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Interactive Infographics' Effect on Elaboration in Agricultural Communication

Abstract

In public health, politics, and advertising, interactive content spurred increased elaboration from audiences that were otherwise least likely to engage with a message. This study sought to examine interactivity as an agricultural communication strategy through the lens of the Elaboration Likelihood Model. Respondents were randomly assigned a static or interactive data visualization concerning the production of peaches and blueberries in Georgia, then asked to list their thoughts in accordance with Petty and Cacioppo's thought-listing measure. Respondents significantly exhibited higher elaboration with the interactive message as opposed to the static, extending the results of past research in other communication realms to agricultural communication as well. This increase in attitude and cognition encourages agricultural communicators to pursue the use of more interactive elements in their messaging.

Keywords

interactivity, agricultural news, interactive graphics, attitudes, elaboration

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INTRODUCTION

Media convergence and the constantly changing state of digital communication has led to increased adaptation and hybridization in communication strategies (Weber & Rall, 2012). The changing communication landscape has become increasingly reliant on visual graphics, with online journalism in particular turning to interactive information graphics to tell stories (Bounegru, Chambers, & Gray, n.d.; Weber & Rall, 2012). “News sites, such as nytimes.com, guardian.co.uk, elmundo.es, bbc.co.uk, and spiegel.de, use interactive information graphics to explain complex information clearly and intelligibly, e.g., the Fukushima nuclear disaster, the White House health care plan, the Iraq protocols, the euro crisis, Hurricane Irene” (Weber & Rall, 2012, p. 1). Interactive infographics have the unique power of engaging the reader in data by pointing out relationships and patterns that would be difficult to explain through text alone (Weber & Rall, 2012). As Reilly (2017) stated, “In a news environment where high story turnover is necessary, the strength of data visualization lies in the viewer’s ability to process visual information more rapidly than verbal information” (p. 8).

As technology has increased exponentially, so, too, has the amount of data to which communicators and their audience have access (Cairo, 2013). Much of the communication received by the general public is digital, now that 89% of the U.S. population uses the internet (Anderson, Perrin, & Jiang, 2018). In a time when companies, news outlets, and individuals are vying for the public’s attention, communication that stands out amongst the crowd of information online has become increasingly important (Holt, 2016). Furthermore, the increase in the amount of information with which consumers are inundated has facilitated a commensurate decrease in attention span (McSpadden, 2015). This information overload also means the more consumers use the internet, the more likely they are to encounter information with which they have low involvement. Rather than provide reassurance, too much information tends to overwhelm consumers, leaving them with negative attitudes toward the entire message (Spenner & Freeman, 2012). In this digital landscape, messages must stand out from the crowd and be quickly understood in order to be persuasive (McSpadden, 2015; Spenner & Freeman, 2012).

To keep pace with the exponential increase in internet use and its correlating increase in the number of low-involvement message consumers, it is imperative agricultural communication adapt and better understand how best to communicate through interactivity. As the use of internet-connected devices increases, the number of low-ability consumers will decrease. This means that as more consumers turn to online sources for media consumption, the value of interactivity in communication will rise. With the exponential increase of internet users, interactive communication becomes an increasingly timely topic for research.

Aside from the need to stay relevant in a world of changing technology, the practical significance of a better understanding of interactivity in the agricultural communication field could create the opportunity for more persuasive communication. Interactivity could be included in online websites, news stories, newsletters and crisis communication, to name a few. Interactive infographics could give consumers more motivation to engage with the information, as well as the power to understand how overarching agricultural issues like drought, temperature increase, or use of pesticides personally affect them. Furthermore, practical use of interactive infographics could help communicate complicated agricultural processes more effectively to the low-involvement layman (Wojdynski, 2015).

“Infographics are an effective way to present complex data in a visual format that is compelling, provides rapidly available information, and is directly useful for decision-making purposes," (Otten, Cheng, & Drewnowski, 2015, p. 1901). The addition of interactive infographics can make an argument more persuasive and attractive to readers, but the finer skills and techniques needed to craft an effective interactive infographic may also pose a dilemma to communicators. Effective infographics challenge the reader to critically engage with the information and identify potential patterns in the information and its applicability to their life (Ovans, 2014). To better understand the power and limitations of interactive infographics to persuade and change attitudes, a basic understanding of cognition and persuasion is required.

The potential of interactive agriculture-based infographics to affect consumer attitudes and elaboration, though promising, remains unclear. This study sought to address current communication trends by identifying and discussing the significant moderators of attitude and elaboration for interactive agricultural infographics among the general public.

