Do They Believe They Can Communicate? Assessing College Students' Perceived Ability to Communicate About Agricultural Sciences

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Abstract

Meeting the demands of a proficient scientific workforce depends on students' communication skill preparation. To describe students' self-perceptions of their communication skills, we surveyed 315 students in Texas A&M University's College of Agriculture and Life Sciences. Participants noted they were most proficient in their ability to listen effectively and least proficient in asking effective questions. Each communication skill characteristic showed a statistically significant difference before and after college engagement, but we found no statistically significant difference in the overall communication scores of students. Therefore, we recommend: 1) interviewing employers to understand their perceptions of entry-level employees; 2) investigating when students transition from false sense of confidence to actual confidence; 3) conducting a longitudinal study to investigate students' perceptions of communication skills throughout their college experience; 4) evaluating faculty's communication teaching methods across disciplines; and 5) investigating the influence of self-reflection on students' attained communication skills. Conducting such studies could lead to stronger connections between the academy and the industry, especially as faculty strive to align their teaching with needs of the industry.

Keywords: communication; writing-intensive courses; communication skills; higher education; scientific and technical industries; workforce development

Introduction

The food, agriculture, natural resources, and human (FANH) sciences are closely associated with global issues—including climate change, energy security, food production and safety, human health and nutrition, and national security (Association of Public Land Grant Universities [APLU], 2009; Von Braun, 2018). A United States Department of Agriculture and Purdue University report stated that nearly 57,900 annual jobs for college graduates with degrees in FANH sciences will need to be filled between 2015 and 2020 (Goecker, Smith, Fernandez, Ali, & Goetz Theller, 2015). However, an estimated 35,400 graduates will enter the workforce annually with degrees from the FANH sciences,

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leaving a 39% gap in qualified applicants with relevant degrees (Goecker et al., 2015). Not proactively filling the FANH sciences void could leave the United States in a vulnerable state without having an adequate supply of qualified individuals to lead the agricultural industry (Von Braun, 2018).

In addition to filling vacant positions, higher education institutions are charged with ensuring FANH college graduates receive the human capacity development needed to address agriculture's critical challenges (APLU, 2009). One element of human capacity development is the ability to communicate effectively (APLU, 2009; Doerfert & Miller, 2006). Meeting the demands of a proficient and professional scientific workforce depends on students' communication skill preparation inside and outside of the classroom (Gerstein & Friedman, 2016; Pelger & Nilsson, 2018). Ensuring college graduates possess the communication skills employers desire is essential to addressing priority three— a sufficient scientific and professional workforce—of the American Association for Agricultural Education National Research Agenda (Stripling & Ricketts, 2016). Although addressing the need for proficient communication skills in scientific and technical fields is not new (Pelger & Nilsson, 2018; Radhakrishna & Bruening, 1994; Robinson & Garton, 2008), the evolving workforce and consumers' desire for instant, accurate information has emphasized the need to find unique ways to teach students effective communication (Doerfert & Miller, 2006; Robinson, Garton, & Vaughn, 2007). As industry and academia continue to interweave their efforts and work to develop an integrated system that includes two-way communication regarding workforce preparation, higher education institutions need to shape and reshape their course offerings (Gibson & Sodeman, 2014).

Much of the FANH communication skill development—not specific to agricultural education—is delivered through hands-on, on-the-job training programs (Alston, Anderson, English, & Wakefield, 2018; Hendrix & Morrison, 2018; Leggette, Sitton, & Blackwell, 2011; Scanlon & Baxter, 1993). Pelger and Nilsson (2018) stated integrating communication components across disciplines could lead to a clearer understanding of science, which requires university faculty and administrators to enable a holistic approach to science communication. Therefore, to proactively teach communication skills specifically to improve technical fields and students' communication skills, universities began integrating communication components and trainings into existing curricula and creating a communication-in-disciplines program that encourages students to not only understand science but also communicate it (Pelger & Nilsson, 2018; Rodgers et al., 2018).

For example, in 2008, Texas A&M University administrators reshaped the core curriculum to target six skills to prepare students to be successful in college, communities, career goals, and life. Those six skill areas include communication, critical thinking, quantitative skills, teamwork, personal responsibility, and social responsibility (Texas A&M University, 2018b). Namely, to prepare students for workforce communication, Texas A&M University administrators integrated communication- and/or writing-intensive courses across disciplines. To graduate, all students must pass at least two communication- and/or writing-intensive courses specific to their major and taught by faculty in their discipline (Texas A&M University, 2018b). If a course outside of a student's degree plan is relevant to the discipline, each department may request that students complete courses outside of their department (Texas A&M University, 2018b). However, each communication- and/or writing-intensive course should include components targeting "oral, aural, written, and visual literacy skills that enable people to exchange messages appropriate to the subject, occasion, and audience" (Texas A&M University, 2018b, para. 14).

