Journal of Applied Communications

Volume 105 | Issue 1 Article 8

Agri-Science Faculty Perceptions of Communication Activities at Texas Tech University, a Non-Land-Grant Institution

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Recommended Citation

Opat, Kelsi; Irlbeck, Erica; and Kristyn Dickey (2021) "Agri-Science Faculty Perceptions of Communication Activities at Texas Tech University, a Non-Land-Grant Institution," *Journal of Applied Communications*: Vol. 105: Iss. 1. https://doi.org/10.4148/1051-0834.2353

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Abstract

Due to the direct impact science has on society, it is important for scientists to communicate with the general public (Rose et al., 2020). There are various means of communication that scientists may choose to disseminate their research. Recently, Bowman et al. (2018) assessed how often Extension personnel at a land-grant institution used various communication skills, how important they perceived each skill to be, and how comfortable they were performing them. Land-grant institutions have different communication expectations for their faculty than those at non-land-grant institutions. Therefore, this study focused on the Use, Comfort, and Importance of communication skills according to faculty members at a non-land-grant university. Survey data were collected from 57 (N = 57) faculty members at Texas Tech University, a non-land-grant institution, within its College of Agricultural Sciences and Natural Resources. Average Use, Comfort, and Importance scores were calculated for each communication skill and categorized as high, average, or low. These scores indicated whether the faculty members at this non-land-grant institution had adopted each communication skill according to Rogers' Innovation Diffusion Process.

Keywords

science communication, Innovation Diffusion Process, non-land-grant, communication activities, social media, communication training

Introduction

In order to be a successful scientist in the modern world, "Communication skills are a must, and mastery of modern technology helps" (Anonymous, 2015, para. 1). More demands are being placed on scientists to not only be masters of their subject and publish findings from their own research but also to make this research known to a wider, more general audience. There are several benefits to disseminating scientific knowledge to audiences outside of academic. For instance, having a science-literate society encourages future generations of science, technology, engineering, and mathematics (STEM) professionals (Hallman, 2017). It also leads to increased employability (National Research Council, 2015), allows for a better quality of life (Shen, 1975), and bestows the ability to make informed decisions on audience members (Hallman, 2017). It is also important for scientific information to be accessible and understandable for policymakers, as governments at every level use scientific evidence to make decisions (Gallo, 2017).

In order to disseminate their research to a more diverse audience, scientists are using a wide range of communication methods. Some use more traditional methods such as newspaper or magazine articles, interviews with journalists, speeches and presentations, or even printed handouts. Others are embracing the possibilities of Web 2.0 – which refers to the second, more social 'phase' of the Internet (Chun et al., 2010) - with more interactive media such as social media, blogs, podcasts, personal websites and more.

These innovative communication methods benefit scientists and their audiences alike. Researchers may use online communication tools to stay up to date with research, popular science, and issues related to their highly specific field or interests (Osterrieder, 2013). Researchers may also use social media, in all its various forms (including blogs, YouTube videos, and podcasts), to study public perceptions, conversations, and concerns surrounding their field of research. This information can, in turn, be addressed by the scientist.

Most importantly, social media give researchers and their audience the unique opportunity to have a dialogue (Wilcox, 2012). Traditional science communication methods focus on a one-way transmission from the scientist, through a gatekeeper (such as a journalist), to a member of the public. This strategy usually follows the knowledge deficit model. This model has four assumptions that were widely adopted by scientists, and are still used in some research (Ahteensuu, 2011). These assumptions, however, do not always stand true. The first assumption stated that the public does not understand science. Whether the public understands science is a complex question. Allum et al. (2018) found that disparities in science literacy can be somewhat explained by cognitive or socioeconomic factors including race, education, and income among others. It also seems that 'understanding' changes with how information is presented. For example, citizens are more likely to recognize scientific images than answer textual questions correctly (Bucchi & Saracino, 2016). It is unfair, however, to assume that the 'general public' as a whole does not understand science, particularly when, according to the 2016 census, one-third of American adults have a bachelor's degree (Alonzo, 2017). The second and third assumptions are easier to unravel. They postulate that the public has a negative attitude toward science and/or technology and that this negative attitude is caused by scientific ignorance. Conversely, 73% of adults in the U.S. agree that science has a 'mostly positive' effect on society (Funk, 2020). In 2019, American adults had a 'great deal' or 'fair amount' of confidence in

