

Listening to the Profession: Insights from an Industry Needs Assessment to Inform Curriculum for a New Life Sciences Communication Major

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Recommended Citation

Akowuah, Y. A., Parrella, J. A., Spence, J. R., & Rutherford, T. (2026). Listening to the profession: Insights from an industry needs assessment to inform curriculum for a new life sciences communication major. *Journal of Applied Communications*, 110(2), 1–24. <https://doi.org/10.4148/jac.20869>

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Listening to the Profession: Insights from an Industry Needs Assessment to Inform Curriculum for a New Life Sciences Communication Major

Abstract

The agricultural and life sciences communication profession is evolving in response to global agricultural shifts, rapid technological advancements, and heightened sociopolitical attention to issues such as food security and public health. These changes demand professionals who are not only proficient in translating complex scientific concepts but also effective at combating misinformation, engaging diverse audiences, and using digital tools. Higher education institutions must therefore ensure that curricula remain relevant, equipping graduates with both foundational and emergent skills. This study sought to identify industry expectations and professional competencies to inform the design of a new undergraduate major in life sciences communication at Virginia Tech. A qualitative research design was employed, guided by the U.S. Department of Education's Employability Skills Framework. We conducted semi-structured interviews with 12 agricultural and life sciences communication professionals representing organizations across the Mid-Atlantic region. Findings revealed three broad domains of skills essential for early-career success: applied knowledge, effective relationships, and workplace skills. Participants emphasized the importance of strong writing and critical thinking, while also highlighting the need for visual communication, storytelling, and digital fluency. They also highlighted the central role of experiential learning in bridging the gap between academic preparation and workplace demands. Findings also pointed to growing expectations for systems thinking and ethical use of artificial intelligence in communication practices. Beyond informing the development of the new major at Virginia Tech, this study contributes to broader conversations on aligning agricultural and life sciences communication education with workforce expectations in a dynamic and complex communication environment.

Keywords

Agricultural communication, science communication, communication education, curriculum development, workforce alignment

Authors

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Introduction

Profound changes are occurring in the agricultural and life sciences communication field. Shifts in global agricultural systems, rapid advances in technology, and increasing sociopolitical attention to issues such as food insecurity and public health all heightened the need for effective, accessible, and science-based communication (Dyment, 2022; Tedrick, 2009; Telg & Irani, 2012; Warwick et al., 2021). As society becomes more information-saturated yet polarized, the ability to clearly and credibly communicate agricultural and life sciences knowledge becomes more vital than ever (Irani & Doerfert, 2013; McNutt, 2013). In this evolving context, communication professionals must not only translate complex scientific information but also respond to the challenges of misinformation, public distrust, and emerging communication platforms. These demands place growing pressure on professionals to serve as both interpreters of science and advocates for public engagement with agriculture and life sciences (Bonnen, 1986; Doerfert & Miller, 2006; Morgan, 2012).

This professional evolution directly implicates how higher education institutions design and deliver agricultural and life sciences communication curricula. The increasing expectations placed on graduates require communication programs to offer training that is both theoretically grounded and practically responsive to industry shifts. Consensus that academic programs must prioritize, not only content expertise, but also technical, interpersonal, and strategic communication competencies continues to grow (Doerfert & Miller, 2006; Telg & Irani, 2012; Warwick et al., 2021). These competencies prepare students to work across disciplines, communicate with diverse audiences, and adapt to rapidly changing technological and media landscapes. As such, universities must continually revisit and realign their agricultural and life sciences communication programs with the evolving needs of employers and the broader communication ecosystem.

Historically, the development of agricultural communications programs remained closely tied to industry demands. From its early roots in agricultural journalism, the field expanded in both form and function, adapting in response to stakeholder feedback, employer expectations, and societal needs (Tucker et al., 2003; Weckman et al., 2000). This evolution led to the proliferation of agricultural and life sciences communication academic programs, a signal of both increased student interest and workforce demand (Cannon et al., 2016; Miller et al., 2015). These developments reinforce the discipline's responsiveness to industry shifts and its role in preparing professionals capable of navigating complex agricultural and life sciences challenges through communication.

Employer input playing a pivotal role in shaping perceptions of graduate readiness remains a consistent finding across several curriculum review efforts. Studies highlighted how employers value both foundational communication skills such as writing, editing, and speaking as well as transferable professional skills including adaptability, critical thinking, time management, and teamwork (Bailey-Evans, 1994; Irlbeck & Akers, 2009; Morgan & Rucker, 2013; Terry & Bailey-Evans, 1995; Watson, 2009). These are often referred to as employability skills, broadly defined as a set of achievements skills, understandings, and personal attributes that make graduates more likely to gain employment and succeed in their chosen occupations (Finch & Crunkilton, 1999; Yorke, 2006). Employer perceptions research in agricultural

communications further emphasizes the value of graduates who demonstrate initiative, professionalism, and the ability to integrate technical and creative communication strategies across media platforms (Corder & Irlbeck, 2018; Kurtzo et al., 2016; Morgan, 2014).

Irlbeck and Akers (2009) conducted a national survey of employers of recent agricultural communications graduates and found trustworthiness, reliability, and being easy to work with were highly rated workplace habits. In contrast, skills such as creativity, organization, and common sense were often rated as needing improvement. Employers also identified technical competencies such as photo editing, page layout, and public relations as strengths among graduates, while web design, sales, and news editing were reported as deficient (Goss & Irlbeck, 2009). Additionally, Corder and Irlbeck (2018) undertook a comprehensive literature review of employer expectations and agricultural communications curricula. They found the most desired skills consistently included written communication, oral communication, visual design, and character or professional behaviors. These align well with core undergraduate offerings but also suggest areas particularly in digital and interpersonal competencies where employer expectations may not be fully met (Corder & Irlbeck, 2018).

