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The Effect of Emphasizing Credibility Elements and the Role of Source Gender on Perceptions of Source Credibility

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Abstract
Agricultural technology continues to evolve to meet the demands of a growing world, but previous advancements in agricultural technology have been met with resistance. Improved science communication efforts can assist in bridging the gap between expert and lay opinion to improve reception of scientific information. Using the framework of the heuristic model of persuasion, the purpose of this study was to examine the impact of emphasizing elements of source credibility – trustworthiness and expertise – and the gender of the source on perceptions of source credibility. A sample of 122 undergraduate students were exposed to one of the four possible developed message treatments. Data collection took place in a laboratory setting using an online instrument that had a randomly-assigned stimulus research design. The results indicated the treatment conditions had higher mean scores for source credibility than the control. Further inferential analysis, however, showed the differences to be non-significant. One significant finding showed the gender of the source can influence perceptions of credibility. This suggests merit in using female sources when presenting scientific information to the Millennial population. While choosing credible sources to present information is important, more research is needed regarding the effect of emphasizing various credibility components and the role of source gender on perceptions of source credibility.

Keywords
science communication, heuristics, source credibility, gender

Cover Page Footnote/Acknowledgements
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Introduction

Mariette DiChristina, editor in chief of *Scientific American*, said "Our nation's ability to handle today's pressing issues, from providing energy security to curing illnesses to living sustainably in a finite world, will require the innovations that arise from basic [scientific] research" (DiChristina, 2014, para. 14). However, those in science communication are tasked with reaching audience members who possess an overall low level of scientific literacy (Miller, 2004; Weigold, 2001). In 2000, a national survey found that only 45% of U.S. adults knew antibiotics do not kill viruses and half thought the Earth rotated the sun more than once a year (Miller, 2004).

Scientists recognize the severity of this problem; 84% of American Association for the Advancement of Science (AAAS) scientists said limited public knowledge about science is a major problem (Funk & Rainie, 2015). One potential reason for this lack of understanding of science is the increasing difficulty of analyzing what the science entails (Achenbach, 2015). Agricultural technology continues to evolve to meet the demands of a growing world, but previous advancements in agricultural technology have been met with public resistance (Blancke, 2015). To avoid polarization of public opinion about forthcoming technologies, agricultural communicators need to use effective means of science communication. These efforts can be improved by using persuasive communication theories.

One construct that has occupied persuasive communication research for decades is source credibility (Chaiken, 1987; Giffin, 1967; Hovland, Janis, & Kelley, 1953; Hovland & Weiss, 1951; McCroskey & Young, 1981; Ohanian, 1990, 1991; Pearson, 1982; Pornpitakpan, 2004). Source credibility is a multidimensional attitude a message receiver holds toward the source of communication (McCroskey & Young, 1981) that is based upon perceived expertise and trustworthiness (Hovland et al., 1953).

As trustworthiness is one of the foundational dimensions of source credibility, it is necessary to discuss the state of public trust. The public does not have uniformly high levels of trust in science (Achenbach, 2015; Frewer, 1999; Haerlin & Parr, 1999; Malka et al., 2009). The public also seems to distrust many organized institutions. Over the past 40 years, Gallup polls have asked U.S. adults to report their level of confidence in various American institutions. This confidence has decreased for government in general, the Supreme Court, individual communities, the economy, public school, media, and big business (Rainie, 2017). Thus, it seems that the trust problem is not singularly related to science.

With a lack of trust in many, if not most American institutions, it is unclear who or what the public views as credible sources for information about science. Takahashi and Tandoc (2016) conducted a survey to discover how people learn about science. The researchers said, "Knowledge about science, scientific process, and science institutions are considered necessary (although not sufficient) conditions for the development of positive scientific attitudes" (Takahashi & Tandoc, 2016, para. 4). The current study sought to determine whether emphasizing a source's trustworthiness and expertise influenced perceived credibility. Another component used to evaluate credibility is similarity of source and recipient (Hovland et al., 1953; Malka et al., 2009), which was explored in terms of gender in the current study.

Literature Review

Source credibility has been identified as a salient variable in persuasive communications (Chaiken, 1987; Hovland et al., 1953; McCroskey & Young, 1981; Ohanian, 1990, 1991; Pornpitakpan, 2004), and even children as young as three or four have been shown to evaluate source credibility (Mills, 2013; Landrum, Eaves, & Shafto, 2015). Hovland et al. (1953) established a foundational,

two-dimensional model of source credibility with the concepts of expertise and trustworthiness. Expertise is defined as "the extent to which a communicator is perceived to be a source of valid assertions" (Hovland et al., 1953, as cited by Ohanian, 1991, p. 46). Trustworthiness is "the consumer's confidence in the source for providing information in an objective and honest manner" (Ohanian, 1991, p. 47).

Since the seminal work, researchers have explored the potential of other factors pertinent to source credibility (Giffin, 1967; McCroskey & Young, 1981; Pornpitakpan, 2004). The influence of gender on perceptions of the source has been studied in various circumstances (Flanagin & Metzger, 2003; Goldberg, 1968; Pearson,1982; Weibel, Wissmath, & Groner, 2008), but it has also been noted that the construct of gender has not received as much research attention as other constructs studied in source credibility research (Pornpitakpan, 2004). Flanagin and Metzger (2003) found females rated websites attributed to a woman least favorably, while males rated the site attributed to a woman most favorably meaning "the opposite-sex credibility evaluations were higher than the same-sex credibility evaluations" (Flanagin & Metzger, 2003, p. 695). Goldberg (1968) found similar results nearly 40 years before the Flanagin and Metzger (2003) study. Goldberg (1968) studied the role of gender in credibility perceptions with relation to various fields that may have existing stereotypes about being primarily male or female dominated areas. Female college students rated the credibility of men higher in each field, even those historically dominated by women (Goldberg, 1968).