scientists (86%) (Funk, 2020). This means more American adults trusted scientists more than public school principals (77%), the military (82%), the news media (47%), or even religious leaders (57%) (Funk, 2020). This leads to the final assumption that the public's knowledge deficit can be alleviated through one-way communication from scientists to the public. In the age of Web 2.0, scientists and the public are now able to directly interact with one another through various social media platforms (Jarreau & Porter, 2017; Liberatore et al., 2018; Collins et al., 2016; Wolf, 2017) and not rely solely on traditional one-way communication methods. It is time to move beyond the knowledge deficit model and toward a new era of science communication in which scientists are able to directly communicate with interested and curious audiences and have an open, two-way dialogue.

Acceptance of innovations, such as new channels for science communication, however, takes time and varies by social system (Rogers, 2003). Social systems are, "a set of interrelated units that are engaged in joint problem solving to accomplish a common goal" (Rogers, 2003, p. 23). Although many scientists and scientific communities have embraced social media, others have been more reluctant. In a 2016 study by Collins et al., which surveyed scientists across scientific disciplines, 88% of the sample confirmed that they had a Facebook account (compared to 93% of the general public), and 33% indicated that they were administrators of science-focused Facebook pages. This suggests that scientists, as a social system, may be slower to adopt the use of social media as compared to the general public.

A more specific social system within the scientific community is Extension personnel at land-grant universities. Extension agents and personnel are faculty members employed by land-grant institutions, which have long practiced public engagement. These institutions – created through the Morrill Acts of 1862 and 1890 – added extension and outreach as part of their missions after the passage of the Smith-Lever Act in 1914 (Burkhart-Kriesel et al., 2019). Extension is responsible for, "the dissemination of knowledge, skills, ideas, and innovations obtained from the research activities to farmers and local communities" (Singh & Sandhu, 2019, p. 30). Extension personnel are expected to participate in public engagement activities.

A recent study by Bowman et al. (2018) assessed the adoption and usage of communication skills of agricultural Extension personnel. The researchers found that personnel were more comfortable performing tasks most professionals might encounter, such as public speaking or marketing, but less comfortable doing media-related communication or social media tasks on platforms other than Facebook (Bowman et al., 2018).

Extension faculty at land-grant institutions are members of a certain social system that uses communication methods and innovations a specific way. There is still a need to study where communication activities/skills lie in the innovation-decision process of another major social system of agricultural scientists: faculty members employed by non-land-grant institutions. A vast majority of faculty at non-land grant institutions do not have an Extension appointment but are still encouraged to participate in public engagement. This is made evident through the number of non-land-grant institutions that present science communication workshops for their faculty members, offer science communication centers as recourses for faculty, and offer scientific public engagement activities which feature faculty members and their research.

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DOI: 10.4148/1051-0834.2353

Acceptance of Social Media

Many forms of communication in this study are universally accepted as required portions of a non-land-grant faculty member's job description, such as speaking in public or preparing handouts. Faculty members who regularly instruct classes or present research at conferences, or have done so in the past, have most likely spoken in public and created handouts on scientific subjects numerous times. However, social media is a relatively new channel for science communication that these faculty members may not currently utilize for science communication purposes.

Social media is, "a set of internet and mobile tools and applications that stimulate interpersonal communication and opinion sharing, and the production and circulation of user-generated content" (Go & You, 2016, p. 177). Some social media sites, such as the now-abandoned Myspace and Google Plus, have proven to be more of a fad than a constant source of social networking. Others, such as the now defunct Vine video app, were recognized for their potential and absorbed by other, more successful, social media platforms. Due to this ever-changing landscape of social media, there seem to be great differences between how well these are accepted by various social systems, as well as how they are used. As an example, a 2013 study conducted by Bowen et al. found that a majority (74.4%) of Tennessee 4-H program leaders used social networking sites such as Facebook, Myspace, LinkedIn, or Google+ and only 3.9% used video sharing sites such as YouTube. However, a study conducted one year earlier (2012) found that a much lower percentage of farmers used Facebook (23.8%) or Google+ (44.1%), but a higher percentage (29.0%) used YouTube (Shaw et al., 2015) when compared to Tennessee 4-H leaders. Although these studies were conducted in a similar span of time, and with two groups both based in agriculture, their uses of social networking sites differed acutely. It is important to study various agri-science-based social systems to understand which platforms are being utilized, how comfortable members are with using the platforms, as well as how important they believe each platforms to be.