Another defining feature of agricultural and life sciences communication programs is the integration of work-integrated learning (WIL), such as internships and other experiential learning opportunities. These industry engagements serve as crucial bridges between academic theory and real-world practice, offering students exposure to the workplace and opportunities to build professional networks (Cannon et al., 2016; Morgan, 2010; Morgan & Rucker, 2013). Internships are often where employability skills are most tangibly developed, allowing students to practice problem-solving, communication under pressure, and cross-functional collaboration all attributes highly regarded by employers (Corder & Irlbeck, 2018; Terry et al., 1994). These opportunities reinforce the broader educational goal of career readiness by supporting not only technical skill acquisition, but also personal and professional development aligned with industry demands.

Numerous studies highlight participation in WIL experiences contributes to enhanced self-efficacy, stronger professional networks, and a greater sense of career readiness (Jackson, 2015). Parrella et al. (2023a) conducted a large-scale survey of nearly 1,000 agricultural and life sciences students at Texas A&M University to assess perceptions and outcomes of employability skill development. Students who clearly identified their intended career paths and engaged in experiential learning reported higher levels of perceived skill development. These insights underscore the significance of structured, purposeful WIL programs in shaping graduates' readiness for complex professional environments in the agricultural and life sciences.

There remains a noted gap between academic training and employer expectations, particularly when it comes to preparing students for rapidly changing industry technologies and workflows (Crawford et al., 2011; Finch & Crunkilton, 1999). Recent studies emphasize the increasing necessity for digital fluency and data-driven decision-making in the agricultural sector. Coetzee and Goede (2024) highlight that employers now prioritize skills in processing large-scale data and making evidence-based decisions based on analytics. Tools powered by artificial intelligence (AI), evolving social media algorithms, and changes in digital audience behavior now influence how communication professionals craft and distribute messages (Bagger,

2024). These changes raise new questions about the digital fluency and ethical judgment required of future agricultural and life sciences communications professionals.

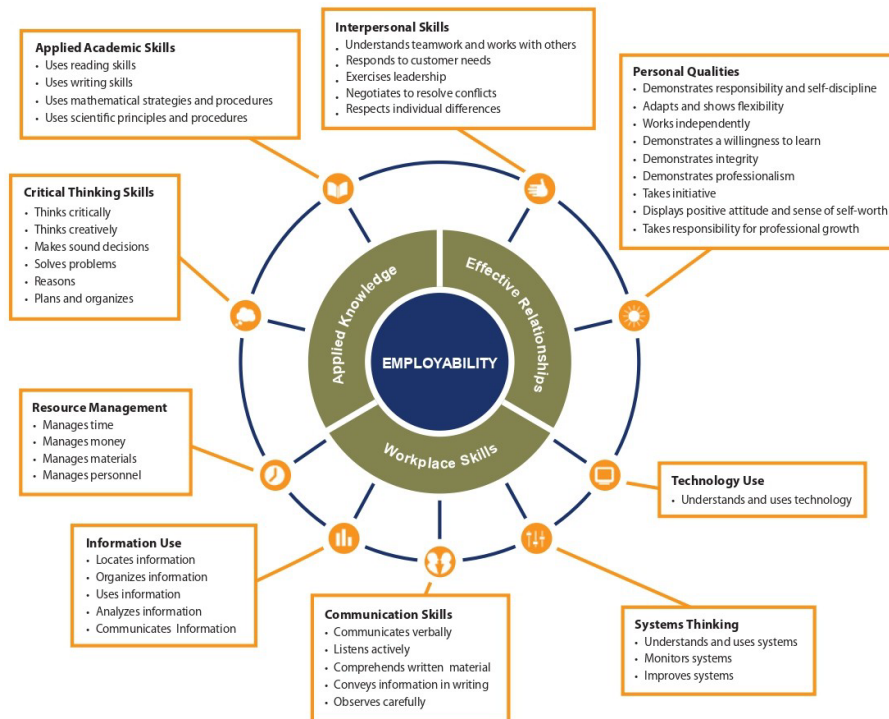
Thus, periodic and forward-looking assessments of employer and industry expectations remain critical to keeping academic programs relevant, dynamic, and future-oriented. More specifically, there is a need to reassess how employer perceptions of employability skills both enduring and emergent are incorporated into program design, instruction, and evaluation (Crawford et al., 2011; Finch & Crunkilton, 1999). In the current needs assessment, we sought to gather insights from communications and marketing professionals working in agricultural and life sciences industry settings, with the goal of identifying the skills, knowledge, and competencies that students need to excel in the field. The findings will inform curriculum development for a new undergraduate program in agricultural and life sciences communication, ensuring it is relevant to the current needs of professionals and aligned with industry expectations.

Conceptual Framework

To address the dynamic and interdisciplinary nature of agricultural and life sciences communication, we used the Employability Skills Framework developed by the U.S. Department of Education's Office of Career, Technical, and Adult Education as a conceptual framework (U.S. Department of Education, 2018; see Figure 1).

Figure 1

U.S. Department of Education Office of Career, Technical, and Adult Education Employability Skills Framework



Note. Adapted from the U.S. Department of Education Office of Career, Technical, and Adult Education, 2018, <https://cte.ed.gov/initiatives/employability-skills-framework>.

This framework provides a structured lens for examining broad, transferable skills essential for success in the field by organizing these competencies into three interrelated domains: applied knowledge, effective relationships, and workplace skills. We used these domains and their associated skills categories to guide the development of our interview questions. Such an approach led to a comprehensive analysis of the multifaceted competencies expected of early-career professionals in a rapidly evolving communication environment (Curtin, 2004; Mahajan et al., 2022).