Although communication- and/or writing-intensive course instructors have flexibility on most content taught within the courses, Texas A&M University administrators outlined a few key components each course should contain to maintain consistent rigor (Texas A&M University, 2018b). Communication-intensive courses must: "a) be offered for at least one credit; b) include writing and public speaking or other oral communication related to the major; c) provide instruction in writing and

speaking and formative feedback that allows improvement of some major assignments; d) base part of the final course grade on writing or speaking quality (at least 25% for a 4-credit course, 33% for a 3-credit course, 50% for a 2-credit course and 70% for a 1-credit course); [and] e) assign at least 1,250 words of finished, graded writing and 5 minutes of oral communication" (Texas A&M University, 2018b, para. 9). Likewise, writing-intensive courses must: "a) be offered for at least one credit; b) include writing assignments related to the major; c) provide instruction in writing and formative feedback that allows improvement of some major assignments; d) base part of the final course grade on writing quality (at least 25% for a 4-credit course, 33% for a 3-credit course, 50% for a 2-credit course, and 70% for a 1-credit course); and e) include at least 2,000 words of finished, graded writing" (Texas A&M University, 2018b, para. 8).

A common component of the Texas A&M University communication- and/or writing-intensive courses is critical thinking. An effective communicator engages critical thinking skills to communicate scientific knowledge (Bisdorf-Rhoades, Ricketts, Irani, Lundy, & Telg, 2005; Watson & Robertson, 2011) as being effective communicators in science-driven disciplines goes beyond simply understanding the language and using correct grammar (Sprecker & Rudd, 1998). Effective scientific communicators must think critically about connecting their messages to non-technical audiences (Sitton, Cartmell, & Sargent, 2005; Treise & Weigold, 2002). Therefore, because of the scientific nature of the disciplines, industries such as agriculture, business, engineering, medicine, and technology often face barriers when employees attempt to communicate important concepts to consumers (Burbach, Matkin, Quinn, & Searle, 2013; Gibson & Sodeman, 2014).

One step to expanding college students' critical thinking skills is understanding their perceptions of their ability to communicate through self-reflection as understanding self-perceptions provides researchers and educators valuable information related to preparing students for workforce success (Caza, Brower, & Wayne, 2015; Conley & French, 2014; Leggette, Rutherford, & Dunsford, 2015). Self-reflection helps students make meaning of their experiences, learn processes to ground self-efficacy for future experiences (Mezirow, 1990), and refine career interests. It is a critical process if students are to take ownership in developing personal skills, including the ability to communicate (Baram-Tsabari & Lewenstein, 2017; Conley & French, 2014). Effectively applying communication skills can be improved with self-assessments (Leggette, McKim, & Dunsford, 2013). Specifically, in written communications, Leggette et al. (2015) argued not only do students need to understand the writing process and the content, but they must also have the confidence to apply it. The more confident students become in their writing skills, the more they develop their skill sets and writing identities (Fischer, Meyers, & Dobelbower, 2017; Leggette & Jarvis, 2015; Lingwall & Kuehn, 2013). Students with strong communication self-efficacy will likely benefit both personally and professionally (Gibson & Sodeman, 2014).

Theoretical Framework

We used Bandura's (1989) social cognitive theory to guide our study of investigating college students' perceptions of their ability to communicate because human behavior is based on perceptions of personal realities and environments. Bandura's (1989) social cognitive theory is instrumental in helping educators learn how to teach students in ways that help them learn best (Kane, 2015). According to Bandura (1989), a person's cognition is influenced by his or her thoughts prior to a situation, by his or her reaction to the situation, and by his or her reflection on their capability to handle tasks.

Self-reflection is key to Bandura's (1989) social cognitive theory as self-reflection leads to skill development (Dishon, Oldmeadow, Critchley, & Kaufman, 2017). Likewise, students' self-reflections of their communication skills help shape their self-efficacy or their personal, long-term belief about their ability to communicate (Bandura, 1977; Kane, 2015). Although self-reflection can occur in several

ways, it often includes an evaluation of skill levels by way of rating self-perceptions (Pajares, 2003). Therefore, our study described herein operationally defined self-reflection as interpreting perceptions of students' ability to communicate (Mezirow, 1990) based on characteristics outlined in our framework.