Using Social Media to Communicate Science

As evidenced by previously cited studies by Bowen et al. (2013), Bowman et al. (2018), and Shaw et al. (2015), social media have been used to disseminate agri-science information to the public. Social media have also been used by other fields of scientists to spread scientific knowledge, although all fields of science are still learning how to use it well (Vraga & Bode, 2017). Collins et al. (2016) surveyed scientists from across the globe and a variety of fields on their social media usage. Their analysis found that the most-used social media were Twitter (88%), Facebook (82%), and LinkedIn (66%) followed by Google+, WordPress, ResearchGate, and Instagram (40%, 34%, 31%, and 21% respectively) (Collins et al., 2016). Half of the respondents said they had authored a blog (Collins et al., 2016). Participants shared that they used Facebook mainly for personal use and did not believe it was conducive to science communication (Collins et al., 2016). Most also cited 'having a lack of platform-specific knowledge' and 'time' as reasons why scientists might not use Twitter (Collins et al., 2016). The current study was able to compare the social media skills and usage of non-land-grant agri-science faculty to those of Collins et al.'s (2016) global study.

Acceptance of Traditional Media

Scientists have also used traditional communication methods such as radio, television, magazines, and newspapers to communicate their science with the public. Prior to the rise of social media approximately 15 years ago, these traditional, one-way methods were the main forms of communication used by scientists to distribute their research to a more general audience. Traditional media methods required journalists and/or science writers who "interpreted" the science for the public. This relationship between scientists and science journalists had its challenges. A 2002 study offers insight; scientists and journalists each questioned one another's qualifications and training (Treise & Weigold, 2002). There also seemed to be a lack of agreement on what science journalists' responsibilities to the public actually were (Treise & Weigold, 2002).

> I feel we need to define, once and for all, the responsibility of the journalist and the scientist – and not just for science news. Is it our responsibility to educate, inform, or to promote critical thinking? Or is it none of the above (Treise & Weigold, 2002, p. 320)?

The role of science journalists, their obligations to be fair to the public by showing both "sides" of science, and the best way to present science news to the public is still being evaluated (Slater et al., 2021).

More recent studies have found that scientists work with media in order to improve their own reputation, careers or funding (Dijkstra et al., 2015; Peters, 2013), to share scientific knowledge and influence policy (Dijkstra et al., 2015), and fulfill a felt duty to communicate science (Peters, 2013; Lundy et al., 2006; Dijkstra et al., 2015). Nonetheless, there are still perceived challenges when it comes to working with the media. For instance, many scientists feel as though they do not have the proper training to do so (Silva & Bultitude, 2009; Scheufele, 2013; Lundy et al., 2006; Nielsen et al., 2007; Ndlovu et al., 2016; Dijkstra et al., 2015). Others feel that using traditional media may have negative effects on public policy and/or perception. They believe having a lack of control over their exchanges with journalists (Peters, 2013), as well as framing (Scheufele, 2013; Peters, 2013; Ndlovu et al., 2016; Nielsen et al., 2007), can cause these harmful consequences. Scientists also believe they lack the time and/or funding to work with the media (Ndlovu et al., 2016; Dijkstra et al., 2015; Ruth-McSwain & Telg, 2008), they do not want media attention (Ruth-McSwain & Telg, 2008), they are restricted by their employers' policies (Ndlovu et al, 2016), and/or they believe the media do not have adequate staff or time to cover their research (Scheufele, 2013).

Theoretical Framework

Rogers' (2003) Innovation Diffusion Process was the theoretical framework used to guide this study. This theory is closely linked to agriculture and the extension model (Rogers, 2003). "Land-grant" colleges were funded with the Morrill Land Grant Acts of 1862 and 1890 (Duemer, 2007), which gave federal lands to states in order for that states to sell and raise funds. The funds were used to establish colleges which focused on agriculture and engineering: land-grant colleges (Rogers, 2003). Agricultural extension services at these colleges were later established

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DOI: 10.4148/1051-0834.2353

with the 1914 Smith-Lever Act (Rogers, 2003). These services were created to distribute useful and practical agricultural and home economics information (Rogers, 2003). However, in this study, the theory was used to determine whether certain communication skills have been adopted by a different social system: non-land-grant faculty.