Literature Review/Theoretical Framework

The Elaboration of Likelihood Model (ELM) is made up of two different routes of persuasion, which represent the two ways humans form opinions based on persuasive communication (Petty & Cacioppo, 1986). The first route of persuasion is the central route, which includes thoughtful consideration of arguments central to the issue. This route requires more cognitive energy, but results in lasting attitude formation (Sundar, Kalyanaraman, & Brown, 2003; Petty & Cacioppo, 1986). The second route of persuasion is the peripheral route, which is tied to simple cues or affective association. The peripheral route requires less cognitive energy, but attitudes formed via this route are more ephemeral (Sundar et al., 2003; Petty & Cacioppo, 1986). The route of persuasion a reader uses to form his opinion is determined by his motivation and ability to evaluate the communication (Petty & Cacioppo, 1986). This motivation and ability were combined under the term elaboration likelihood. The ELM proposed there are a limited number of ways to affect this elaboration likelihood (Petty & Cacioppo, 1986). The ELM's strength and ubiquity in cognition and communication research has been due to this ability to classify all communication variables into the discrete categories of argument, peripheral cue, or factor affecting argument scrutiny (Petty & Cacioppo, 1986). By containing the many possible variables into these distinct categories, the ELM provided a schema through which the persuasiveness of communication methods may be judged.

In order to convey complex information, the implementation of data visualization into messages can greatly increase the accessibility and comprehension of information to the public (Kelleher, & Wagener, 2011). The term data visualization specifically addresses the use of a graphic or visual to aid in communicating data across disciplines (Few, 2009). When it comes to persuasive communication, infographics are a valuable tool that lend messages broader appeal while fostering better comprehension and retention of information as opposed to text or images alone (Vanichvasin 2013). Simply put, for most audiences, infographics are more persuasive (Vanichvasin, 2013). Furthermore, the appeal seems universal, as infographics have been shown to lead to a higher level of elaboration among both visual and verbal learners (Atkinson & Lazard, 2015). The broad appeal of infographics and the continued hybridization of digital communication has combined to create the ability to click, slide, or otherwise navigate multiple different visuals working together as a group to tell the story of a dataset. These hybrid forms are known as interactive infographics, which have, over the last few years, become staples in online journalism news sources (Weber & Rall, 2012).

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Applying the ELM to interactive infographics showed the presence of interactivity may serve as an argument, peripheral cue, or factor that affects the extent of elaboration (Petty & Cacioppo, 1986; Liu & Shrum, 2009). Hybridization of communication strategies and advances in technology has fostered an increase of interactivity in messaging, which could in turn represent the potential of increasing attitudes and elaboration in most audiences (Weber & Rall, 2012; Rafaelli, 1986). Interactivity has the potential to create other positive effects as well, including increased performance quality, motivation, sense of fun, cognition, learning, and sociability of a message (Rafaelli, 1986).

Under the ELM, the mere presence of interactivity acted as a positive peripheral cue to readers. This combined with its unique power to illustrate data has made it a popular method of science communication (Weber & Rall, 2012). The effects of interactivity on message persuasiveness have been examined in the realm of public health, advertising, and marketing in multiple studies (Liu & Shrum, 2009). The early results of these interactive infographic studies were often contradictory, despite the broad appeal of infographics and the positive peripheral cue of interactivity. Combining these two strategies created a new communication method that was more than simply the sum of its parts.

With issues pertaining to genetically modified organisms, animal welfare, and seed propriety, agricultural science is one of the more divisive sciences to capture the public mind today (Brossard & Nisbet, 2006). With the introduction of opinions concerning conventional agriculture and its accompanying sciences propagated by many disparate interests including companies, politicians, farmers, scientists, and members of the general public, it can be difficult for a low-involvement consumer to form their own opinions about agriculture in the United States (Brossard & Nisbet, 2006). The public tendency is to take cognitive shortcuts whenever available, relying on attitudes and beliefs to help make sense of persuasive agricultural communications (Brossard & Nisbet, 2006). Therefore, the power of interactive infographics could be harnessed to work as a peripheral cue to increase the attitudes of these low-involvement individuals. In fact, Wojdynski (2015) stated, “interactivity may specifically have an effect on those who are otherwise least likely to engage with a message” (p. 19). Besides acting as a positive peripheral cue, interactive infographics can be utilized in agricultural communication to combat opinion overload of the uninformed consumer by presenting factual data in a manner that is both engaging and easy to understand, which allows consumers to heuristically form their own opinions about issues in agriculture.