Forming positive communication self-efficacy is also crucial for students building self-confidence in their eventual career goals (Lent, Brown, & Hackett, 2002). For example, Conley and French (2014) stated:

> Students with strong motivation and drive, a desire to achieve goals, a belief in their own capacity for success, the ability to reflect on their learning strategies, and a willingness to persist in the face of obstacles can overcome specific shortcomings in English and mathematics content knowledge or obtain the knowledge necessary to succeed. (p. 1019)

Furthermore, preparing college- and career-ready students to have self-efficacy hinges on a students' ability to take ownership of their education (Conley & French, 2014; Elmore, 2012; Perusse, Poynton, Parzych, & Goodnough, 2015). The value of student ownership in learning, both face-to-face and online, is difficult to quantify (Conley & French, 2014) but can be investigated through retrospective self-reflections.

Retrospective self-reflection remains a key element to understanding how students rate their personal abilities (Kane, 2015). Consequently, Lent, Brown, and Hackett (1994, 2002)—guided by Bandura's (1989) social cognitive theory—suggested a new way of approaching career development by seeking to understand a) how students form career interests; b) how students decide on career and academic selections; and c) what makes students perform and persist related to their educational and career goals. One element of helping students form career decisions is encouraging them to self-reflect and take ownership of their career interests (Conley & French, 2014). Moreover, investigating these perceptions at career-related events, such as college career fairs, gives valuable insight to the career-readiness process in a college classroom, and in turn, can help students build confidence in their communication skills (Zikic & Saks, 2009).

Preparing a sufficient, professional, and scientific workforce requires employees to be competent in soft skills (Stripling & Ricketts, 2016). Crawford, Lang, Fink, Dalton, and Fielitz (2011) studied soft skill priority areas, a conceptual framework guiding our study. To ensure the agricultural industry has a qualified workforce, Crawford et al. (2011), in partnership with the University Industry Consortium (UIC) and the APLU, performed a comparative analysis of the soft skills agricultural employers desire in entry-level employees. Following a comprehensive review of employability skills in current literature, Crawford et al. (2011) surveyed current college students, alumni, faculty members, and agricultural industry employers ($N = 8,111$) to identify soft skill priorities for college graduates in agricultural, food, and natural resources.

Employers ranked communication skills as the most important skillset for entry-level employees (Crawford et al., 2011). In their study, Crawford et al. (2011) identified the following as the top seven communication skill characteristics: 1) listening effectively; 2) communicating accurately and concisely; 3) communicating orally; 4) communicating pleasantly and professionally; 5) communicating in writing; 6) asking effective questions; and 7) communicating appropriately and professionally using social media. Because agricultural employers desire proficient communication skills in entry-level employees and faculty members seek to prepare students for careers in the workforce (Crawford et al., 2011), there is a need to understand how students perceive their communication skills and, ultimately, how faculty train students to be successful communicators. Recognizing that students' self-perceptions of their communication skills often correlate with their success and actual ability (Kane, 2015), we sought to investigate students' retrospective self-perceptions of their communication abilities.

Purpose of Study

We sought to identify students' perceptions of how college engagement, which could include completion of communication- and/or writing-intensive courses, influenced their ability to communicate. The following objectives guided this study:

RO1:   Describe and compare the changes in students' retrospective perceptions of their communication skills before and after college engagement, which could have included participation in a communication- and/or writing-intensive course.

RO2:   Compare the changes in students' retrospective perceptions of their communication skills based on their grade level classification.

RO3:   Compare the changes in students' retrospective perceptions of their communication skills based on the number of communication- and/or writing-intensive courses students had completed or were currently completing.

RO4:   Compare students' overall retrospective perceptions of their communication skills before college or enrollment in a communication- and/or writing-intensive course and after.

Method

The study was a component of a federally-funded project to investigate the effectiveness of college students' communication skills in the Texas A&M University College of Agriculture and Life Sciences. Therefore, findings from the study described herein are included in a larger report submitted to the funding agency.

Our descriptive, quantitative study used survey methodology (Dillman, Smyth, & Christian, 2011) with a researcher-developed questionnaire based on Crawford et al.'s (2011) framework. Investigating students' retrospective self-perceptions of their communication skills helped us understand students' perceived ability to communicate (Kane, 2015). The retrospective data collection approach provided a personal insight into students' self-perceived ability to communicate (Zikic & Saks, 2009).

Sample

We collected retrospective data from a convenience sample of students who attended the Texas A&M University College of Agriculture and Life Sciences career fairs in the spring 2017 and fall 2017 ($N = 900$) semesters. Because students who attend career fairs and spend more time participating in career exploration activities are reported to have a higher association with career-related self-efficacy (Zikic & Saks, 2009), we chose to survey students as they entered a career fair environment. We stationed at the career fair registration tables and surveyed students as they entered and exited the career fairs.

