, flexible, and adaptive to the needs and skill levels of new agents being assigned to specific roles. The researchers recommended for training programs to be conducted in a face-to-face format and responsive to the needs of the agents (Garst et al., 2007).

Purpose & Objectives

The purpose of this research was to examine agents' self-perceived ability to effectively utilize communication skills to provide knowledge and resources to their communities available at the [J]. This study was developed to gather baseline data of existing programming in order to improve and modify future communication training programs for Extension agents, domestically and abroad. Therefore, the objectives guiding this study were:

1. To understand agents' self-perceived communication knowledge prior to attending the University of Georgia training.
2. To understand agents' self-perceived communication knowledge after completing the University of Georgia training.

Methods

To answer the research objectives posed for the current study, a retrospective pre- and post-test survey was administered to the new Extension agents in Georgia attending a communication training workshop. A retrospective pre- and post-test design was used to more effectively measure "changes in knowledge compared to traditional pre- and post-test evaluation because participants may not be aware of the new knowledge and its application until they learn about it in the workshop" (Lelekacs et al., 2016, p. 7). Using this type of design allowed the workshop participants to truly

reflect upon their knowledge before and after attending the training experience (Lelekacs et al., 2016).

Treatment Design

The training workshop was two days in length and covered topics from interacting with the media, writing stories, maintaining social media presence, and creating short videos within their communities, while utilizing resources available at the university and representing the college and university. The agents were hosted on the main campus of the university for the workshop. The workshop sessions were taught by communication professionals from the university. Workshop sessions focused on preparing the agents to effectively communicate with their communities using university materials and branding. Agents were given the opportunity to have hands-on experience learning how to write effectively utilizing university research, create communication materials for events within their communities, engage with the media by conducting interviews about university research and information relevant to their area, and design materials and edit videos to effectively engage with their communities. Agents were encouraged to bring current projects they were working on to get personal help and feedback from the communication professionals. Agents were shown proper branding guidelines and materials to use on all of their work in the community. Additionally, agents received one-on-one time with university communication staff to address potential topics and methods of communicating specific to their community.

The agents were required to attend the communication training workshop within one year of beginning their new position. Since the workshop was an intensive learning experience, the agents were only asked to complete the survey one

time; however, they were asked to respond to the same survey questions and give a response for their self-perceived communication abilities before and after the training.

Instrument Design

The survey was researcher developed and created based on the training workshop curriculum. The survey was evaluated by a panel of research professionals for face and content validity (Field, 2009). The training workshop was the first and only opportunity to test the instrument with the target population of new Extension agents familiar with the communication workshop curriculum. The curriculum was established based off of needs of the state for communication within the communities.

The survey had twenty questions that assessed various skills addressed within the training. The survey was administered through the online survey software, Qualtrics. The participants were asked to complete the survey immediately upon completion of the second day of training. The survey used 5-point, Likert-type scale questions to measure participants' self-perceived communication abilities before and after the workshop training. The data were analyzed and the responses for each question were compared using a paired-samples t-test to evaluate any changes in the agents' self-perceived communication abilities (Table 1).

Results

Upon analyzing the data to answer the objectives of the current study, participants' self-reported efficacy of communication skills were compared upon completion of the training. A total of 21 participants completed the survey of the 23 workshop attendees for a 91.3% response rate. One participant of the 21 study participants did not complete the second,

post-test survey; therefore, the final, complete participation rate was 86.9% for the current study.

To answer the first research objective of understanding agents' self-perceived communication knowledge prior to attending the university training, the survey data were analyzed for means and frequencies to better understand attendees' prior communication comfort and experience (Table 1). The Extension agents at the training indicated they were the least confident in their communication skills related to creating high-quality videos for education or promotion ($M = 2.35$), writing and developing Public Service Announcements for radio ($M = 2.71$), and creating well organized and visually appealing marketing materials ($M = 3.14$), prior to receiving the communication training. Agents indicated they were most confident in their communication skills related to effectively articulating their thoughts in written communication ($M = 3.86$), identifying how adult audiences are different younger audiences ($M = 3.86$), and identifying the differences between teaching and facilitating ($M = 3.81$), prior to receiving the communication training.