Applied knowledge refers to the foundational academic and cognitive competencies necessary for integrating disciplinary knowledge with practical applications. In the context of agricultural and life sciences communication, this includes the ability to interpret scientific data and translate it into accessible messages tailored to diverse audiences. Key skills under this domain include reading, writing, and applying mathematical reasoning to analyze and present data effectively. Critical thinking is also part of this domain, which is necessary for analyzing complex agricultural problems, evaluating sources of information, and making evidence-based

decisions. This includes the ability to think creatively, solve problems using available resources, and assess different options to make sound decisions.

Effective relationships are dependent on interpersonal skills that foster productive, ethical, and inclusive workplace environments (Corder & Irlbeck, 2018). Skills associated with this domain include active listening, empathy, leadership, conflict resolution, and teamwork. Employers frequently seek professionals who demonstrate initiative, self-direction, time management, professionalism, and the ability to work independently personal qualities also included under this domain (Finch & Crunkilton, 1999). Additionally, cultural competence and appreciation for diverse perspectives are fundamental to effective relationships and a productive working environment.

Workplace skills generally involve practical abilities that enable individuals to function efficiently within professional environments. In agricultural and life sciences communication contexts, these competencies are essential for managing complex projects, adapting to evolving demands, and aligning communication efforts with organizational goals. One key competency in this domain is resource management, which involves efficiently handling time, budgets, and communication materials, particularly in project-driven roles. Another is information use, which requires the ability to critically evaluate and apply credible sources to craft accurate, strategic, and audience-targeted messages. Systems thinking is also vital, as it enables communicators to situate their work within broader sociotechnical systems such as food systems, environmental policy, or agricultural supply chains and to understand how different components interrelate (Kenny & Drysdale, 2009). Finally, technology use falls under this domain, encompassing not only the ability create and disseminate content across digital platforms using multimedia tools but also adapt to emerging technologies, including AI-powered tools, that are transforming the communication landscape (Curtis & McKenzie, 2002).

Methodology

Context of Study

We are developing a new undergraduate program in life sciences communication within the Department of Agricultural, Leadership, and Community Education at Virginia Tech. We developed the life sciences communication major, rather than an agricultural communications (or similarly named) major, to reflect the interdisciplinary nature of food systems. While agriculture remains a foundational pillar of the curriculum, we designed the program to encompass communication across food, agricultural, environmental, biological, and health sciences, among other disciplines that contribute to food systems. Because most of our students remain in the region after graduation, we targeted agricultural and life sciences communication professionals in the Mid-Atlantic, with an emphasis on Virginia.

Additionally, Virginia Tech's new Bridge Experience Program informed this needs assessment, which requires all undergraduates to complete an experiential learning opportunity connecting disciplinary knowledge with real-world applications. Thus, the goal of this needs assessment was to identify and build relationships with relevant stakeholders, introduce them to the new major, open doors for internships and other experiential opportunities, and gather their

insights to inform curriculum development. This approach helped ensure the program aligns with current industry needs and supports students' career readiness.

Study Design

We used a descriptive qualitative research design to explore the perspectives of agricultural and life sciences communication professionals working in the Mid-Atlantic region (Creswell & Poth, 2017). Qualitative research was particularly well-suited for investigating the complex, context-dependent issues where depth of understanding was prioritized over generalizability (Creswell & Poth, 2017). It allowed researchers to examine how individuals interpret their experiences, make decisions, and construct meaning in relation to their work environments (Merriam & Tisdell, 2016). Specifically, we conducted semi-structured interviews, which encouraged participants to reflect deeply on their professional experiences, organizational expectations, and perceptions of employability skills.

A qualitative, semi-structured interview approach has strengths and weaknesses. Strengths include the ability to capture rich, detailed narratives and uncover subtle dynamics that may be overlooked in quantitative research (Lim, 2025). Weaknesses include potential researcher bias, limited sample size, and reduced generalizability of findings (Maxwell, 2013; Ross & Bibler Zaidi, 2019). To mitigate these limitations, we paid careful attention to the interview protocol development, reflexivity during data analysis, and the use of verbatim transcription to preserve the integrity of participants' voices. Ultimately, semi-structured interviews were most appropriate for this study because our goal was to illuminate the nuanced, practice-based understandings of agricultural and life sciences communications professionals.

Interview Protocol Development

We developed an interview protocol with 29 questions. These questions directly aligned with the Employability Skills Framework (Perkins Collaborative Resource Network, n.d.) and were divided into five sections and various subsections: 1) background information; 2) applied knowledge (applied academic skills, critical thinking skills); 3) effective relationships (interpersonal skills, personal qualities); 4) workplace skills (resource management, information use, communication skills; systems thinking; technology use); and 5) wrap-up (see Table 1). For each section, we developed questions that sought to elicit from industry professionals what skills students need before they enter the job market. To address bias in the development of the interview protocol, the research team engaged in reflexive discussions to bracket personal assumptions. Additionally, two scholars with content expertise in agricultural and life sciences communication reviewed the interview questions for clarity and content relevance. We made revisions based on their feedback.