The Texas A&M University (2018a) College of Agriculture and Life Sciences had an enrollment of 7,338 students in spring 2018—6,120 undergraduate, 460 masters, and 758 doctoral. The College has 31 undergraduate degrees, 37 master's degrees, 24 doctoral degrees, and six online graduate degrees offered through its 14 academic departments. In 2012–2013, the College had an enrollment of 56% female and 67% white/non-Hispanic (Texas A&M University, 2018a).

Our study had 315 voluntary participants ($n = 315$), yielding a 35% participation rate between the two career fairs. Twenty-one percent ($f = 65$) of the participants were 21 years old. Of those, 60%

(f = 188) were female and 34% (f = 107) were college seniors. Participants represented all 14 departments in the College with 24% (f = 77) representing the agricultural economics department. Fifty-seven percent (f = 180) of participants had completed or were currently completing one or more communication- and/or writing-intensive course (Table 1).

Table 1

Participants' Demographic Characteristics as they Relate to Age, Gender, Classification, and Department (n = 315)

Characteristic	F	%
Age (n = 290)		
18	51	16.19
19	50	15.87
20	49	15.56
21	65	20.63
22	39	12.38
23	12	3.81
24	11	3.50
25+	13	4.13
Classification (n = 314)		
Freshman	70	22.22
Sophomore	44	13.97
Junior	74	23.49
Senior	107	33.97
Graduate Student	19	6.03
Department (n = 315)		
Agricultural Economics	77	24.44
Agricultural Leadership, Education and Communications	61	19.37
Animal Science	52	16.51
Biochemistry & Biophysics	7	2.22
Biological and Agricultural Engineering	9	2.86
Ecosystem Science and Management	3	0.95
Entomology	7	2.22
Horticultural Sciences	4	1.27
Nutrition and Food Science	11	3.49
Plant Pathology and Microbiology	2	0.63
Poultry Science	4	1.27
Recreation, Park and Tourism Sciences	6	1.90
Soil and Crop Sciences	8	2.54
Wildlife and Fisheries Sciences	8	2.54
Other	56	17.78
Enrollment in Communication- and/or Writing-Intensive Course(s) (n = 315)		
0	135	42.86
1	103	32.70
2	64	20.32
3	10	3.17
4+	3	0.95

Table 1

Participants' Demographic Characteristics as they Relate to Age, Gender, Classification, and Department (*n* = 315) *Continued…*

Gender (*n* = 313)		
Female	188	59.68
Male	125	39.68

Note. Percentages do not equal 100% because they do not include students who did not complete all demographic questions. Students selected their primary department. Frequencies do not reflect students' primary and secondary departments.

Procedures

We developed our questionnaire using Crawford et al.'s (2011) framework of seven communication skill characteristics as constructs. The questionnaire included 19 close-ended questions (i.e., dichotomous, Likert-type scale, interval scale, and categorical) to assess communication skill characteristics and participant demographics. The questions were designed to address communication needs highlighted in the literature and the communication needs of the federal funding agency.

Based on constructs provided by Crawford et al.'s (2011) framework, our questionnaire included a five-point, Likert-type scale (i.e., 1 = *low ability*; 2 = *mid-low ability*; 3 = *average ability*; 4 = *mid-high ability*; and 5 = *high ability*) for students to rate their communication skills before college and after engaging in college, which could have included participation in a communication- and/or writing-intensive course. Students who had not enrolled or completed at least one communication- and/or writing-intensive course were asked to rate their communication skills prior to attending college and how they currently perceived their communication skills. Students rated their communication skills based on seven specific communication characteristics outlined by Crawford et al. (2011): 1) listening effectively; 2) communicating accurately and concisely; 3) communicating orally; 4) communicating pleasantly and professionally; 5) communicating in writing; 6) asking effective questions; and 7) communicating appropriately and professionally using social media. Due to a desire to understand students' career readiness throughout their full college experience, we compared students' perceptions of the communication characteristics based on grade classification. We also compared how students' perceptions of their communication skills changed based on the number of communication- and/or writing-intensive courses they had completed or were currently completing.