Unlike the studies described above, Pearson (1982) explored the role of gender without reference to context (i.e. field, position, environment). After asking simple questions such as "In general, are men or women more ___", Pearson (1982) found that overall, men were perceived as more credible than women; men were rated higher for competence, but women were perceived as more trustworthy. These perceptions were true for both male and female respondents. Pearson (1982) also discovered "individuals perceive they will have higher credibility with others of the same sex than with others of the opposite sex, regardless of their own gender" (p. 22). Weibel et al. (2008) studied the effect of gender and age on the credibility of newscasters in Switzerland. Overall, male newscasters were perceived as more credible than female newscasters. However, the researchers did not report results for interaction between the gender of the participant and the gender of the newscaster (Weibel et al., 2008).

In a study conducted with a college student population, Clow, James, Sisk, and Cole (2011) examined how the gender of a model in print advertisements influenced perceptions of source credibility. The researchers used five source characteristics: expertise, trustworthiness, attractiveness, similarity, and liking. While significant differences were found for attractiveness, similarity, and liking between male and female models (with females scoring higher), this difference was not significant in evaluations of expertise or trustworthiness. The findings indicated that in the context of advertising credit cards to college students, the gender of the model does have a limited influence on perceptions of source credibility (Clow et al., 2011).

A recent study regarding the role of gender on source credibility examined these variables in the context of live-streaming. Using an online survey of nearly 1,000 respondents, Todd and Melancon (2018) evaluated source credibility based on three factors: attractiveness, trust, and expertise. In regard to attractiveness, male viewers rated female broadcasters significantly higher than male viewers who watched male broadcasters. Female viewers did not report a significant difference in ratings of attractiveness for male or female broadcasters. Ratings of trust were not significantly different based the gender of the viewer or the broadcaster; however, both men and women respondents rated male broadcasters significantly higher in expertise. Yet, when the three

constructs of credibility were combined, female broadcasters had a significantly higher overall score on source credibility (Todd & Melancon, 2018). The differing results of this study indicate the need to continue researching the role of gender on source credibility.

In several studies related to specific fields and in a study without regard to context, men were perceived as more credible than women (Flanagin & Metzger, 2003; Goldberg, 1968; Pearson,1982; Weibel et al., 2008) while other studies have found inconclusive results (Clow et al., 2011; Todd & Melancon, 2018). In the current study, gender was explored in the context of agricultural biotechnology. This is salient because context can be relevant in studies of gender (Pearson, 1982). Science has historically been a male dominated field (Bryner, 2007; Pollack, 2013) as well as the agriculture industry (Wilde, 2015).

Theoretical Framework

The theoretical framework for this study was the Heuristic Model of Persuasion, which explains several aspects that influence opinion change in response to persuasive communication. Similar studies that investigate persuasive communication may use the Elaboration Likelihood Model (ELM) as a theoretical framework. The ELM first proposed the information processing concepts outlined in the heuristic model (Petty & Cacioppo, 1986). This model also postulates people use one of two routes of thinking when exposed to a persuasive message. The central route allows for cognitive deliberation on a subject and is typically used when the recipient has a strong involvement with or is otherwise connected to the message content (Petty & Cacioppo, 1986). The peripheral route is used when recipients do not have such a connection and results in the use of simple decision rules to judge the validity of the message (Petty & Cacioppo, 1986). According to the ELM, these routes of information processing cannot occur concurrently (Petty & Cacioppo, 1986), which differs from the view of the heuristic model (Chaiken, 1987).

Typically, the ELM is used to discuss this mediating role of information processing. In other words, the ELM is focused on how to encourage message recipients to process information either systematically or peripherally, based on the goals of the communication efforts (Petty & Cacioppo, 1986). Contrary to this model, the Heuristic Model of Persuasion is not predominately focused on the mediating role of information processing. The heuristic model is used to identify and explore the mental heuristics recipients employ to assess the validity of the message (Chaiken, 1987). Heuristics are simple decision rules based upon factors such as source credibility, length of the message, or argument quality that, if present, allow the recipients to conserve cognitive effort and make fast decisions about the validity of the message. The Heuristic Model of Persuasion suggests that when recipients are exposed to messages beyond their cognitive ability, source credibility and other heuristics can influence an audience member's acceptance of the message (Chaiken, 1987).

In this study, the heuristic model was selected for several reasons. First, science, especially science about gene-editing technology, is often difficult to understand by lay publics (Achenbach, 2015; Miller, 2004; Rainie, 2017). Without the necessary cognitive ability, recipients are more likely to rely on heuristics when presented with such messages (Chaiken, 1987). Second, the purpose of this study was to explore the influence of specific variables – source credibility and gender – on the persuasiveness of messages about novel scientific technology. The ELM poses that these types of variables only have indirect influences on an audience's acceptance of a message (Chaiken, 1987). The heuristic model, however, recognizes the salient role such variables play when a recipient is assessing a message. Finally, this study was not concerned with the amount or type of information processing that occurs in recipients when exposed to messages about

science. This study was instead focused on how science communicators can use characteristics salient to the audience to gain public support of technology. Basically, this study focused on how to get the public to consider the conclusions of messages about science.

Purpose and Research Questions

Because personal characteristics can impact perceptions of source credibility (Brewer & Ley, 2013; Chaiken, 1987; Flanagin & Metzger, 2003; Pearson,1982; Pornpitakpan, 2004; Weibel et al., 2008; Wheeler, 2009) and perceptions of source characteristics can influence message effect (Chaiken, 1987; Hovland et al., 1953; McCroskey & Young, 1981; Ohanian, 1990, 1991; Pornpitakpan, 2004), the purpose of this study was to examine the impact of emphasizing elements of source credibility and the gender of the source on perceptions of source credibility.