To answer the second research objective of understanding agents' self-perceived communication knowledge after completing the university training, the survey data were analyzed for means and frequencies to understand attendees' experience with the training communication workshop (Table 1). Upon analysis, the agents were least confident in their communication ability to create high-quality educational or promotional videos ($M = 3.75$) and effectively utilize the Extension numbered publication data base ($M = 3.80$) after receiving the communication training.

Table 1
Paired Sample t-test of Self-Perceived Communication Skills Before and After the Training

Communication Skill	Pre		Post		Δ M	<i>t</i>	<i>p</i>
	M	SD	M	SD			
Create high-quality educational or promotional videos	2.35	.98	3.75	.85	1.40	6.29	.000
Write and develop Public Service Announcements for radio	2.71	.84	3.95	.86	1.23	6.38	.000
Properly utilize branding requirements for Extension	3.14	.72	4.24	.53	1.09	5.31	.000
Create well organized and visually appealing marketing materials	3.14	.79	4.14	.57	1.00	6.48	.000
Utilize support services within University of Georgia	3.33	.79	4.29	.78	.95	4.74	.000
Identify strategies for teaching/facilitating adult learning	3.52	.68	4.33	.48	.81	5.45	.000
Effectively communicate programs and events via website	3.29	.90	4.05	.92	.76	4.20	.000
Identify the differences between teaching and facilitating	3.81	.60	4.38	.49	.57	4.38	.000
Take interesting, high-quality photos	3.38	.74	4.14	.65	.76	3.70	.001
Use social media to professionally present information	3.14	1.06	4.00	.94	.85	4.07	.001
Align facilitation style with audience needs	3.67	.65	4.33	.48	.66	3.83	.001
Create positive interactions with media professionals	3.35	.67	4.15	.67	.80	3.76	.001
Identify how adult audiences are different from younger	3.86	.65	4.33	.57	.47	.20	.002
Identify why adults engage in learning	3.71	.84	4.29	.56	.57	3.00	.007
Effectively edit my writing	3.47	.77	4.00	.74	.52	2.72	.014
Write well-constructed stories	3.62	.66	3.95	.66	.33	2.64	.016
Articulate my thoughts well in written communication	3.86	.65	4.19	.40	.52	2.72	.014
Write effectively for news stories	3.71	.56	4.00	.54	.28	2.03	.055
Effectively utilize the Extension numbered publication database	3.50	.76	3.80	1.00	.30	1.55	.137

The agents indicated their confidence in their communication skills after the training was highest in identifying the differences between teaching and facilitating ($M = 4.38$), align facilitation style with audience needs ($M = 4.33$), and identify how adult audiences are different from younger ($M = 4.23$).

In order to further understand the findings of the current study, the means of the agents' perceived communication abilities before and after the trainings were examined using a paired samples t-test. A statistically significant difference was found with agents' perceived ability to create well organized and visually appealing marketing materials ($t = 6.48, p = .00$), write and develop Public Service Announcements for radio ($t = 6.38, p = .00$), effectively communicate programs and events via website ($t = 4.20, p = .00$), utilize support services within University of Georgia ($t = 4.74, p = .00$), identify the differences between teaching and facilitating ($t = 4.38, p = .00$), identify strategies for teaching/facilitating adult learning ($t = 5.45, p = .00$), properly utilize branding requirements for Extension ($t = 5.31, p = .00$), and create high-quality educational or promotional videos ($t = 6.29, p = .00$).

To additionally examine any changes in self-perceived communication skills, the change in means were examined (Table 1). The greatest change in mean was observed with their self-perceived ability to create high-quality educational or promotional videos ($\Delta M = 1.40$), write and develop Public Service Announcements for radio ($\Delta M = 1.23$), properly utilize branding requirements for Extension ($\Delta M = 1.09$), and create well organized and visually appealing marketing materials ($\Delta M = 1.00$).

Discussion, Conclusions & Implications

Overall, the post-test, reflective survey analysis showed an increase in

perceived efficacy in all 19 skills assessed as a result of the communication training. Agents indicated a significant change in perceived ability in all communication skills except: writing effectively for news stories and effectively utilize the Extension numbered publication data base. Using Bandura's (1977) perceived self-efficacy element of the social cognitive theory as guidance, the statistically significant change in perceived ability suggests the Extension agents are likely to pursue tasks that involve these communication skills, rather than avoid them, and perform them in at least a satisfactory manner. Additionally, agents are more likely to feel empowered to complete tasks involving these communication skills while putting more effort to execute them (Bandura, 1977).