According to Rogers (2003), an innovation is, "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (p. 12). This study explores different communication innovations, and how they are "diffused" to non-land-grant faculty members as science communication skills.

The innovation-decision process consists of five stages: knowledge, persuasion, decision, implementation, and confirmation (Rogers, 2003). Individuals gain an awareness of an innovation in the knowledge stage and develop an attitude, either favorable or unfavorable, in the persuasion stage. In the decision stage, actions are taken that lead to the choice of whether or not the innovation should be adopted. Individuals make use of the innovation in the implementation stage and make a re-assessment of whether the innovation best met their needs and should continue to be used in the confirmation stage. Perceptions during the knowledge and persuasion stage influence the degree of implementation (Rogers, 2003).

Purpose/Objectives

The purpose of this study was to understand whether non-land-grant faculty members have adopted various methods of communication. In order to accomplish this purpose, the study was guided by the following research questions:

RQ1: How often do respondents use each communication method?
RQ2: How comfortable are respondents using each communication method?
RQ3: How important do respondents believe each communication method to be?

Methodology

A quantitative survey method was used to fulfill the purpose of this study. The first portion of the questionnaire was used to measure how often faculty use various communication skills, how comfortable they are with each skill, as well as how important they perceive each skill to be. This part of the questionnaire was based on the Extension survey developed by Bowman et al. (2018). The original creators distributed the survey to Mississippi State Extension personnel (Bowman et al., 2018). Although the original questionnaire provided a baseline measurement for communication skills, it was developed for Extension personnel, not faculty members of non-land-grant institutions. As described, these positions and institutions have different outreach/communication missions and standards; therefore, the Bowman et al.'s (2018) questionnaire was adapted for the purpose of this study. In order to do so, the researchers conducted an extensive review of the literature and had the final questionnaire approved by a panel of science communication experts at Texas Tech University.

The following changes were made from Bowman et al.'s (2018) original questionnaire: 1) Bowman et al. (2018) asked participants whether they had worked with local media to get

coverage of Extension events/stories, whereas this study asked participants whether they had worked with local media to get coverage of departmental events/stories 2) Five questions were removed by the science communications expert panel regarding skills exclusive to Extension personnel, such as marketing 3) One question was added to determine whether non-land-grant faculty members maintain a personal website. This was added in response to research that found personal websites were maintained by a majority of highly-cited European scholars (Más-Bleda & Aguillo, 2013). Cronbach's alphas were calculated for each subsection (*Use*, *Comfort*, and *Importance*) of this portion of the questionnaire. Reliability for each subsection ranged from .85 – .93, which is acceptable according to Kline (1999).

In order to measure how often faculty members use each communication skill, they were asked, "Do you do the following tasks as part of your job?" Respondents were able to choose "yes" or "no." Descriptive statistics were used to analyze *Use* data. Frequency and percentage of usage for each communication skill were reported.

To measure how comfortable participants were with the various communication skills, they were asked, "How comfortable are you doing each of the following tasks?" They answered using a Likert-type scale where 1 = *Very Uncomfortable* and 5 = *Very Comfortable*. Descriptive statistics were also reported for this section. In addition, *Comfort* scores were also sorted into groups (High, average, and low) to indicate participants' comfort levels. Scores greater than 3.76 (one standard deviation above the mean *Comfort* score of 3.17, *SD* = .59) were considered to be high, and those lower than 2.58 (one standard deviation below the mean *Comfort* score) were considered to be low. Those greater than 2.58 but less than 3.76 were considered to be average *Comfort* scores.

To measure how important participants considered each communication skill to be, they were asked, "How important is it for you to do the following tasks?" They answered using a Likert-type scale where 1 = *Unimportant* and 5 = *Extremely Important*. Descriptive statistics were calculated for *Importance* scores. *Importance* scores were also sorted into groups (High, average, and low) to indicate participants' comfort levels. Scores greater than 3.78 (one standard deviation above the average *Importance* score of 3.00, *SD* = .78) were considered to be high, and those less than 2.22 (one standard deviation below the average *Importance* score) were considered to be low. Those scores which were greater than 2.22 but less than 3.78 were considered to be average *Importance* scores.