The following hypotheses and research questions were used to guide the study:

H_1: Emphasizing components of source credibility throughout a message will result in higher perceptions of source credibility.

RQ_1: Do perceptions of source credibility vary depending on the source's gender?

RQ_2: Do perceptions of source credibility vary depending on the recipient's gender?

RQ_3: What interaction, if any, is there between gender differences and/or similarities and resulting source credibility perceptions?

Methodology

This study was part of a larger research project that sought to determine the relevance of perceptions of source credibility on willingness to support research when recipients were exposed to a message about a new technological advancement in agricultural science. This paper presents the influence of emphasizing elements of credibility on resulting perceptions of the source. Furthermore, the roles of source gender, deference to scientific authority, agricultural involvement, and gluten involvement were investigated.

This study employed an experimental design. The manipulations were the emphasis of source credibility and gender of the source. Per Kirk's (1982) operationalization, this study was a two (control vs. treatment) x two (male source vs. female source) randomized block factorial design. Figure 1 shows this design.

	Female Source	Male Source
No Additional Information (control)	Stimulus 1	Stimulus 3
Emphasized Credibility (treatment)	Stimulus 2	Stimulus 4

Figure 1. Layout of randomized block factorial design of independent variables (Kirk, 1982).

Independent Variables

To explore the influence of emphasizing source credibility on resulting perceptions of the source, components of source credibility were used to create articles about fictitious sources researching CRISPR technology. CRISPR stands for clustered regularly interspersed short palindromic repeats (Rajendran, Yau, Pandey, & Kumar, 2015) and is a genome-editing technology that allows for the removal, addition, or altering of specific sections of DNA (Doudna & Charpentier, 2014; Rajendran et al., 2015). The role of gender was explored by attributing the articles to either a

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female or male source. The source type used in this study was university scientists, which is a source type consistently regarded as credible (Berdahl, Bourassa, Bell, & Fried, 2016; Brewer & Ley, 2013; McComas, 2008). The message content about CRISPR was kept the same between the treatment and control articles. The only difference between the two were the statements that emphasized components of credibility. All stimuli were one page in length with the same general design, and the sources were associated with the same department and university. To establish the validity of the stimuli and reliability of the source credibility scale, a manipulation check was conducted before collecting data for the main experiment. Two rounds were conducted to ensure the quality of the stimuli and that differences in source credibility were identified between the treatment and control.

Message Stimuli: Emphasizing Source Credibility. The dimensions of source credibility recognized in this study were expertise and trustworthiness. According to Hovland et al. (1953), the components of expertise are age, position of leadership, and similarity of source and recipient. An example of the stimulus is provided in Figure 2. The location for the research was credited to Texas Tech University because it allowed all participants to have a similar amount of proximity to the source. However, the featured researchers were fictional characters so all participants would lack familiarity with them specifically.

In the control articles, no information was provided about age. In the treatment articles, a specific age was not provided because this would not be a commonly accepted practice in the type of fact sheet created. However, information was provided about when the scientists received their degrees and the length of time they had worked at the university so participants could make individual decisions regarding potential age. This was kept the same across genders to eliminate any differences in perceptions of credibility based upon differences in perceived age. Age was also accounted for by choosing photographs in which the female and male sources appeared to be in the same age range, verified by a panel of experts consisting of faculty and doctoral students in the Agricultural Education & Communications Department. To emphasize credibility through position of leadership, the male and female treatment articles identified the scientists as the lead researcher of the project.

College of Agricultural Sciences & Natural Resources | Research Highlights

Dr. Emily Johnson
Professor
Department of Plant and Soil Science
Texas Tech University

Dr. Emily Johnson has been working at Texas Tech University since 2005. Johnson obtained her bachelor's degree in biology in 1990. Her master's degree was in biochemistry. In 1997, Johnson received her PhD in genomics. Now she works in the Department of Plant and Soil Science, where she teaches and conducts research on plant hybrids.

Q: Tell me about CRISPR technology and your research.

A: First, we need to define a couple of terms. A genome is like the instruction manual for biology; it tells organisms and cells how to form. DNA is the language of that instruction manual. The new technology I am working with is called CRISPR. CRISPR is a new form of genome-editing biotechnology, which means we can edit, fix, or delete bad genes. CRISPR is a programmable technology that allows us to target specific parts of DNA, making it more precise than any other previous technology. The development of this technology led to the project we are currently working on, which is research to produce gluten-free wheat. We are very excited about this research and how it can help people with allergies.

I am the executive researcher for this project, and we have been working with this technology for the past two years. Before starting this project, I have helped develop three plant hybrids that have become available to farmers.

Q: How is this technology different than other kinds of biotechnology?

A: One reason I am eager to see this project succeed is because this technology is fundamentally different in how it works. Previous technology only let us edit DNA by inserting foreign DNA from another organism or by deleting entire portions of the DNA. CRISPR technology inserts a protein, changes the base pairs that cause the mistake or problem, and then the protein is removed. No foreign DNA is left in the genome, so it removes common concerns like triggering allergies or accidentally affecting other parts of the genome. CRISPR uses Cas-9 protein to target specific regions, so even if a gene needs to be turned off, it is only in a very specific place and cannot affect anything other than what it is programmed for. There is always risk with every kind of new technology, but thus far, research has shown that CRISPR is safer than any technology we have had before.

Q: What does this research mean for plant science and agriculture?

A: Because CRISPR allows us to turn off certain genes, we can make crops without allergens, make crops resistant to fungi and insects, and make production more efficient. The research our team is working on is gluten-free wheat. We can remove the genetic coding for the gluten protein family that causes allergic reactions. We can reduce the allergenic affects without compromising the proteins that allow wheat to make functional dough.