The purpose of this study was to ascertain whether interactive infographics could be an effective agricultural communication strategy by exploring the effects of interactivity on the average consumer’s elaboration of messages presented as agricultural infographics through the framework posited by the elaboration likelihood model (Liu & Shrum, 2009). The study contributed to this pre-existing understanding of interactive communication strategies by presenting a relevant agricultural message to a general populace, in this case a message about blueberry and peach production in Georgia during the year 2017 to Georgia residents.

Based on a review of past studies concerning elaboration and interactive infographics, this study put forth the following hypothesis:

H1: Interactive elements will produce an overall positive effect on user elaboration and attitude of agricultural messages.

METHODOLOGY

The purpose of this study was to better understand elaboration of an interactive agricultural message. The technique of thought-listing was used to gauge the audience's attitudes and elaboration (Cacioppo & Petty, 1981). The message audience was then asked to list their thoughts on the topic after viewing the message. This technique of writing a list of thoughts is a useful measure, as it can be administered in a manner that does not restrict dimensions, is easily administered over web survey, and is perceived as private and nonthreatening (Cacioppo & Petty, 1981). Importantly, thought listing does not affect reported behavior and is proven to be non-reactive (Cacioppo & Petty, 1981). It is sensitive to distraction, repetition, social loafing, and changes in cognitive response when a person's motivation or ability has been manipulated (Cacioppo & Petty, 1981). Furthermore, the thought-listing technique allows for the self-generation of arguments, which has been found to be a direct result of high-cognitive cost activities (Cacioppo & Petty, 1981). Realizing the number of thoughts elicited by each subject will vary, Cacioppo and Petty (1981) suggested controlling for this variable by calculating a ratio score where (favorable thought- unfavorable thought)/(favorable thought + unfavorable thought), which was observed in this study. The thought listing measure was reliable both internally, through split-half testing, and on retesting (Cacioppo & Petty, 1981). Because the measure is reliable, valid, and non-reactive, it has been shown to tap into a consumer's thoughts that moderate their affective and behavioral responses (Cacioppo & Petty, 1981).

Population

A broad population was selected because the current study sought to investigate the moderating effect of interactivity on agricultural communications to the general public. In order to ensure that all respondents had the same base level of involvement due to location, the sample was comprised of Georgia residents. The sample selected sought to replicate the Georgia's general population. In order to match the U.S. Census Bureau's population estimates for July 1, 2017 this sample was representative of the Georgia's population. All respondents were recruited through Qualtrics via crowdsourcing techniques and received remuneration as outlined in Qualtrics' terms. The survey was administered to a total of 464 different respondents in which the treatment and control messages were assigned randomly where 269 respondents viewed the static control message stimulus and 195 viewed the experimental interactive.

Stimulus Design

Respondents were divided randomly between interactive and static message stimuli. Both messages explained the economic impact of poor blueberry and peach production in Georgia during the year 2017. Both versions of the messages were made as similar as possible to avoid incidental confounds. That is, the two conditions were identical in content and differed only in their levels of interactivity. Each message had three data visualizations: a map and two charts. The map included color-coded locations of peach and blueberry farms in the Georgia. Farm location data was provided by the Georgia Department of Agriculture. These locations were overlaid on maps made from the National Oceanic and Atmospheric Administration's temperature data for Georgia regions during the months of January through June 2017. The next data visualization was a scatterplot of Georgia's peach and blueberry yield compared against the price received per pound from 2008-2016. This map showed a fairly linear progression of peach prices as compared to a higher but unpredictable and widely variable price per pound of blueberries. The final data visualization illustrated the quality of peach and blueberry yields for the months of April and May from 2015-2017. The quality was measured by the percent of the total month's yield graded as

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either excellent, good, fair, poor, or very poor. This visualization illustrated the extremely poor quality of fruit during 2017 in comparison to the past two years.

Where the data visualization components were identical in both stimuli, so too were the message presentation elements of fonts, and images. Both messages used the same four images of frost-damaged blueberries and blooms and peach trees in the snow found on the Georgia Department of Agriculture's website.

The control group was shown the static stimulus: an infographic published in the Georgia's Department of Agriculture's newspaper publication in May of 2017. This data visualization appeared as an embedded .png image within the Qualtrics survey, therefore respondents were not required to navigate away from the survey to view the static stimulus.

Following Weber and Rall's (2012) recommendation of including linear, explorative, and non-linear interactivity. Specifically, the interactive message used forward and backward buttons to establish linear interactivity. This study's interactive message established explorative interactivity through the use of a dropdown menu in the chart exploring peach and blueberry quality. Finally, the study's interactive stimulus established non-linear interactivity through the use of a timeline slider on the map data visualization that allowed respondents to toggle through the temperature data of the months of January through June of 2017.