The second segment of the survey was created by the researchers of this study. Faculty were asked demographic questions (current position, department, race, age, and gender) as well as how often they attend communications training. The online Qualtrics survey was distributed to all college of agriculture faculty at Texas Tech University through email. Faculty members at Texas Tech University were chosen because the institution is not Texas' land-grant institution; however, it is classified by The Carnegie Classification of Institutions as an R-1: Doctoral University with very high research activity. The strong research culture at the institution is complemented by the College of Agricultural Sciences and Natural Resources' efforts to increase communication with the public by providing faculty communication training and resources. This is evidenced by the creation of the Center for Agri-Science Communications at Texas Tech (CATT) in 2017. This combination of high research with encouraged public outreach is

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DOI: 10.4148/1051-0834.2353

comparable to that of a land-grant institution. The initial survey was sent on December 12, 2018. Three follow-up reminders were sent, and data collection commenced on January 21, 2019.

Responses from agricultural education and agricultural communication faculty were used to analyze the reliability of the survey, but not in the final data set. These faculty were not part of the population (bench agri-scientists at a non-land-grant university) and are assumed by the researchers to possess higher communication skills due to their areas of study and practice.

The 57 (N = 57) participants ranged in age from 30 to 70 years old, with an average age of 47.14 years old (SD = 10.94). A majority were white, non-Hispanic (n = 36, 63.2%) and male (n = 38, 66.7%). Current job titles of participants are listed in Table 1. Some participants could be classified as two positions (for example, one associate dean for the college also holds a professor position within a college department), but participants were only allowed to classify themselves as one position.

Table 1

Demographic Characteristics of Participants

Characteristic	*f* (%)
Current Position	
Professor	18 (31.6%)
Assistant Professor	15 (26.3%)
Associate Professor	13 (22.8%)
Department Chair	5 (8.8%)
Instructor	3 (5.3%)
Administrator (Dean, Associate Deans)	3 (5.3%)
Professor of Practice	1 (1.8%)
Gender	
Male	38 (66.7%)
Female	13 (22.8%)
Preferred not to answer	6 (10.5%)
Race	
White, non-Hispanic	36 (63.2%)
White, Hispanic or Latino	6 (10.5%)
Asian	6 (10.5%)
Preferred not to answer	6 (10.5%)
Other	3 (5.3%)

Results/Findings

RQ1: How often do respondents use each communication method?

Editing writing for grammar and clarity (98.2%), making speeches or presentations (98.2%), and writing a handout for class (89.5%) were the skills most commonly used by faculty who participated in this study (Table 2). The skills faculty used the least were managing a blog (8.8%), writing for a blog (8.8%), and creating Snapchat posts (3.5%).

Table 2

Non-Land-Grant Ag. Faculty's Use, Comfort, & Importance of Communications Activities

Activity	Use *f (%)*	Comfort[1] *M (SD)*	Importance[2] *M (SD)*
Edited writing for grammar & clarity	56 (98.20%)	4.62 (0.85)**	4.94 (0.23)**
Made a speech or presentation	56 (98.20%)	4.47 (0.98)**	4.89 (0.37)**
Written a handout for class	51 (89.50%)	4.53 (0.92)**	4.65 (0.71)**
Taken photos	49 (86.00%)	4.16 (1.01)**	3.91 (1.43)**
Written business letter	46 (80.70%)	4.25 (1.08)**	4.28 (1.19)**
Edited photos	37 (64.90%)	3.47 (1.15)	3.20 (1.43)
Shot video	37 (64.90%)	3.07 (1.23)	2.94 (1.45)
Worked with local media	35 (61.40%)	3.20 (1.28)	3.45 (1.41)
Been interviewed for radio	30 (52.60%)	3.05 (1.45)	3.26 (1.36)
Created Facebook posts	27 (47.40%)	3.02 (1.33)	2.41 (1.43)
Written a news story	25 (43.90%)	3.33 (1.19)	2.91 (1.34)
Written a news release	24 (42.10%)	3.51 (1.09)	3.09 (1.35)
Edited video	23 (40.40%)	2.42 (1.20)*	2.65 (1.47)
Graphic design for promo. handout	22 (38.60%)	2.96 (1.17)	2.94 (1.50)
Been interviewed for TV	22 (38.60%)	2.78 (1.37)	3.15 (1.34)
Maintained a personal website	21 (36.80%)	2.93 (1.33)	2.72 (1.52)
Written an editorial column	19 (33.30%)	3.45 (1.27)	3.07 (1.45)
Written for webpages	17 (29.80%)	2.93 (1.18)	2.78 (1.46)
Written promotional newsletter	16 (28.10%)	3.27 (1.24)	3.11 (1.34)
Written educational newsletter	16 (28.10%)	3.35 (1.19)	3.17 (1.31)
Created webpages	15 (26.30%)	2.49 (1.28)*	2.59 (1.46)
Graphic design for newsletter	15 (26.30%)	2.87 (1.22)	2.43 (1.44)
Managed a Facebook page	12 (21.10%)	2.76 (1.31)	2.13 (1.44) *
Other social media	10 (17.50%)	2.56 (1.14)*	2.11 (1.33)*