Q: What is the future of this research?

A: I personally have a lot of allergies, so I am very excited about this technology. If we can successfully make a gluten-free wheat hybrid, we can move onto removing other allergens, such as those in peanuts and fruits. From there, the possibilities are endless, from agriculture to revolutionizing medicine.

The CASNR research program is recognized nationally and globally for excellence in the discovery and delivery of knowledge on current and emerging aspects of the food, fiber, fuel, natural resources, environmental sciences, management, and planning disciplines.

Figure 2. Female treatment stimulus.

Hovland et al. (1953) identified the components of trustworthiness as intent, symbols of social role, sincerity, and informational rather than propagandistic tone. In all stimuli, including the control condition, the technology was discussed in an informational tone. To increase trustworthiness of the higher-credibility sources, the treatment articles included statements about the scientists' desire to conduct the research, such as "I personally have a lot of allergies, so I am very excited about this technology." Further emphasis of trustworthiness included the source being

enthusiastic to share and discuss the research, the acknowledgement of risk associated with the use of CRISPR, and frequent references to the team working on the research and eagerness for the research to succeed, highlighting sincerity and unselfishness (Hovland et al., 1953).

Message Stimuli: Gender of the Source. The second independent variable was the gender of the source of the articles. To determine this influence, the stimuli articles were attributed to a male or female source. To better clarify this, participants could have been shown any one of the following stimuli: 1) a control article with a female source; 2) a treatment article with a female source; 3) a control article with a male source; or 4) a treatment article with a male source. To account for potential confounding variables, the information about the female source (name, photograph) was kept exactly the same between the control and treatment articles; the same was done for the male source.

Dependent Variable

The dependent variable was the participants' perceptions of the credibility of the source, which was measured on a 10-item scale (Ohanian, 1990) that combined items to measure both trustworthiness and expertise. Trustworthiness was measured using a 5-item, 5-point semantic differential scale with the following items: dependable/undependable, honest/dishonest, reliable/unreliable, sincere/insincere, and trustworthy/untrustworthy. Expertise was measured using a 5-item, 5-point semantic differential scale with the following items: expert/inexpert, experienced/inexperienced, knowledgeable/unknowledgeable, qualified/unqualified, and skilled/unskilled. Reliability for these scales was established by Cronbach's alpha values of 0.895 and 0.885, respectively (Ohanian, 1990). Participants rated the source credibility directly after reading the stimulus.

Individual Difference Variables

Personal characteristics of the participants can influence perceptions of source credibility (Brewer & Ley, 2013; Brossard & Nisbet, 2007; Campbell et al., 1999; Flanagin & Metzger, 2003, 2008; Frewer, 1999; Lupia, 2013; Pornpitakpan, 2004). The personal characteristics collected in this study were participants' gender, age, political views, deference to scientific authority, agricultural involvement, and gluten involvement.

Political views were measured as it has been shown that this can influence perceptions of credibility (Brewer & Ley, 2013). Participants reported their political views on a 7-point scale where 1 = *extremely liberal* and 7 = *extremely conservative*.

Deference to scientific authority has been identified as a salient factor in perceptions of science (Brossard & Nisbet, 2007). Deference to scientific authority was measured using a scale of 7 items from the General Social Survey (Smith et al., 2015). Participants indicated their response to each item measured on a 7-point Likert-type scale where 1 = *strongly disagree* and 7 = *strongly agree*. P*ost hoc* reliability analysis resulted in a Cronbach's $\alpha = 0.561$. Two items were removed ("Science makes our way of life change too fast" and "Scientists are apt to be odd and peculiar people"), which raised the reliability coefficient to a Cronbach's $\alpha = 0.754$. While a 0.80 reliability score is more ideal (Norcini, 1999), 0.70 is considered acceptable (Kline, 1998).

Issue involvement can be salient to message effectiveness and perceptions of source credibility (Chaiken, 1987). Issue involvement was operationalized as agricultural involvement and gluten involvement in this study. Agricultural involvement and gluten involvement were chosen because the stimuli discussed using CRISPR technology to create gluten-free wheat. The

agricultural involvement scale, adapted from Reysen and Branscombe's (2010) fanship and fandom scale, had a previously reported Cronbach's $\alpha = 0.971$ (Tarpley, Bigham, Steede, & Akers, 2017). This scale provides a nuanced understanding of how involved an individual is with the agriculture industry. *Post hoc* reliability was confirmed with Cronbach's $\alpha = 0.972$. To determine gluten involvement, participants were asked how important it was that they stay on a strictly gluten-free diet where 1 = *not at all important* and 5 = *extremely important*.

Procedure

The population for the study was college students at Texas Tech University. Both demand characteristics and experimenter effects were accounted for by employing a double-blind procedure, and the study was conducted in a laboratory setting to reduce the threat of environmental cues (Kirk, 1982). Students sat at individual computers and accessed an online Qualtrics questionnaire that contained randomly assigned stimuli so each participant had an equal chance of receiving any one of the four articles. This was randomized on an individual level, rather than administering one manipulation to an entire group. Therefore, it can be assumed that any subject effects were randomly distributed throughout the data, reducing the possibility of these effects influencing one manipulation and not the others. Participants took 10-15 minutes to complete the instrument.

Participants

The sample consisted of 122 undergraduate students who volunteered to participate to receive extra credit. Thirty-nine (32.0%) of the participants identified as male, 83 (68.0%) of the participants identified as female. The average age of participants was 20.22 (*SD* = 2.04); 28 participants did not provide their age. Due to the small variance in this variable and missing data, it was excluded from further analyses. In terms of political views, 3.3% (*n* = 4) of participants identified as extremely liberal, 14.8% (*n* = 18) of participants identified as liberal, 13.9% (*n* = 17) of participants identified as slightly liberal, 19.7% (*n* = 24) of participants identified as moderate, 6.6% (*n* = 8) of participants identified as slightly conservative, 30.3% (*n* = 37) of participants identified as conservative, 5.7% (*n* = 7) of participants identified as extremely conservative, and 5.7% (*n* = 7) chose not to answer.