Among the skills with the largest change in mean were: create high-quality educational or promotional videos, write and develop Public Service Announcements for radio, properly utilize branding requirements for Extension, create well organized and visually appealing marketing materials, and utilize support services within the university. The findings in the current study suggest training agents on specific skills critical to creating collateral within their communities, with proper university branding guidelines, can be achieved in training workshops. The results of this study show there is still remove to increase agents' efficacy in creating collateral to be used within their communities. While creating videos did have a significant change in perceived ability, the agents still did not feel as confident in their ability as compared to other skills after the training. This is not surprising given the complexity of creating materials using unfamiliar software and skills.

Additionally, results showed a significant increase in perceived ability from the retrospective pre- and post-survey in all

of the skills as well. It seems logical agents had the highest level of agreement with their perceived ability in these skills since their role naturally encompasses educating others (Brown, 2003; Bruce & Anderson, 2012). The training is likely to have increased their knowledge, abilities, and confidence in these skills, similar to the training results observed in the study conducted by Vijayaragavan et al. (2005). These findings support the need for regular training to prepare agents, even in the most fundamental skills required for their roles. Also, the results in this study show the effectiveness of communication training, as have several other studies that have implemented other content training to Extension agents in the past (Allen et al., 2014; Garst et al., 2007; Lelekacs et al., 2016; Vijayaragavan et al., 2005).

Recommendations

Based on the findings of the current study, Extension agents' perceived communication abilities, related to engaging and sharing scientifically accurate information with communities and the public, can be positively impacted by attending workshops and trainings. Specifically, agents in this study could benefit from training to improve their use of university research databases and hone their writing skills. These skills are paramount for effectively engaging communities with accurate and relevant science-based information. Strategically designing training and professional development opportunities for agents does impact agents' perceived abilities to effectively communicate the public, while utilizing resources and guidelines established by the land-grant university. The increase in perceived ability with educating others, again, a fundamental aspect to Extension agents' role, emphasizes how training should not be limited to agents' weakest abilities. It is recommended Extension agents be offered at least one

communication in-service training annually to strengthen their knowledge, abilities, and confidence in communication skills. Creating a series of communication in-service training focused on various skill areas for each training will allow for a wider range of skills to be taught, and agents can choose the communication method most relevant for their community.

Recognizing the need for Extension training to be structured specifically to the needs of agents throughout the world (Garst et al., 2007), creating opportunities to dialogue with agents to understand the barriers and needs they face within their unique communities is paramount. While training modules can be implemented to address the foundations of good communication practices with stakeholders, to truly prepare agents to be effective communicators, unique barriers and needs of their specific audiences must be identified. Specifically in developing countries, agents may be limited in their contact with communities (McCole et al., 2014); therefore, every opportunity they have to share information must be meaningful and relevant to the audience. Creating tailored and purposeful communication trainings can be created to further the communication efforts of agents worldwide (Robinson, 2013), and better prepare them to provide scientifically meaningful information to their communities from the university.

Additionally, future research needs to examine training protocols for training Extension agents, specifically geared toward the communication of science-based information, to measure self-efficacy, proficiency, and utilization of university resources for the benefit of citizens on a global scale. The current research indicated agents had the least amount of change in self-efficacy of utilizing the university Extension database. This database could provide agents with peer-reviewed research;

however, if agents are not comfortable utilizing this resource, the information will not be shared with the communities as effectively. Additionally, these databases are not bound by location. This could create the opportunity for sharing information and resources with agents without regard to location. Therefore, more research should be conducted with agents to understand how this type of resource could be integrated into their communication efforts in future.

In a different vein of thinking, research in the future should examine the practicality and effectiveness of offering communication training courses for Extension professionals through online resources. Integrating research-validated, online-learning strategies could have a broader reach for Extension professionals in need of communication training in remote areas, or in areas lacking access to communication training professionals. The need for communication training for Extension professionals extends beyond the state borders of land-grant universities and spans international boundaries for the good of all world citizens. With today's technology, Extension agents should not be limited to communication training just because of their geographical location.

Communication is a universal skill needed regardless of location. With an ever-changing atmosphere of using technology to engage with information, Extension agents have the ability to connect and engage with their communities in innovative and unique ways. However, they need programs available to help them navigate how to professionally share scientifically accurate information in meaningful and relevant ways with diverse audiences.

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