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DOI: 10.4148/1051-0834.2353

Table 2. Continued

Activity	Use *f (%)*	Comfort[1] *M (SD)*	Importance[2] *M (SD)*
Created Instagram posts	10 (17.50%)	2.51 (1.03)*	2.06 (1.30)*
Manage a Facebook group	9 (15.80%)	2.69 (1.26)	2.09 (1.35)*
Managed a blog	5 (8.80%)	2.55 (1.25)*	2.15 (1.27)*
Written for a blog	5 (8.80%)	2.56 (1.26)*	2.15 (1.31)*
Created Snapchat posts	2 (3.50%)	2.44 (1.05)*	1.98 (1.30)*

Note. [1]Where 1 = *very uncomfortable*, 5 = *very comfortable*.[2]Where 1 = *unimportant*, 5 = *extremely important*. *Low *Comfort* or *Importance* score. **High *Comfort* or *Importance* score.

RQ2: How comfortable are respondents using each communication method?

Participants' mean *Comfort* scores for each communication activity can be found in Table 2. The data revealed that faculty were most comfortable editing writing for grammar and clarity (*M* = 4.62, *SD* = .85), writing a handout for class (*M* = 4.53, *SD* = .92), and making a speech or presentation (*M* = 4.47, *SD* = .98). Participants were least comfortable editing video (*M* = 2.42, *SD* = 1.20), creating Snapchat posts (*M* = 2.44, *SD* = 1.05), and creating webpages (*M* = 2.49, *SD* = 1.28). Skills with high (editing writing for grammar & clarity, making a speech or presentation, taking photos, and writing business letters) and low (editing video, creating webpages, other social media, creating Instagram posts, managing a blog, writing for a blog, and creating Snapchat posts) mean *Comfort* scores are indicated in Table 2.

RQ3: How important do respondents believe each communication method to be?

Respondents' mean *Importance* scores for each communication activity can also be found in Table 2. Faculty indicated that they perceived the most important communication activities to be editing writing for grammar and clarity (*M* = 4.94, *SD* = .23), making a speech or presentation (*M* = 4.89, *SD* = .37), and writing a handout for class (*M* = 4.65, *SD* = .71). Participants perceived creating Snapchat posts (*M* = 1.98, *SD* = 1.30), creating Instagram posts (*M* = 2.06, *SD* = 1.30), and managing a Facebook group (*M* = 2.09, *SD* = 1.35) to be the least important communication skills. Skills with high average *Importance* scores (editing writing for grammar & clarity, making a speech or presentation, writing a handout for class, taking photos, and writing a business letter) as well as skills with low average *Importance* scores (managing a Facebook page, other social media, creating Instagram posts, managing a Facebook group, managing a blog, writing for a blog, and creating Snapchat posts) are indicated in Table 2.

Conclusions/Recommendations

Faculty only rated skills they were highly comfortable with as highly important (editing writing for grammar and clarity, making a speech or presentation, writing a handout for class, taking photos, and writing business letters) and vis versa. These were also the five most commonly used

skills. It can be assumed that these five skills are in the implementation or confirmation stages of Rogers' (2003) Innovation Diffusion Process; they have been adopted by faculty but may be evaluated to assess if the skill should continue to be used. According to Bowman et al. (2018), making a speech or presentation was the skill Extension personnel were most comfortable with (besides marketing, which was eliminated from this questionnaire), while making a speech or presentation had the second-highest comfort score among the non-land-grant activity in the current study. More non-land-grant faculty indicated using their public speaking skills (98.2%) than Extension personnel (92.4%) (Bowman et al.). This may be because most participants in the current study teach courses and/or give public speeches on a regular basis.