Results

Source credibility was measured using a 10-item bipolar semantic differential sale. Scores ranged from 1 representing the lowest possible credibility score to 5 representing the highest possible credibility score. The highest mean was for the female treatment stimulus (*M* = 4.64, *SD* = .42) and the lowest mean was for the male control stimulus (*M* = 4.24, *SD* = .56). Table 1 provides the mean and standard deviation values for each stimulus.

Table 1.
Descriptive Statistics for Perceptions of Source Credibility (N = 122)

Stimulus	*M*	*SD*
Female Treatment	4.64	0.42
Female Control	4.56	0.54
Male Treatment	4.50	0.57
Male Control	4.24	0.56

Note: Scores were based on semantic differential scale where 1 = *low* and 5 = *high*.

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To determine the effects of emphasizing trustworthiness and expertise of the source, source gender, and participant gender, an ANCOVA was conducted on the mean scores of the perceptions of source credibility. The covariates in this analysis were political views, deference to scientific authority, agricultural involvement, and gluten involvement. The hypothesis for the first portion of the analysis was:

H_1: Emphasizing components of source credibility throughout a message will result in higher perceptions of source credibility.

The inferential statistics reported for this ANCOVA are shown in Table 2. The effects of source and participant gender were also explored in this ANCOVA. The research questions for that portion of the analysis were:

RQ_1: Do perceptions of source credibility vary depending on the source's gender?

RQ_2: Do perceptions of source credibility vary depending on the recipients' gender?

RQ_3: What interaction, if any, is there between gender differences and/or similarities and resulting source credibility perceptions?

Table 2.

Analysis of Covariance of Perceptions of Source Credibility as a Function of Emphasizing Credibility Information, Source Gender, and Participant Gender, With Individual Difference Variables as Covariates

Source	*df*	*F*	*p*	Eta Squared
Credibility Condition	1	3.528	0.063	0.031
Gender Condition	1	4.341	0.039*	0.037
Participant Gender	1	0.010	0.922	0.000
Source Gender * Participant Gender	1	0.266	0.607	0.002
Credibility * Gender Interaction	1	0.968	0.327	0.009
Covariates				
Political Views	1	1.093	0.298	0.010
Deference to Scientific Authority	1	7.153	0.009*	0.060
Agricultural Involvement	1	0.146	0.703	0.001
Gluten Involvement	1	1.721	0.192	0.015

While there was a slight difference in the means with preference to the treatment, the result was not significant ($F = 3.528$, $p = 0.063$). Therefore, we rejected H_1. This portion of the analysis is provided visually in Figure 3. The calculated means are shown for the control and treatment manipulations, as well as the bounds of the 95% confidence interval. Additionally, the interaction between the credibility condition and the gender condition was not significant ($F = 0.968$, $p = 0.327$).

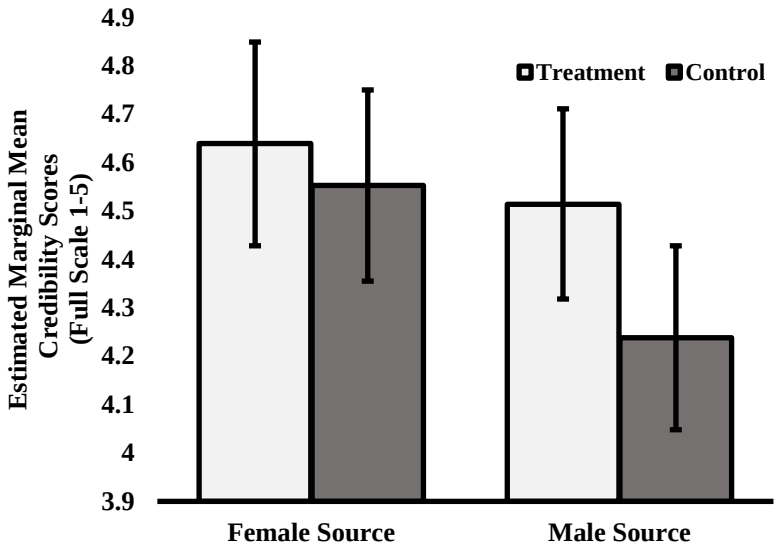

Figure 3. Estimated marginal means of the control and treatment manipulations, where the covariates were political views, deference to scientific authority, agricultural involvement, and gluten involvement.

To answer the research questions, mean and standard deviation values for the female and male stimuli were calculated. As gender interaction was also tested, these values are split across participant gender (See Table 3). The highest mean was observed when female participants viewed a message from a female source (M = 4.63, SD = 0.47). The lowest mean was observed when female participants viewed a message from a male source (M = 4.36, SD = 0.62).

Table 3.
Descriptive Statistics of Perceptions of Credibility by Source Gender and Participant Gender (N = 122)

	Female (n = 83)		Male (n = 39)	
Source	*M*	*SD*	*M*	*SD*
Female (n = 60)	4.63	0.47	4.54	0.53
Male (n = 62)	4.36	0.62	4.37	0.51

Table 4 provides the results of an ANCOVA of perceptions of source credibility as a function of gender of the source. The gender of the source had a significant influence on perceptions of credibility (F = 4.285, p = 0.041), and the female sources were rated highest in terms of source credibility. The gender of the participant (F = 0.001, p = 0.971) and the interaction between gender of the source and gender of the participant (F = 0.200, p = 0.655) did not have any significant effects on perceptions of credibility.