Table 1*Interview Questions*

Section	Questions
Background Information	1. What is your title at [Organization]? 2. How long have you been in this role? 3. Can you briefly describe your primary responsibilities in this role? 4. What is your educational background? 5. How has your educational background prepared you for your career in life sciences communication? 6. Are there areas you felt your educational background could have better addressed your professional needs?
Applied Knowledge	
Applied academic skills; critical thinking skills	7. Which foundational applied skills (e.g., writing, graphic design, audience analysis, data visualization) do you find essential for communicating life sciences topics to specific audiences? 8. What gaps do you see in the skills or knowledge of new hires entering life sciences communication roles? 9. What experiences could help students develop critical thinking and creative problem-solving skills for addressing challenges in life sciences communication?
Effective Relationships	
Interpersonal skills; personal qualities	10. What interpersonal skills (e.g., teamwork, leadership, conflict resolution, empathy, active listening) are essential for students preparing to work with diverse teams within life sciences organizations? 11. What interpersonal qualities do you feel new hires lack when integrating into diverse teams or managing stakeholder relationships? 12. What strategies could better prepare students to develop interpersonal skills, including exercising leadership and navigating team conflicts
Workplace Skills	
Resource Management	13. What resource management skills (e.g., time management, prioritization, coordinating with others) are most important to succeed as a life sciences communication professional 14. In your experience, where do new hires tend to struggle when managing multiple projects or allocating resources efficiently? 15. What strategies could students learn to effectively manage multiple projects and prioritize tasks in fast-paced communication environments?
Information Use	16. What information-use skills (e.g., research, analysis, interpretation, organization) are essential for effectively communicating life sciences topic

Section	Questions
Communication skills	17. What are common gaps you see in new hires' ability to locate, organize, and use information efficiently for communication purposes?
	18. What tools or methods do you use to organize and present data effectively to diverse audiences?
	19. What communication techniques (e.g., storytelling, graphic design, visual media, non-verbal cues) do you rely on most to engage with your audience?
	20. What challenges do you observe in new hires' ability to use these specialized communication skills in practice?
	21. From your perspective, what strategies would best help students develop specialized communication skills before entering the workforce?
Systems thinking	22. How does understanding life sciences systems (e.g., research processes, regulatory requirements) enhance communication effectiveness in your role?
	23. What gaps do you see in new hires' ability to think systematically and understand the interconnectedness of life sciences systems?
	24. What should students learn about systems thinking to understand the complexities of communication environments?
Technology use	25. What are the most important technology tools (e.g., data visualization software, social media platforms, analytics tools) you use in life sciences communication?
	26. What challenges do you notice in how new hires adapt to or effectively use these technologies in their roles?
	27. How important is it for communicators to understand emerging technologies, like AI or machine learning, to accurately convey scientific advancements?
Wrap-Up	28. We have discussed a range of skills across various categories. In your opinion, what key skills should students already possess when starting a job, and what skills should they expect to develop on the job?
	29. Is there anything else you would like to add about how we can better prepare students for careers in life sciences communication?

Sample

We conducted an online search to identify agricultural and life sciences organizations in the Mid-Atlantic region and used their websites to determine whether they had communications or marketing professionals. We defined agricultural and life sciences organizations as institutions or organizations involved in food, agricultural, environmental, biological, or health sciences.

This definition aligned with the interdisciplinary scope of the life sciences communication major and informed our participant recruitment strategy.

For each organization, we used a Microsoft Excel spreadsheet to gather the organization's name, location, the name(s) of relevant professionals, and their email addresses. When multiple communications professionals were listed, we selected the highest-ranking individual. We contacted 25 professionals and 12 agreed to participate. Although we sent reminder emails to increase participation, 12 professionals ultimately participated. Our analysis indicated that data saturation had been reached, as no new codes or themes emerged half-way through the interviews. The dataset was rich in addressing the research questions; therefore, the final sample of 12 was deemed appropriate. Participants represented organizations based in Virginia, New York, and Maryland. We assigned pseudonyms to ensure confidentiality (Subedi, 2025; Itzik & Walsh, 2023; see Table 2). Most participants had between four months and 11 years of experience in their professional roles.

Table 2

Professional Characteristics of Interview Participants

No.	Pseudonym	Communication Field	Years of Experience
1	Belinda	Food and agricultural research	2
2	Jane	Seafood and aquaculture research	1
3	Sonia	Life sciences	6
4	John	Environmental and natural resources	4 months
5	Frank	Agriculture and life sciences	1
6	Patricia	Life sciences	10
7	Ivy	Poultry and animal agriculture	4
8	Mabel	Agricultural research and Extension	14 months
9	Nancy	Local food systems and sustainability	4
10	Patrick	Agriculture and life sciences	7
11	Moses	Human nutrition, food, and health	1
12	Gloria	Cooperative Extension and horticulture	3

Data Collection

The study was approved by the Virginia Tech Institutional Review Board on November 21, 2024 (#24-1265). We sent an invitation email to 25 professionals, followed by a reminder email one week later unless they responded to the initial message. Twelve agreed to participate, and we identified a mutually convenient time to schedule the interviews. One researcher (YA) conducted all 12 interviews via Zoom, each lasting between 45 and 60 minutes. Data collection occurred between December 2024 and March 2025. One week prior to each interview, we sent participants the interview questions and informed consent documents, allowing them time to review the materials and prepare accordingly. With participants' consent, we audio-recorded each interview and took detailed notes to support accuracy during the transcription process.