This study's interactive stimulus was created to follow recommendations of effective interactivity use. Studies indicated low to moderately interactive messages provided the best chance for elaboration in groups moderated by involvement and ability (Liu & Shrum, 2009; Sundar, Kalyanaraman, & Brown, 2003; Weber & Rall, 2012). This study's interactive stimulus followed guidelines to establish low and moderate interactivity from two different studies (Sundar, Kalyanaraman, & Brown, 2003; Weber & Rall, 2012).

The linear interactivity type was preferred to create low interactivity conditions (Weber & Rall, 2012). Most interactive infographic authors and readers "prefer traditional 'step-by-step navigation' because linear storytelling ensures clear user guidance. In the experts' opinions, users can perceive all aspects of the story and therefore catch the message easily; they are not overwhelmed by information or even lost in the data" (Weber & Rall, 2012, p. 15). Although each type of interactivity was present in this study's interactive stimulus to replicate the common hybridizations found within the communication strategy, the predominant type of interactivity was linear, controlled by the navigation bar and forward and back arrows. This followed Weber and Rall's (2012) recommendations for low interactivity conditions, as it allowed users to only view and interact with one figure at a time.

Moderate interactivity was established through the use of hyperlinks (Sundar, Kalyanaraman, & Brown, 2003). A hyperlink to the Georgia Department of Agriculture's press release on the 2017 freeze damage to peaches and blueberries was used to establish moderate interactivity conditions as hyperlinks were a common type of interactivity that create a hierarchical linear flow of information (Sundar, Kalyanaraman, & Brown, 2003).

Survey Administration

Due to a technical issue with the method in which respondents viewed the interactive message, a small adjustment to the survey was made after 353 respondents completed the survey. Of these first 353 respondents, 153 of these were randomly assigned the interactive experimental condition. These 153 respondents were all asked to navigate away from the survey in order to view the message on a blank browser tab. However, due to an increased dropout rate of respondents after being asked to navigate away and return to the survey, the method of viewing was modified so that respondents using a desktop would view a version of the interactive message embedded within the survey in much the same way the static graphic visualization used for the static experimental condition was embedded in the survey. Respondents taking the survey with their mobile phone were still asked to navigate away from the survey with the exact same question as the prior version of the survey, as the embed code for the interactive message did not prove mobile-friendly when inserted into the Qualtrics survey software. In order to assure this modification did not affect the validity of responses, a Mann-Whitney *U* test was conducted between the first group of 147 responses to the interactive experimental condition recorded prior to the survey edit and the following group of 48 responses to the same condition that may not have been required to navigate away from the survey in order to view the message based on their device (Nordstokke & Zumbo, 2010; Nordstokke, Zumbo, Cairns, & Saklofske, 2011). The two groups exhibited no significant difference in elaboration (Mann-Whitney $U = 3317$, $n_1 = 147$, $n_2 = 48$, $p = .668$). After viewing the message, respondents were given instructions and proceeded to the thought-listing portion of the survey.

In this study, the thought-listing technique was carried out in the manner recommended by Cacioppo and Petty including topic instruction, time limits, and post-message survey as opposed to pre and post (1981). During the topic instruction portion, participants were asked to list all thoughts that occurred to them while viewing the message in order to avoid the dubious assumption that participants are able to discriminate the cognitive effect of the message. This topic instruction produces experimental demand for subject to report relevant responses and compels them to show their "open mindedness" and "intelligence" by generating thoughts on both sides of the issue (Cacioppo & Petty, 1981). A time limit of five minutes was instituted to increase the chance that responses were easily accessible and directly evinced by the message. Participants were asked to list their thoughts directly after viewing the message to best replicate the affective and cognitive responses present in normal conditions (Cacioppo & Petty, 1981). While measuring after the message has occasionally led to some loss of retention of cognitions, this is the preferred method as it least distorts naturally elicited responses (Cacioppo & Petty, 1981). Participants were presented with a total of 18 blanks to fill within the allotted five minutes, though respondents were instructed they were neither required nor expected to fill all the blanks.

Data Analysis

In the thought listing method, "independent judges have demonstrated a high degree of agreement in their classification of responses along the polarity dimension" (Cacioppo & Petty, 1981, p. 325). Open-ended responses to the thought-listing portion of the survey were polarity coded by two independent judges. No weighting mechanism was used as a measure of how strongly assertions were made as this has shown to have a null effect (Cacioppo & Petty, 1981). Judges were hypothesis-blind graduate students familiar with scoring categories. These judges were trained and then tested for agreeance of 5% of the responses (n = 23). The Krippendorff's alpha test was used to estimate the inter-judge reliability (Krippendorff, 2011). Judges showed high reliability, with $a = .8261$.