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Table 4.
Analysis of Covariance of Perceptions of Source Credibility as a Function of Gender of the Source With Individual Difference Variables as Covariates

Source	*df*	*F*	*p*
Gender Condition	1	4.285	0.041*
Stimuli Gender * Participant Gender	1	0.200	0.655
Participant Gender	1	0.001	0.971
Covariates			
Political Views	1	0.543	0.463
Deference to Scientific Authority	1	7.926	0.006*
Agricultural Involvement	1	0.079	0.780
Gluten Involvement	1	1.093	0.298

Note: *Indicates significance at $p \leq 0.05$

This analysis of covariance is also shown visually in Figure 4. The calculated means of credibility are displayed for the female and male sources, separated by participant gender), as well as the bounds of the 95% confidence interval.

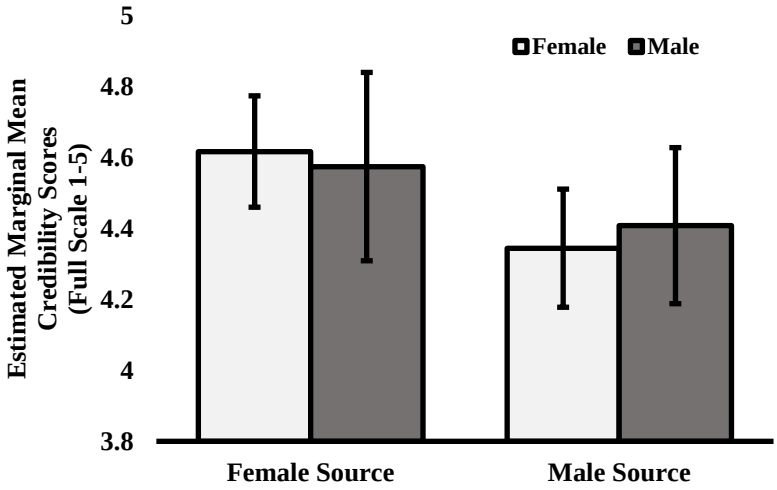

Figure 4. Estimated marginal means of credibility scores of the female and male sources, separated by participant gender, where the covariates were political views, deference to scientific authority, agricultural involvement, and gluten involvement.

Conclusions & Discussion

As the agriculture industry evolves to address significant challenges, many in the public question novel technology advancements (Blancke, 2015). The current study sought to explore the specific context of gene editing applications in agriculture and how the specific heuristics of source credibility and gender may influence evaluation of those messages. The Heuristic Model of Persuasion acknowledges that when message recipients do not have the cognitive ability to fully consider a complex topic, they will rely on cognitive shortcuts – heuristics – to judge the validity of the message (Chaiken, 1987). The topic of gene editing technology is complex and likely beyond the understanding of many audience members who typically have an overall low level of

scientific literacy (Miller, 2004; Weigold, 2001). Researching audience members' evaluation of specific heuristics (i.e. source credibility and gender) contributes to a better understanding of persuasive communication's role in science communication. This study also contributes to the literature base through its exploration of the role of gender in a field that is undergoing a shift from historic gender roles (Bryner, 2007; Pollack, 2013).

The mean scores for perceptions of source credibility varied for each stimulus. The female treatment received higher perceptions of source credibility than the female control. Similarly, the male treatment received higher perceptions of source credibility than the male control. When these perceptions were collapsed across gender, the descriptive analysis revealed the participants exposed to the treatment stimuli rated the sources higher in terms of source credibility. While previous literature acknowledges the importance of source credibility when selecting sources to present information (Chaiken, 1987; Hovland et al., 1953; Ohanian, 1990, 1991; Pornpitakpan, 2004), this study differed from these previous studies by emphasizing elements of source credibility instead of comparing low and high credibility sources.

The finding that treatment stimuli had higher levels of source credibility suggests a value in emphasizing elements of source credibility. Further inferential analysis, however, showed the differences to be non-significant. This suggests that while choosing credible sources to present information is important, more research and audience analysis should be conducted to determine the relevance of making an extra effort to emphasize various credibility components. For example, certain segments of consumers may be concerned with the connection of the researcher to the field of study, while other segments may be more concerned with the researcher's experience in the field. Further research could explore these differences and identify what components of credibility (education, experience, sincerity, etc.) are more salient than others.

Descriptive analyses of the influence of gender showed the perceptions of source credibility were higher for both of the female stimuli, which suggests the female scientist was viewed more favorably than the male scientist. Additionally, the female treatment received the highest rating of source credibility overall. Further inferential analysis confirmed the gender of the source had a significant influence on perceptions of source credibility. Although past research has indicated that males are perceived as more credible than females (Flanagin & Metzger, 2003; Goldberg, 1968; Pearson, 1982; Weibel et al., 2008), this was not supported in the current study. This is encouraging—as science and technology have historically been male-dominated fields (Bryner, 2007; Pollack, 2013). The current results suggest historic gender roles of the field may not significantly influence credibility perceptions.

Descriptive statistics also showed the highest level of source credibility was observed when female participants received a message from a female source. The lowest mean for source credibility was when female participants received a message from a male source. Furthermore, both female and male participants rated the female source higher in terms of source credibility. This finding is in line with what Todd and Melacon (2018) found, but partially contradicts Flanagin and Metzger's (2003) conclusions. In Todd and Melacon's (2018) study, female broadcasters had overall higher source credibility scores than male broadcasters for both male and female viewers, but Flanagin and Metzger (2003) found participants rated sources of the opposite sex higher in terms of source credibility. In the current study, both male and female participants rated the female sources higher than the male sources. This implies that audience members' judgements of source credibility vary depending on the context, which is supported in prior research (Pearson, 1982).