The questionnaire also included four, close-ended questions to determine student's demographics (i.e., age, gender, classification, and department). After students selected their department, students were directed to a list of the communication- and/or writing-intensive courses offered by their department to select which courses they had completed or were completing, if applicable. We generated the list of communication- and/or writing-intensive courses from the Texas A&M University Writing Center course database. These courses are not service courses taught by agricultural education but, rather, are courses taught by faculty within each specific department. In retrospect, it would have been beneficial to allow an option for students who were double majors to select two departments in the case that students took a communication- and/or writing-intensive course listed in their secondary department. We also did not include a specific question asking students if they had completed or were currently completing a communication- and/or writing-intensive course, which we address further in the limitations section. Rather, we asked students to select courses that they had taken.

We established validity using an expert panel and a pilot study prior to administering the questionnaire at the career fairs. A panel of experts specializing in communications and education assessed content and face validity using Crawford et al.'s (2011) framework (Creswell, 2012). Participants rated their retrospective perceptions of their communication skills using single scale items provided by Crawford et al. (2011). The Cronbach's alpha for the overall communication skill scores before and after was .76.

As students checked in and checked out of the career fairs, we asked them to complete the questionnaires. We gathered a balanced number of responses from participants before and after the career fair. We administered the questionnaires using Qualtrics^{TM} software on four iPads issued by Texas A&M University's Department of Agricultural Leadership, Education, and Communications. Prior to beginning the questionnaire, students completed a statement of consent and we informed them about the scope of the study, their confidentiality, and the benefits to participating in the study. Participants' names remained anonymous as their responses were only associated with their universal student identification number. To maintain confidentiality, we reported aggregate data. We had a few students who completed the questionnaire at both career fairs, and to address this, we retained their initial submission (spring 2017) and removed their second submission.

We analyzed the data using IBM Statistical Package for the Social Sciences (SPSS) Statistics 25.0 for Macintosh^{TM}. We used central tendencies to report descriptive statistics for each of the study's objectives, and we used percentages and frequencies to report nominal data (Creswell, 2012). We also reported ordinal data with means and standard deviations (Creswell, 2012) and used a paired-samples t-test to compare participants' overall communication skills scores (Creswell, 2012). We used a one-way analysis of variance (ANOVA) test to determine statistically significant differences between the participants' overall communication skills scores and the number of communication- and/or writing-intensive courses completed or currently completing. We tested the homogeneity of variance using Levene's test, which was not statistically significant before college engagement ($F = 0.74$, $p = .569$) or after ($F = 0.91$, $p = .456$); therefore, the assumption of homogeneity was met. Because an ANOVA is an omnibus test statistic (Creswell, 2012), we determined a priori to use the Ryan-Einot-Gabriel-Welsh F (REGWF) post hoc test if the global F statistic was significant. Finally, we used an independent samples t-test to compare the overall communication skills scores between the participants who reported completion of at least one communication- and/or writing-intensive course and those who had not (Creswell, 2012).

Limitations

We believe this study had three primary limitations. First, the study used retrospective data collection on a convenience sample. According to Nickson (2017), retrospective responses can sometimes be prone to participant recall and selection bias, specifically when asking students to reflect on their experiences in a course after varying lengths of time. As such, asking students to recollect their perceptions of their communication skills before college might not provide a clear indicator of their confidence in their communication skills at that time. Nevertheless, because we were interested in understanding students' perceptions of their ability to communicate, retrospective data collection best fit our research purpose and objectives as it is beneficial for helping establish causal relationships to build hypotheses for future studies (Nickson, 2017).

Second, the questionnaire had students report which communication- and/or writing-intensive courses they had taken or were currently taking, but we did not include a specific question for students to denote, which course(s), if any, that they were currently completing. To describe students' retrospective perceptions of their communication skills effectively, it would be helpful to investigate findings from students who had completed a course and who were currently completing a course. As

such, we recommend investigating students' perceptions of their communication skills in the mid-semester as well as before and after taking a communication- and/or writing-intensive course to separate these findings.

The third limitation was a refined list of communication skill characteristics for students to rate their abilities. We designed our study to describe students' perceptions of communication skills based on the seven characteristics Crawford et al. identified in 2011. Certainly, these seven characteristics are not an inclusive list of indicators representing the ability to communicate. However, we established content validity using a panel of experts within communications.

Therefore, because this study was descriptive and specific to Crawford et al.'s (2011) framework, much of the inference from these findings are limited to this population and cannot be generalized. Even still, in an effort to align our curricula and research with the needs of employers in FANH sciences, Crawford et al.'s (2011) framework best fit our needs for addressing communication characteristics employers' desire in entry-level employees.

Results

We used four objectives to display the results of the study.