Data Analysis

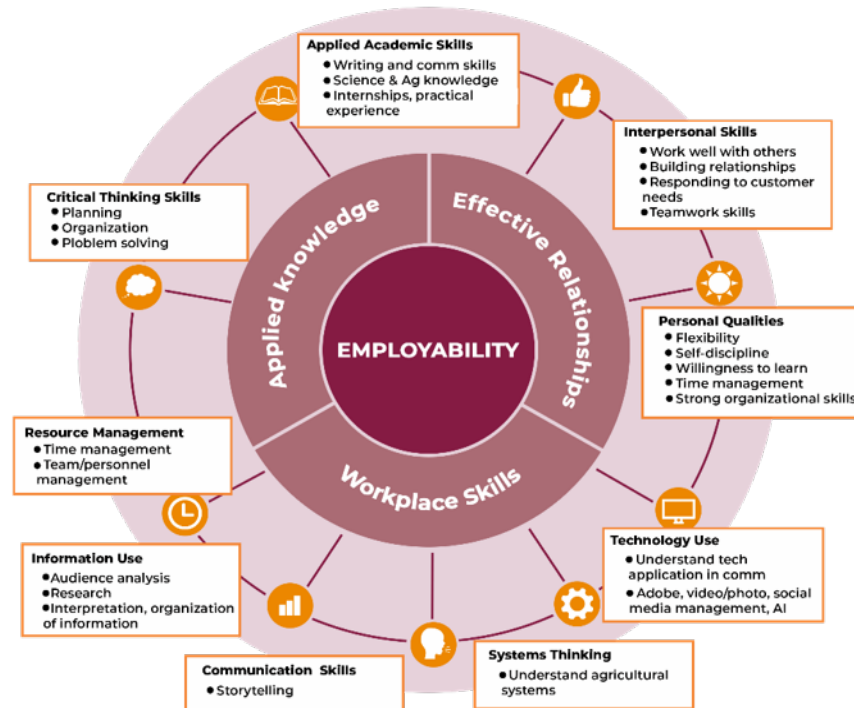
Prior to data analysis, the same researcher who conducted the interviews (YA) prepared verbatim transcriptions of each interview and imported the transcriptions into ATLAS.ti for coding and thematic analysis. Two researchers (YA and JS) jointly coded the data and held regular peer debriefing sessions to enhance the credibility and trustworthiness of the findings (Lincoln & Guba, 1985). Thematic coding followed a deductive approach guided by the Employability Skills Framework. We coded the data using the predefined domains and associated skills categories of the Employability Skills Framework and iteratively refined the codes through multiple readings of the transcripts while comparing patterns across cases to identify both shared and divergent perspectives among participants (Braun & Clarke, 2006). To ensure analytic rigor and coherence in theme development, we discussed discrepancies in coding and came to collaborative resolutions.

Findings

Our findings provided evidence of all skills within the Employability Skills Framework on applied knowledge (i.e., applied academic skills, critical thinking skills), effective relationships (i.e., interpersonal skills, personal qualities), and workplace skills (i.e., resource management, information use, communication skills, systems thinking, technology use) (see Figure 2).

Figure 2

Competencies Associated with Applied Knowledge, Effective Relationships, and Workplace Skills Identified from Participants



Note. Adapted from the U.S. Department of Education Office of Career, Technical, and Adult Education, 2018, <https://cte.ed.gov/initiatives/employability-skills-framework>.

Applied Knowledge

Applied Academic Skills

Participants stressed the significance of *applied academic skills* above all else. They mentioned having either a strong science foundation but limited communication training, or a communication background with less formal science preparation. As Jane explained:

I find you often have one of two backgrounds: either a strong science foundation but limited professional outreach and communication skills, or a degree in communications with less formal science education, where you are learning science both for personal understanding and to communicate effectively to others. I think merging the two could be beneficial, perhaps by having a student take a life science biology class alongside a communications class and learning how to combine them.

This recurring point emphasizes the need for academic preparation that systematically integrates both disciplinary fields.

Additionally, participants highlighted the importance of practical classroom learning and internships as opportunities to turn academic training into real-world experiences. Ivy emphasized this, stating the following:

Communication is a very hands-on kind of job. And probably students would benefit from gaining experience in a range of different fields. So, if there could be a semester organized where students shadow communications professionals or undertake short-term internships or similar opportunities, I think that would be very beneficial.

Again, admitting that strong writing skills were essential for the work they do, participants agreed new hires often lacked it and even for those who had it, the quality was poor. However, these new hires at the same time possessed great design skills, something the participants lacked when they entered the industry. John stated:

I've always placed a strong emphasis on quality writing, because if you don't know how to write, you're not going to be able to design things well, in my opinion, because you're not going to have to write words on the pages. You're not going to be able to really do a correct audience analysis. You could probably do some data visualization, but writing is something that having worked in this field over nearly a decade now, I've seen it decline, the quality of writing decline for people entering the workforce dramatically of the last few years to where sometimes this is not even usable material, which has been disappointing to see.

Patrick further explained "the new hires have been pretty good with video like honestly, they've been decent at video right off the get-go. Their graphic design skills are pretty decent." Nancy added, "a little bit of background and graphic design is fantastic. I didn't have a lot. I learned from my graphic designer at the TV station. She taught me so much."

Lastly, participants noted how their educational background prepared them with necessary transferable skills, which helped them demonstrate versatility and the ability to adapt quickly in the industry. Sonia said the following about her experience:

That's why I think this program is unique because when I started my career, I was at another advertising agency, but they only focused on biotech and healthcare and I had a lot to learn about the different rules and regulations, what you can and cannot say, how you like all of the different process and approval processes for drugs and things like that. I think my education did a great job of preparing me for the fundamentals of public relations, marketing, and advertising. But then I learned most of the life sciences component on the job and doing it.

Critical Thinking Skills

Participants largely agreed *critical thinking* was essential to the success of their work as communications and marketing professionals. They identified the ability to manage multiple projects with good planning and organizational skills, thinking strategically, and teamwork,

which most saw as necessary to get things done effectively and efficiently. Frank gave an example from his work:

Alright, we have like a small idea—a nugget of an idea. We want to develop it into something bigger and that usually leads to having a conversation with someone else. What is the true impact or the implications of this thing that we're sharing? [...] It's like, how do we get an outside person to, say, talk about the significance of our work? [...] We're so often talking about ourselves and what we're doing, but it adds validity and value when you can bring in outside folks to help you tell that story.