Faculty gave low comfort and importance ratings to five skills: other social media, creating Instagram posts, managing a blog, writing for a blog, and creating Snapchat posts. The researchers believe these skills are in the knowledge stage of Rogers' (2003) Innovation Diffusion Process, where faculty are beginning to be aware of these skills but think of them unfavorably. These skills are used through social media platforms with a younger user-base than this study's participants, who were an average of 47 years old. Instagram and Snapchat, for instance, are most popular among 18- to 24-year-olds (Perrin & Anderson, 2019). Bloggers are also typically younger than the average participant of this study, with 53.5% of bloggers ranging in age from 21-35 years old (Sysomos, 2010). Of those surveyed, only 21.1% managed a Facebook page and 15.8% managed a Facebook group. This is relatively low compared to the 82% of scientists who used Facebook for career-related purposes in Collins et al.'s (2016) study.

Two skills had low *Comfort*, but standard I*mportance* scores: editing video and creating webpages. They were also used by a fairly large portion of participants with 40.4% having edited videos and 26.3% having created webpages. In the decision stage (Rogers, 2003), a decision is made whether an innovation should be adopted. These skills may have been accepted, but the participants are not yet comfortable using them.

Another two skills – managing a Facebook page and managing a Facebook group – had low *Importance* but standard *Comfort* scores. Innovations are re-assessed to see if they should continue to be used in the final stage of the Innovation Diffusion Process (Rogers, 2003). Faculty may be comfortable using Facebook from applications outside of their job, such as personal use. Participants of this study ranged in age from 30 to 70 years old. Nearly 80% of 30- to 49-year-olds and almost 70% of 50- to 64-year-olds use Facebook (Perrin & Anderson, 2019). These adults are also familiar with the platform, as around 75% of adult Facebook users visit the site at least once a day (Gramlich, 2019). It is highly probable that faculty members are comfortable managing a Facebook group or page because they have done so outside of work, but they do not believe they are important communication skills for their faculty jobs after evaluating their usefulness.

When compared to results from Bowman et al.'s (2018) evaluation of Extension personnel's communication skills, non-land-grant faculty were only more comfortable with editing writing for grammar and clarity. Extension personnel (Bowman et al., 2018) were more comfortable with all other communication skills. Faculty gave higher average *Importance* ratings than Extension personnel in Bowman et al.'s (2018) study to three skills: editing writing for grammar and clarity, making a speech or presentation, and writing a handout for class. Since these are essential skills for college instructors, it is unsurprising that these were rated as highly

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DOI: 10.4148/1051-0834.2353

important by the non-land-grant faculty members. Making a speech or presentation was also ranked as highly important by Extension personnel in Bowman et al.'s (2018) study. Extension personnel (Bowman et al., 2018) ranked every skill other than these three as more important than non-land-grant faculty members.

Data from this study also revealed that more non-land-grant faculty had used the following 10 skills than Extension personnel in Bowman et al.'s (2018) study: editing for grammar and clarity, making a speech or presentation, writing a handout for class, writing a business letter, shooting video, editing video, writing an editorial column, creating webpages, other social media, and creating Instagram posts.

Faculty members' communication training attendance was also evaluated. The largest portion of faculty attended communication training about once a year. About 28% of faculty reported never attending communication training. Scientists should attend communication training (Braha, 2017; Willems, 2003), especially since lacking confidence in one's communication skills can reduce faculty's communication efforts (Rose et al., 2020), but communication skills are also not rewarded like other parts of scientists' careers (Braha, 2017), such as publishing research. Faculty may not attend training because they are using time and resources to publish, conduct, or present research or other activities that are recognized by their universities.

Recommendations

Future training for non-land-grant faculty members at Texas Tech University should focus on skills that the faculty see as important but lack comfort in implementing. According to the data collected in this study, future science communication training for non-land-grant agricultural faculty members should focus on editing videos and creating webpages. Training for new faculty members should focus on the skills given high *Importance* rankings: editing writing for grammar and clarity, making a speech or presentation, writing a handout for class, taking photos, and writing a business letter. Although these skills were also the only ones given high *Comfort* ratings, a majority of participants were senior faculty members (professors, associate professors, department chairs, or administrators). This may have led to the high average *Comfort* ratings among participants in this study. Future research should also determine whether comfort levels of these skills differ between senior and junior faculty members. Finally, the researchers of this study suggest evaluating why many non-land-grant agricultural faculty members are rarely attending communications training, if at all. More recognition for public engagement may be needed for faculty members to value communication training.

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