Objective 1: Description and Comparison of Retrospective Perceptions of Communication Skills

When comparing each communication skill characteristic, participants noted they were most proficient in listening effectively with a *mid-high ability* before (M = 3.93; SD = 0.88) and a *mid-high ability* after (M = 4.36; SD = 0.76) college engagement, which could have included participation in a communication- and/or writing-intensive course. Participants noted they were the least proficient in asking effective questions with an *average ability* before (M = 3.14; SD = 0.99) and a *mid-high ability* after (M = 4.12; SD = 0.82) college engagement. However, participants perceived they improved the most in their ability to ask effective questions before (M = 3.41; SD = 0.99) and after (M = 4.12; SD = 0.82) college engagement, ending with a *mid-high ability* to listen effectively.

When comparing how students' retrospective self-perceptions of their communication skills changed, participants indicated statistically significant improvement for each of the seven communication skill characteristics before and after college engagement (Table 2).

Table 2

Students' Retrospective Self-Perceptions of Communication Skills Before and After College Engagement, Which Could Have Included Participation in a Communication- and/or Writing-Intensive Course (n = 315)

		Before College		After College					
								p-value	
Characteristic	*f*	*M*	*SD*	*M*	*SD*	*t*	*df*	value	*r*
Listening Effectively	315	3.93	0.88	4.36	0.76	-8.82	314	< 0.001	0.46
Communicating Accurately and Concisely	315	3.65	0.94	4.26	0.73	-12.78	314	< 0.001	0.51

Table 2

Students' Retrospective Self-Perceptions of Communication Skills Before and After College Engagement, Which Could Have Included Participation in a Communication- and/or Writing-Intensive Course (n = 315) Continued…

Communicating Orally	315	3.60	1.01	4.19	0.80	-12.07	314	< 0.001	0.57
Communicating Pleasantly and Professionally	315	3.68	1.01	4.32	0.73	-12.88	314	< 0.001	0.53
Communicating in Writing	315	3.62	1.05	4.24	0.81	-11.82	314	< 0.001	0.52
Asking Effective Questions	315	3.41	0.99	4.12	0.82	-15.14	314	< 0.001	0.59
Communicating Appropriately & Professionally Using Social Media	315	3.62	1.12	4.24	0.85	-11.82	314	< 0.001	0.57

Note. p < .05. (0.00–1.50 = low ability; 1.51–2.50 = mid-low ability; 2.51–3.50 = average ability; 3.51–4.50 = mid-high ability; and 4.51–5.00 = high ability).

We used a paired samples t-test to compare participants' overall communication skills scores and found a statistically significant difference ($t(315)$ = -17.63, $p < 0.001$, $r = 0.62$) between participants' overall communication skills score (an average of the seven communication skill characteristics) before and after college engagement.

Objective 2: Comparison Based on Grade Level Classification

Students in each classification (i.e., freshman, sophomore, junior, senior, and graduate) perceived they had a *mid-high ability* to communicate before and a *mid-high ability* to communicate after college engagement, which could have included participation in a communication- and/or writing-intensive course. When comparing the overall communication skills scores (an average of the seven communication skill characteristics) among the classifications, freshmen students retrospectively rated their communication skills the highest before college engagement with a *mid-high ability* ($M = 3.69$; $SD = 0.80$) to communicate. Seniors retrospectively rated their communication skills the lowest before college engagement with a *mid-high ability* ($M = 3.54$; $SD = 0.78$). After taking at least one college course, graduate students retrospectively rated their ability to communicate the highest with a *mid-high ability* ($M = 4.39$; $SD = 0.50$) to communicate (Table 3).

Table 3

Students' Retrospective Self-Perceptions of Communication Skills by Classification (n = 314)

		Before College		After College	
Classification	*f*	*M*	*SD*	*M*	*SD*
Freshman	70	3.69	0.80	4.09	0.74
Sophomore	44	3.66	0.78	4.13	0.60
Junior	74	3.69	0.67	4.27	0.56
Senior	107	3.54	0.78	4.35	0.56

Table 3

Students' Retrospective Self-Perceptions of Communication Skills by Classification (*n* = 314) *Continued…*

Graduate Student	19	3.75	0.70	4.39	0.50
Total	314	3.64	0.75	4.25	0.61

Note. Questionnaire used a five-point, Likert-type scale (0.00–1.50 = *low ability*; 1.51–2.50 = *mid-low ability*; 2.51–3.50 = *average ability*; 3.51–4.50 = *mid-high ability*; and 4.51–5.00 = *high ability*) to retrospectively assess students' self-perceptions of communication skills. Frequencies and percentages do not reflect non-completer(s).