Although a difference was discovered in the descriptive analyses regarding source credibility scores, the inferential analysis showed the interaction between source gender and participant gender was not significant. While the findings suggest the gender of the source should

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be considered for messages about CRISPR technology, future research should explore the potential influence of gender interactions, as the results of this study were not enough to entirely discard the possibility of such effects. The female sources were rated higher in terms of credibility, which suggests female sources may be more effective when communicating about CRISPR technology with a Millennial audience. This result further highlights the necessity of tailoring messages to specific audiences. Overall, this study found the gender of the source can influence credibility perceptions and should be taken into consideration when creating messages about scientific technology.

Recommendations

It is also important to note the participants in this study – college students – are frequently surrounded by credible sources in the form of university scientists and professors. The stimuli were also affiliated with the university these students attended, which could have influenced the results. This proximity to credible sources could have lessened the observed interaction effects and hidden any potential gender bias. To address the inability to generalize the findings, this study should be replicated with a larger random sample of the U.S. population. It would also be prudent to replicate this study with credible sources who are not directly tied to a single university to improve external validity. In addition to research conducted using sources with no institutional affiliation, research is needed to determine if the institution to whom the source is attributed impacts the level of source credibility and the effectiveness of the message.

The influence of emphasizing elements of credibility warrants additional research. A qualitative exploration could be conducted to determine if any particular components of credibility (e.g. education, experience in the field, sincerity) make a significant impact on perceptions of source credibility. This research effort explored the elements as a whole treatment and only collected quantitative data. Studying the effect qualitatively could produce insight about how to improve perceptions of source credibility for those who are viewed as less credible, such as industry and advocacy groups, corporate scientists, private research and environmental organizations, and local and national news stations (Berdahl et al., 2016; Brewer & Ley, 2013; McComas, 2008; Takahashi & Tandoc, 2016).

Examining the influence of emphasizing elements of source credibility should also be conducted with other media. The stimuli in this study were print articles in a research highlight format. Researching the use of other forms of media, such as videos created to inform the public on social media, could result in a more pronounced difference on source credibility. Studying the influence of emphasizing elements of source credibility in relation to other types of media could also reveal an effect for gender, as male and female sources could potentially present information in different ways. For example, men and women could differ by tone of voice, inflection, and emphasis in various components of a video message, which could result in different perceptions of the elements of credibility such as trustworthiness or sincerity.

Additional data collection should include an equal numbers of male and female participants to calculate higher-level inferential statistics on the possibility of an influence of gender interactions. Limitations of the current study did not allow for more data collection nor more robust analyses. Finally, an additional study should be conducted to examine the individual constructs that comprise source credibility. We measured expertise and trust, but other studies have included other aspects such as attractiveness (Clow et al., 2011; Todd & Melancon, 2018). This would provide a more nuanced understanding of how credibility judgements are formed.

In regard to practical implications, this study highlights the need for communication practitioners to work with scientists to emphasize aspects of source credibility (e.g. education, expertise, personal relevance, sincerity), which may serve as heuristics for audience members. This can be accomplished through media relations training to help scientists become skilled in sharing not only the technical aspects of their research, but how to connect with the audience to improve perceptions of credibility. Communicators should also strive to include evidence of source credibility beyond a source's formal title when sharing complex science information. This means establishing a source's qualifications such as education, work history, and past successes along with technical content about the scientific application.

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References

Achenbach, J. (2015, March). Why do many reasonable people doubt science? *National Geographic.* Retrieved from http://ngm.nationalgeographic.com/2015/03/science-doubters/achenbach-text

Berdahl, L., Bourassa, M., Bell, S., & Fried, J. (2016). Exploring perceptions of credible science among policy stakeholder groups: Results of focus group discussions about nuclear energy. *Science Communication 38*(3), 382-406. doi: 10.1177/1075547016647175

Blancke, S. (2015, August 18). Why people oppose GMOs even though science says they are safe. *Scientific American.* Retrieved from https://www.scientificamerican.com/article/why-people-oppose-gmos-even-though-science-says-they-are-safe/

Brewer, P. R., & Ley, B. L. (2013). Whose science do you believe? Explaining trust in sources of scientific information about the environment. *Science Communication 35*(1), 115-137. doi: 10.1177/1075547012441691

Brossard, D., & Nisbet, M. C. (2007). Deference to scientific authority among a low information public: Understanding U.S. opinion on agricultural biotechnology. *International Journal of Public Opinion Research, 19*(1), 23-52. doi: 10.1093/ijpor/edl003

Bryner, J. (2007, October 9). Why men dominate math and science fields. *Live Science.* Retrieved from https://www.livescience.com/1927-men-dominate-math-science-fields.html

Campbell, M. K., Bernhardt, J. M., Waldmiller, M., Jackson, B., Potenziani, D., Weathers, B., & Demissie, S. (1999). Varying the message source in computer-tailored nutrition education. *Patient Education and Counseling 36*, 157-169. doi: 10.1016/S0738-3991(98)00132-3

Chaiken, S. (1987). The heuristic model of persuasion. In M. P. Zanna, J. M. Olson, & C. P. Herman (Eds.), *Social Influence: The Ontario Symposium* (3-39). Hillsdale, NJ: Lawrence Erlbaum Associates.

Clow, K. E., James, K. E., Sisk, S. E., & Cole, H. S. (2011). Source credibility, visual strategy, and the model in print advertisements. *Journal of Marketing Development and Competitiveness, 5*(3), 24-31.