Effective Relationships

Interpersonal Skills

Participants highlighted numerous instances where *interpersonal skills* were vital to their roles, recognizing them as essential competencies for agricultural communicators. These included the ability to work effectively with others, build relationships, respond to customer needs, and, most notably, teamwork skills. Belinda illustrated the importance of teamwork in her practice, stating:

I often reach out to my communications team in [City], and I will say, hey, I have this great idea for a story. Do you think it would be better to present this as a news article, share it on social media, and include it in the newsletter? Or would you just put this on social media? So, I think that when I look at the bigger picture, it is helpful to get feedback to know more specifically where to target that story. It helps me put it together for the right outlet.

Similarly, Moses emphasized the collaborative nature of teamwork, noting:

Teamwork is important because you are not going have the same strengths as people you are working with, especially as a communicator with a scientific background. You are not going to have a lot in common with someone who is a marketer or someone who is a journalist working for, you know, a TV news station.

Together, these insights emphasize the central role of teamwork in agricultural and life sciences communication, where diverse yet interconnected skillsets enable professionals to compensate for individual limitations and collectively enhance communication outcomes.

Personal Qualities

Participants described the need for academic training along with *personal qualities* such as prioritization, flexibility, self-discipline, willingness to learn, time management, and strong organizational skills as essential for science communicators. Belinda stated, “for any new

graduate, regardless of the role, it is simply about being open, adaptable, and continuously striving to improve what you already know, and your skill set, and to use it to the best of your ability.” Other participants echoed this view by discussing the importance of ongoing learning and adaptability in the field. They stressed science communication is a dynamic profession influenced by changing technologies, shifting audience expectations, and the continuous emergence of new scientific knowledge. Therefore, the ability to stay responsive, pursue lifelong learning, and continually improve one’s skills was described as not only beneficial but vital for ongoing effectiveness and professional development. Belinda further explained:

And I also think for new hires in general in a role like this, it’s just um technology is constantly challenging you. It’s always changing um the social media platform and the way people want to receive their information daily and just being um, again, flexible and adaptable and willing to constantly be a work in progress. If you can ever get ahead of all of the technology, but at least, you know, understanding the tools that are available to you at any given time and how to use those most efficiently.

Sonia added, “digital is changing so much all the time. And so important to stay up-to-date on trends. So, take some courses here and there, but that’s really, that’s it for the most part.” Similarly, Ivy stated:

I would say a challenge is that the media industry is like constantly changing, so encouraging students to stay connected to training programs and reach out to mentors, you know, just like kind of share that expectation that it’s going to keep on changing and you should be prepared to keep changing with it.

Workplace Skills

Resource Management

Participants described *resource management* as contributing immensely to their role as communication professionals in the agricultural and life sciences industries. They articulated time management, managing materials, the use of technology to organize and prioritize tasks for effective communication, and the awareness of available resources to aid their communication activities. Of these, the use of technology to organize and maximize the use of time and prioritize activities stood out amongst their responses. Belinda explained her approach:

Definitely making calendar systems, anything like that for like time management, um I know like my team in [City], we use teams to like quickly to chat with each other. That’s been super helpful for me because I’m off campus. Um but I know I work here in my office with a big white board, and I make lists and have a paper calendar as well as my outlook calendar. And then I have other team members who like having everything on their phones.

Information Use

Participants consistently emphasized the importance of *information use* skills, especially research, interpretation, organization, and, most critically, audience analysis. They explained that the dissemination of information holds little value unless communicators can effectively analyze and understand their audiences. Sonia said, “we want to make sure that we know who our target audiences are whenever we are doing any kind of communication plan or digital plan.” Similarly, some participants acknowledged how challenging it is for non-science audiences to appreciate complex scientific discoveries and stressed the need to train students with practical communication skills to navigate such complexities. Patricia spoke from her experience:

Knowing different audiences and being able to tailor information to them is one thing, which new hires who come in with a very strong technical life sciences background lack. They are unable to translate information into a way that people with non-scientific or non-technical backgrounds can understand. That is a struggle, so I would say just that ability to take complex information and make it digestible for non-technical audiences is key.

Communication Skills

Beyond traditional communication skills such as writing, public speaking, and visual communication, participants consistently highlighted storytelling as a key *communication skill*. Patricia emphasized this, noting to be an effective communicator:

You need to be able to, you know, say things in a way that captivates people and then adapt it to your audience, and you know, think about what imagery or graphics would go along with it. It always comes back to storytelling and then you must be able to take that story and tell it in multiple different channels.

Like Patricia, Ivy echoed the power of storytelling, describing it as “foundational level of everything,” meaning if communicators get their storytelling wrong, it affects their ability to effectively communicate to their audience. Moses also emphasized the importance of storytelling to encourage audience engagement by promoting connection between communicators and audiences and capturing and sustaining the audience’s interest. He explained the following:

Everyone loves a good story. If you’re able to tell something to someone in a way that grabs their interest and you know in a way that takes them on a journey and they can see, you know, the way this is interacted with the world. [...]. It’s hard to beat the way that draws people in. So, whether you’re writing, whether you’re posting on social media, whether you’re, you know, editing a long form video, you want to make sure that you’re telling a story.