Objective 3: Comparison Based on Course Completion

We separated students based upon the number of communication- and/or writing-intensive courses reported. When comparing the overall communication skills scores (an average of the seven communication skill characteristics) among the number of courses completed or currently completing, students who reported not completing a communication- and/or writing-intensive course rated themselves the highest with a *mid-high ability* (*M* = 3.72; *SD* = 0.77) to communicate. Students who completed or were completing at least four communication- and/or writing-intensive courses retrospectively rated their communication skills the highest with a *high ability* (*M* = 4.67; *SD* = 0.30) to communicate (Table 4).

Table 4

Students' Retrospective Self-Perceptions of Communication Skills by Reported Enrollment in Communication and/or Writing-Intensive Courses (*n* = 315)

		Before College		After College	
No. of Courses	*f*	*M*	*SD*	*M*	*SD*
0	135	3.72	0.77	4.23	0.58
1	103	3.52	0.74	4.18	0.67
2	64	3.65	0.72	4.33	0.57
3	10	3.71	0.98	4.47	0.77
4+	3	3.95	0.86	4.67	0.30

Note. Questionnaire used a five-point, Likert-type scale (0.00–1.50 = *low ability*; 1.51–2.50 = *mid-low ability*; 2.51–3.50 = *average ability*; 3.51–4.50 = *mid-high ability*; and 4.51–5.00 = *high ability*) to retrospectively assess students' self-perceptions of communication skills.

Objective 4: Comparison Based on Reported Engagement in Communication- and/or Writing-Intensive Courses

We expanded our investigation of overall communication skills scores (an average of the seven communication skill characteristics) by comparing participants based on the number of communications- and/or writing-intensive courses they reported (i.e., 0, 1, 2, 3, or 4+). We did not find a statistically significant main effect for students' average communication skills before or after college engagement, which could have involved participation in a communication- and/or writing-intensive course ($F(4, 310) = 1.25$, $p = 0.288$, $\eta^2 = 0.02$) or after ($F(4, 310) = 1.25$, $p = 0.288$, $\eta^2 = 0.02$; Table 5). Because the global F tests were not statistically significant, post hoc tests were not warranted (Creswell, 2012).

Table 5

Summary of ANOVA Between the Average Communication Skills Before and After College Engagement, Which Could Have Involved Participation in a Communication- and/or Writing-Intensive Course

		Sum of Squares	df	Mean Square	F	Sig.*
Average Score Before	Between Groups	2.85	4	0.71	1.25	0.29
	Within Groups	176.35	310	0.57		
	Total	179.20	314			
Average Score After	Between Groups	1.91	4	0.48	1.28	0.28
	Within Groups	115.93	310	0.37		
	Total	117.84	314			

Note. $*p < 0.01$

We also performed an independent samples t-test to compare the overall communication skills scores between the participants who had completed at least one communication- and/or writing-intensive course ($f = 180$; $M = 4.26$; $SD = 0.64$) and those who had not ($f = 135$; $M = 4.23$; $SD = 0.58$). We did not find a statistically significant difference ($t(313) = -3.07$, $p = 0.76$).

Conclusions, Recommendations, and Implications

Participants' perceived communication skill abilities were similar to the rankings in the Crawford et al. (2011) study. Employers in the Crawford et al. (2011) study ranked listening effectively as the most important communication skill characteristic for new employees, and participants in our study noted listening effectively as their second most proficient communication skill characteristic. Participants perceived they had an *average* to *mid-high ability* to listen effectively before college engagement and had a *mid-high* to *high ability* to listen effectively after college engagement, which could have included completing a communication- and/or writing-intensive course. Although students' perceived abilities to listen effectively improved between their retrospective before- and after-perceptions, it is not possible to determine if students' confidence in their ability to communicate matches their competence. Therefore, this finding warrants future studies as documenting if students' confidence in their abilities aligns with their competence is critical to designing effective communication instruction.

Agricultural industry employers in the Crawford et al.'s (2011) study ranked asking effective questions as the second least important communication characteristic, which is interesting as asking effective questions is an important component to critical thinking and inquisitive thinkers are often more effective writers. In our study, participants noted that their ability to ask effective questions improved the most from an *average ability* before to a *mid-high ability* after college engagement. We believe this is important as an effective communication course should challenge students' thinking and allow them to develop their critical thinking skills. Thus, a communication course that advances students' abilities to ask effective questions enhances the curriculum (Leggette et al., 2015). However, the discrepancies between students' perceived growth in their ability to ask effective questions and employers' lack of emphasis on asking effective questions should be investigated further. For example, Conley and French (2014) claimed that students who value similar priorities as employers are more likely to be career-ready upon college graduation. Therefore, we recommend interviewing employers to compare their perceptions of entry-level employees' communication skill abilities to their

expectations of these employees in the workforce. Such an investigation could help align educators' efforts with employers' expectations for rigorous outcomes of college curricula.