DiChristina, M. (2014, July 22). Why science is important. *Scientific American.* Retrieved from https://www.scientificamerican.com/article/why-science-is-important/

Doudna, J. A., & Charpentier, E. (2014). The new frontier of genome engineering with CRISPR-Cas9. *Science, 346*(6213). doi: 10.1126/science.1258096

Flanagin, A. J., & Metzger, M. J. (2003). The perceived credibility of personal Web page information as influenced by the sex of the source. *Computers in Human Behavior, 19*, 683-701. doi: 10.1016/S0747-5632(03)00021-9

Frewer, L. (1999). Risk perception, social trust, and public participation in strategic decision making: Implications for emerging technologies. *Royal Swedish Academy of Sciences 28*(6), 569-574. Retrieved from http://www.jstor.org/stable/4314956

Goldberg, P. (1968). Are women prejudiced against women? *Trans-action, 5*(5), 28-30. doi: 10.1007/BF03180445

Giffin, K. (1967). The contribution of studies of source credibility to a theory of interpersonal trust in the communication process. *Psychological Bulletin, 68*(2), 104-120.

Haerlin, B., & Parr, D. (1999). How to restore public trust in science. *Nature, 400*, 499.

Hovland, C. I., Janis, I. L., & Kelley, H. H. (1953). *Communication and Persuasion: Psychological Studies of Opinion Change.* New Haven: Yale University Press.

Hovland, C. I., & Weiss, W. (1951). The influence of source credibility on communication effectiveness. *The Public Opinion Quarterly, 15*(4), 635-650.

Kirk, R. E. (1982). Experimental design. *Handbook of Psychology* (23-45).

Malka, A., Krosnick, J. A., & Langer, G. (2009). The association of knowledge with concern about global warming: Trusted information sources shape public thinking. *Society for Risk Analysis, 29*(5), 633-647. doi: 10.1111/j.1539-6924.2009.01220.x

McCroskey, J. C., & Young, T. J. (1981). Ethos and credibility: The construct and its measurement after three decades. *Central States Speech Journal, 32*, 24-34.

McComas, K. A. (2008). Nutrition communication: The role of trust in health communication and the effect of conflicts of interest among scientists. *Nutrition Society 67*, 428-436. doi: 10.1017/S0029665108008689

Miller, J. (2004). Public understanding of, and attitudes toward, scientific research: What we know and what we need to know. *Public Understanding of Science, 13*, 273-294. doi: 10.1177/0963662504044908

Ohanian, R. (1990). Construction and validation of a scale to measure celebrity endorsers' perceived expertise, trustworthiness, and attractiveness. *Journal of Advertising, 19*(3), 39-52. Retrieved from http://www.jstor.org/stable/4188769

Ohanian, R. (1991). The impact of celebrity spokespersons' perceived image on consumers' intention to purchase. *Journal of Advertising Research, 31*(1), 46. Retrieved from

http://eds.a.ebscohost.com.lib-e2.lib.ttu.edu/ehost/pdfviewer/pdfviewer?sid=caff4bca-c503-468b-b3f9-5a844a0f569c%40sessionmgr4009&vid=1&hid=4202

Pearson, J. C. (1982). The role of gender in source credibility. *Proceedings of the annual Meeting of the Speech Communication Association.* Retrieved from http://files.eric.ed.gov/fulltext/ED226390.pdf

Petty, R. E., & Cacioppo, J. T. (1986). The elaboration likelihood model of persuasion. *Advances in Experimental Social Psychology, 19*, 123-205.

Pollack, E. (2013, October 3). Why are there still so few women in science? *New York Times.* Retrieved from http://www.nytimes.com/2013/10/06/magazine/why-are-there-still-so-few-women-in-science.html

Pornpitakpan, C. (2004). The persuasiveness of source credibility: A critical review of five decades' evidence. *Journal of Applied Social Psychology*, *34*(2), 243-281.

Rajendran, S. R. C. K., Yau, Y., Pandey, D., & Kumar, A. (2015). CRISPR-Cas9 based genome engineering: Opportunities in agri-food-nutrition and healthcare. *OMICS International, 19*(5), 1-15. doi: 10.1089/omi.2015.0023

Rainie, L. (2017, April 21). The new landscape of facts and trust. *Pew Research Center: Internet & Technology Presentations.* Retrieved from http://www.pewinternet.org/2017/04/21/the-new-landscape-of-facts-and-trust/

Reysen, S., & Branscombe, N. R. (2010). Fanship and fandom: Comparison between sport and non-sport. *Journal of Sports Behavior, 33*(2), 176-193.

Takahashi, B., & Tandoc, E. C. (2016). Media sources, credibility, and perceptions of science: Learning about how people learn about science. *Public Understanding of Science 25*(6), 674-690. doi: 10.1177/0963662515574986

Tarpley, T. G., Bigham, A. L., Steede, G. M., & Akers, C. L. (2017). *Who even cares about agriculture? An instrument for measuring agricultural involvement.* Research poster presented at the annual Association for Communication Excellence, New Orleans, LA.

Todd, P. R., & Melancon, J. (2018). Gender and live-streaming: Source credibility and motivation. *Journal of Research in Interactive Marketing, 12*(1), 79-93. https://doi.org/10.1108/JRIM-05-2017-0035

Weibel, D., Wissmath, B., & Groner, R. (2008). How gender and age affect newscasters' credibility- An investigation in Switzerland. *Journal of Broadcasting & Electronic Media, 52*(3), 466-484. doi: 10.1080/08838150802205801

Weigold, M. (2001). Communicating science: A review of the literature. *Science Communication, 23*(2), 164-193.

Wheeler, R. T. (2009). Nonprofit advertising: Impact of celebrity connection, involvement and gender on source credibility and intention to volunteer time or donate money. *Journal of Nonprofit & Public Sector Marketing, 21,* 80-107. doi: 10.1080/10495140802111984

Wilde, V. (2015, March 4). Why women in agricultural science is good for development? *The Fish Tank.* Retrieved from http://blog.worldfishcenter.org/2015/03/why-women-in-agricultural-science-is-good-for-development/

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