Systems Thinking

Participants did not have a full understanding of what *systems thinking* meant. Further explanation had to be provided before they could appreciate the concept and provide the needed

response. While some did not respond, those who did believed having a good understanding of the industry as a system, appreciation of food systems for communication, learning relevant systems in school, and familiarity with the rules and regulations governing the life sciences industry is key. As Moses noted:

If you understand the process, um, it's a lot easier to explain that process to other people. You know the way the research is being conducted, the way the data is stored, or the way it is read and translated—when you understand that it makes you a much better communicator or much better person to share that information because you're not just repeating words you've heard, you're able to tailor that to the audience or to the person you're speaking to. Understanding the way the work in your environment is done makes you a better communicator because it allows you to share it in your own words in the way that makes more sense to you and the person you're talking to.

Technology Use

Participants described *technology use* as central to their communication roles, emphasizing both the necessity of understanding how technology is applied to communication needs and the challenge of keeping pace with its continual evolution. Tools such as Adobe Creative Suite and Canva were frequently recognized as essential competencies for new communication recruits. Patricia stated, “Adobe Creative Suite is a tool that I would say all new hires should be familiar with in the communication field,” highlighting the importance of graduates entering the workforce already proficient with key technical design software.

Additionally, participants identified a wide range of digital tools as essential to their work, including social media platforms, website management tools, data analytics software, newsletter and email systems, and social media management platforms such as Hootsuite. Many also highlighted the increasing importance of AI in communication roles. They underscored the need to understand both the appropriate uses of AI and its potential limitations. Participants explained AI should not be seen as a substitute for creative or critical thinking but rather as a tool to improve efficiency and audience engagement. Sonia discussed their growing use of AI in their communications roles and their focus on using it the “right” way, stating:

[AI is] so, so important. I discuss AI on every client call at the moment. I believe it is crucial to understand how to utilize AI in emerging technologies to perform tasks more efficiently, rather than relying solely on it. So, with ChatGPT, for example, I advise my team to use it appropriately. We want to use ChatGPT to help brainstorm ideas or to check a post for grammar and typos, tasks that can consume a lot of your time. But what we avoid relying on it for is creative thinking, critical thinking, or confidential and compliant information. I digressed a bit, but understanding how to use it is very important for us. And I believe it can do much good, but we must exercise caution with it.

Other participants echoed these sentiments, acknowledging both the potential and the difficulties of AI, and ultimately confirming its increasing significance in the communicator's toolkit.

Discussion, Conclusions, and Recommendations

By conducting semi-structured interviews with 12 communications and marketing professionals working in the agricultural and life sciences communication industries, we sought to identify the skills, knowledge, and competencies students need to succeed in the field. The Employability Skills Framework guided our interview questions, as it has been effectively applied in previous studies of agricultural students' career preparedness (e.g., Parrella et al., 2023b). The goal of this study was to inform curriculum development for a new undergraduate major in agricultural and life sciences communication at Virginia Tech, ensuring relevance to professional needs and alignment with industry expectations. This is essential since the success of such programs depends on close ties to industry demands and responsiveness to the needs of stakeholders, employers, and society (Tucker et al., 2003; Weckman et al., 2000). In the discussion, we interpret the findings and their implications for curriculum and programmatic development, which will guide ongoing efforts to shape the new major.

Our findings highlight the importance for agricultural and life sciences communications professionals to have strong writing skills. They must be able to craft effective written messages tailored to their target audiences. This supports earlier research emphasizing writing proficiency as essential for success in the field (Bailey-Evans, 1994; Cannon et al., 2016; Goss & Irlbeck, 2009; Irlbeck & Ackers, 2009; Miller et al., 2015; Morgan, 2014; Morgan & Rucker, 2013; Sprecker & Rudd, 1998; Terry & Bailey-Evans, 1995; Watson, 2009). The findings further revealed the declining quality in the writing abilities of new hires; an area they agreed the curriculum should pay very close attention to.

Although some participants acknowledged that they lacked skills in graphic design, photography, videography, social media, and other creative areas and had to learn them on the job, they observed new hires generally enter the industry with strong visual communication abilities. This suggests that the curriculum we are developing should cultivate students' creative design skills and emphasize the central role of writing in effective visual communication (Corder & Irlbeck, 2018; Goss & Irlbeck, 2009). Incorporating writing-intensive assignments across multiple courses, paired with visual or digital deliverables, could help students combine strong writing with creative work, enabling them to practice storytelling across multiple channels as part of a comprehensive communication strategy (Kurtzo et al., 2016; Morgan, 2014).

Furthermore, participants reinforced the value of students studying agricultural and life sciences communication, gaining foundational knowledge in both communication and agricultural/life sciences disciplines. Some participants entered the field with backgrounds in only one area—agriculture, communications, or another unrelated discipline—and believed that students pursuing careers in agricultural and life sciences communication would benefit from coursework in both areas. Other studies have similarly discussed the importance of dual knowledge for students entering the industry (Doerfert & Miller, 2006; Morgan & Rucker, 2013; Cannon et al., 2016; Kurtzo et al., 2016; Corder & Irlbeck, 2018). Therefore, having students connect their applied communications coursework and assignments with subject matter knowledge they gain in agricultural and life sciences core courses could strengthen their credibility, improve their confidence, and better prepare them to address contemporary issues facing the sector (Dyment, 2022; Tedrick, 2009; Telg & Irani, 2012; Warwick et al., 2021).