Furthermore, freshmen students retrospectively had higher mean ratings for their communication skills before college engagement. When putting this into context, students often are not aware of what they do not know. Based on our experiences and anecdotal evidence from teaching communication courses for many years, students often have false confidence early in their college careers or early in a communication course. As they progress in their education, students begin to understand effective and efficient communication and gain true confidence in their abilities to communicate. Such ideas have been documented in the literature as well. Elmore (2012) claimed freshmen students are likely to enter college with a false confidence or artificial maturity level, which was further substantiated by Perusse et al. (2015) with the argument that high school graduates often identify their personal and professional goals based on their confidence in their soft skill abilities. Therefore, we recommend investigating when students transition from a false sense of confidence to actual confidence in their communication abilities. To address the study limitation that participants retrospectively rated their perceptions of their communication skills (Nickson, 2017), we suggest conducting a longitudinal study to investigate college students' perceptions of their communication skills throughout their full college experience. Such a study would help us understand the transition from false to genuine confidence.

A critical component of developing rigorous curriculum is understanding students' experiences and opinions about the curricula. This type of study helps us begin to understand the university-wide communication curricula and its potential impact on students' communication abilities. The study reported herein is not without limitation, but we believe it is situated as a starting point for more rigorous curriculum and research studies. Findings from our study will help educators understand how students self-perceive their communication skills when they enter their classroom, which, in turn, can likely help colleges and universities develop rigorous curricula. Robinson and Garton (2008) asserted that students who are self-aware of their communication skills have a stronger edge and are more prepared to enter the workforce.

By understanding students' perceptions and opinions about their preparation for communicating within agriculture, we are not only enhancing the science of agriculture but also developing more effective communicators within the industry. Therefore, we recommend conducting a longitudinal, quasi-experimental study to measure students' communication abilities and skill development. This would extend the research beyond basic perception data and provide strong empirical data to guide communication curricula changes throughout colleges of agriculture.

As colleges of agriculture and life sciences strive to meet the needs of employers within the scientific and technical industries (Pelger & Nilsson, 2018), this research implies that curricula improvement is still needed to advance communication skills. Participants' overall communication scores were not significantly different between students who had reported the completion of or were currently completing a communication- and/or writing-intensive course and those who had not. Looking at this data, perhaps, Texas A&M University communication- and/or writing-intensive courses are not currently effective. Yes, participants who had completed at least four or more courses or were completing their fourth communication- and/or writing-intensive courses had higher mean ratings than students who had completed fewer courses, but the difference was not statistically significant. Therefore, it appears that the completion of more courses does not necessarily equate to a perception of increased communication skills. We recommend evaluating how faculty teach communication skills across different disciplines in Texas A&M University's College of Agriculture and Life Sciences to inform and enhance the current communication curricula. This finding calls us to focus on developing fewer, more rigorous courses rather than adding additional communication courses to the curricula.

Bandura (1989) suggested self-reflection strengthens cognition; thus, we recommend investigating the influence of self-reflection on students' attained communication skills. Baram-Tsabari and Lewenstein (2017) argued self-reflection aids in the learning process and helps students connect lessons taught in the classroom to career-related skills and goals. Subsequently, Kane (2015) also argued self-reflection is an important element to improving communication ability. Therefore, because behavior can be influenced by perceptions of personal realities and environments, we recommend investigating the effectiveness of different reflection strategies to teach Crawford et al.'s (2011) communication skill characteristics.

Our recommendations for practice focus on the application of content-specific, communication skills. To address priority three of the American Association for Agricultural Education National Research Agenda—developing a sufficient scientific and professional workforce (Stripling & Ricketts, 2016)—faculty must teach strategies to strengthen students' abilities to communicate across FANH disciplines (APLU, 2009). Therefore, we recommend agricultural communications educators within Texas A&M University and in the profession work with faculty across colleges of agriculture to help them design and deliver communications curricula that is effective and efficient for both faculty and students. Gerstein and Friedman (2016) postulated that students are more apt to understand the application of communication skills in real-world environments when experiences are supplemented by relevant teaching examples in the classroom (Pelger & Nilsson, 2018). As such, we also recommend agricultural communications faculty partner with FANH industry leaders to provide internship or externship opportunities for students to practice and strengthen communication skills beyond the classroom. These experiences can assist faculty in meeting the needs of FANH employers and allow students the opportunity to build their communication skill repertoire prior to graduation.

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