To bridge the gap between theory and practice, participants stressed the importance of internships to apply communication skills in real-world settings. Their views align with those from earlier studies about how internships provide students with direct industry experience and practical exposure (Cannon et al., 2016; Corder & Irlbeck, 2018; Morgan, 2010; Morgan & Rucker, 2013; Terry et al., 1994). At Virginia Tech, the new Bridge Experience Program addresses this need by requiring all undergraduate students to complete an experiential learning opportunity, connecting disciplinary knowledge with real-world application. Anecdotally, not all majors at other universities have such a requirement, however, although internships are often encouraged, many students still graduate without them. Our findings point to the importance of building strong relationships with industry partners in the region so that we can provide students with meaningful experiential learning opportunities to meet the Bridge Experience Program requirement (Jackson, 2015; Kainer & Leggette, 2023). For agricultural and life sciences communication programs at other universities, these findings also emphasize the value of integrating structured experiential components, such as internships, cooperative education (co-op) programs, or applied projects with community partners into the curriculum to help students gain both professional experience and industry exposure before graduation (Crawford et al., 2011; Finch & Crunkilton, 1999).

Moreover, our findings highlight the importance of teamwork and interdisciplinary collaboration in agricultural and life sciences communication. These competencies can strengthen partnerships between scientists and communication professionals. In science communication, interdisciplinary collaboration and partnerships supports the breakdown of complex scientific data into easy-to-understand concepts for non-science audiences who often struggle to interpret scientific findings (Irlbeck and Akers, 2009; Morgan & Rucker, 2013). The importance of transferable skills like teamwork and other interpersonal abilities is critical for effective collaboration and stakeholder engagement in the industry and it should feature prominently in core pedagogical models for the program development through experiential coursework, collaborative and assignments, and partnerships with industry professionals to effectively cultivate this capacity (Bolton, 2015; Corder & Irlbeck, 2018).

The growth in technological tools, such as those powered by AI, has enhanced design capabilities; however, participants believed they also introduced some serious challenges. Overdependence on AI, for example, may reduce creative problem-solving, critical thinking, and the nuanced judgment necessary for effective communication. This suggests the curriculum must prepare students to use these tools thoughtfully and strategically (Bagger, 2024). Preparing graduates for this evolving landscape requires not only teaching technical competencies but also fostering adaptability and ethical judgment so they can leverage AI without sacrificing intellectual and creative rigor (Coetzee & Goede, 2024; Crawford et al., 2011; Finch & Crunkilton, 1999). Developing AI literacy in courses should therefore be a priority, encompassing lessons on the capabilities and limitations of various AI platforms, their practical uses, and ethical considerations. We must teach students, through experiential learning approaches, how to leverage these tools in ways that are appropriate and demonstrate how AI cannot substitute for original, creative thought.

The value of storytelling also emerged as a powerful communications tool, which aligns with Joubert et al.'s (2019) conclusion that effective science communication depends on creating

emotional connections between the communicator and the public to facilitate informed decision-making. Storytelling and audience analysis skills are essential for the success of agricultural and life sciences communicators since these professionals must tailor their narratives to the specific contexts and experiences of their audiences (Park et al., 2021). Therefore, through our curriculum, we must prepare students to tell compelling science stories using a variety of communication modes and channels (Kurtzo et al., 2016; Morgan, 2014). More specifically, students need opportunities to practice crafting science narratives, conduct audience analysis exercises, and receive feedback on how effectively their stories resonate with diverse audiences.

Regarding systems thinking, participants had difficulty grasping the concept. This surprised us, because communication often requires professionals to frame issues within broader ecological, social, and technological systems that influence decision-making. Without systems thinking, communicators may struggle to convey the interconnectedness of scientific issues (Lee et al., 2023). When provided with additional information about systems thinking, some participants acknowledged its importance. This suggests agricultural and life sciences communication professionals may intuitively value systems thinking but may not recognize it as a distinct skill. For curriculum design, systems thinking should be introduced as a distinct concept and showcased as the lens through which science communication occurs in complex environments with dynamic, interacting elements (Kenny & Drysdale, 2009). Through case studies, interdisciplinary projects, and real-world problem-solving activities, the concept can be integrated into courses in ways that allow students to identify, articulate, and apply systems thinking strategies. More broadly, such training would equip students to frame complex science issues in ways that resonate across disciplines and audiences, ultimately enabling more effective communication in an increasingly interconnected world.

Although we interviewed agricultural and life sciences communications in the Mid-Atlantic region and are using the findings to inform curriculum for the new major at Virginia Tech, there are important implications for agricultural and life sciences communications programs across the country. Specifically, our findings support the need for curriculum that balance strong writing skills with visual communication skills, integrate disciplinary knowledge from both agriculture and communication, foster teamwork environments, navigate emerging technologies like AI, strengthen storytelling and audience analysis competencies across communication channels, and introduce systems thinking as a framework for communication about complex science issues. Importantly, programs should also provide meaningful experiential learning opportunities that allow students to apply these skills to real-world communication environments. These priorities may help programs revamp their curricula and better align with evolving industry demands and expectations.

Our study opens the door for future research. We recommend teacher-scholars design and evaluate teaching strategies that promote students' AI literacy, systems thinking, and storytelling skills in agricultural and life sciences communication. Similar to Parrella et al. (2022), who experimentally assessed how paired role-play activities developed agricultural communications students' empathy skills, future studies could apply Kolb's (1984) experiential learning theory to guide students through a structured cycle of thinking (abstract conceptualization), doing (active experimentation), feeling (concrete experience), and reflecting (reflective observation). We also recommend research on how to best prepare students to work effectively in agricultural and life

sciences communication teams. Participants identified teamwork as an essential skill, but it can be challenging for students (Parrella et al., 2023b). Future studies could use experimental, observational, or interview approaches to investigate how capstone courses and other experiential projects might best be structured to provide the training and support needed for students to excel when working in teams. Such research would inform continuous program improvement and expand the broader scholarship of teaching and learning in agricultural and life sciences communication.

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