Reliability

Inter-coder reliability for the thought-listing measure was acceptable, calculated by the Krippendorff's alpha of $a = .8261$ (Krippendorff, 2011). Attitude scores were calculated by favorable thought - unfavorable thought)/(favorable thought + unfavorable thought) in order to avoid weighting attitudes by the number of thoughts, as recommended by Cacioppo and Petty (1981).

Limitations

It is acknowledged there are limitations of this study that include sample limitations, the general negativity of the topic of the message topic and its possible implications for polarity coding, and the effect of the University of Georgia branding on the Qualtrics survey pages. By nature of the recruitment of this Qualtrics panel sample, it is unlikely that many farmers or other agriculturalists were Qualtrics online survey respondents, an important note for this study. Despite the fact that 43% (n = 202) respondents self-reported as living in a rural area, many rural residents highly involved with agriculture were likely excluded from this sample due to the unavailability of a reliable internet connection in rural areas (Salemink, Strijker, & Bosworth, 2017).

The topic of the message presented to respondents was the loss of revenue incurred by Georgia's economy due to strange weather patterns that killed, or otherwise ruined, many peaches and blueberries during the 2017 growing season. As this message was inherently negative, polarity coding was likely more difficult than that of a message with a more optimistic or neutral tone. However, coder instruction and training resulted in a high inter-coder reliability of a = .826 (Krippendorff, 2011).

Another limitation was the effect of University of Georgia branding of a respondent's level of trust in the message. It is possible having the University of Georgia academic logo on each page of this study led respondents to place more trust in this message than they would normally, resulting in increased elaboration both from a polarity standpoint in the thought listing measure and as a reliable message source (Petty & Cacioppo, 1986). The term University of Georgia and city of Athens were both mentioned seven times whereas "university" was mentioned eight and "school" three, exhibiting the university branding did play some role in respondent reaction to the message stimulus.

FINDINGS

The hypothesis of this study was confirmed in that consumers elaborated significantly more with the interactive infographic as opposed to the static.

Sample

A crowd-sourced sample of 466 respondents, with an even gender split and racial makeup matching 2017 predicted U.S. census numbers for the state of Georgia, was used to represent the population of the state in this study. 43% (n = 202) respondents described their location as "rural," with the remaining 57% (n = 264) identified as residing in an "urban" location. Of this sample, 42% (n = 195) were exposed to the interactive experimental condition and 58% (n = 271) to the static condition, through random assignment.

Analysis

Nonparametric Tests

A Shaprio-Wilk's test ($p > .05$) (Shapiro & Wilk, 1965; Razali & Wah, 2011), an inspection of the skewness and kurtosis measures and standard errors (Cramer, 1998; Cramer & Howitt, 2004; Doane & Seward, 2011), and a visual inspection of their histograms, normal Q-Q plots and box plots showed the sample data were not approximately normally distributed. A non-parametric Levene's test was used to verify the equality of variances in the samples (homogeneity of variance) ($p > .05$) (Nordstokke & Zumbo, 2010; Nordstokke, Zumbo, Cairns, & Saklofske, 2011). As such, all statistical tests conducted with the overall elaboration scores were non-parametric. This inspection of normality and homogeneity of variances was carried out for all scales listed in these results. This means that although much of the data from this study exhibited non-normal distributions, the homogeneity of variances in each of these cases allowed for non-parametric statistical tests to be conducted.

These non-parametric tests account for non-normally distributed data by assessing the location and range of the lowest group's distribution within the overall sample range and contrasting this against a theoretical ranked distribution approaching normal. That is, due to the homogenous variances, nonparametric tests can redistribute data normally through the use of ranking. The nonparametric tests used in this data analysis included the Mann-Whitney test, considered the nonparametric equivalent of a t-test (Nordstokke & Zumbo, 2010; Nordstokke, Zumbo, Cairns, & Saklofske, 2011).

Elaboration Measure

Thoughts were coded based on polarity, the most consistent measure of thought-listing as recommended by Cacioppo and Petty (1981). Though Cacioppo and Petty describe the coding with the words positive, neutral, and negative, it should be recognized that coding along the polarity dimension does not only measure the attitude of the thought but also its relevance to the message (1981). Thoughts were coded as positive if they were, "in favor of the referent that mention specific desirable attributes or positive associations, statements that support validity or value of situation/stimulus and statements of positive effect" (Cacioppo & Petty, 1981). Examples of thoughts scored as positive included, "I am from Georgia, but didn't realize that the blueberry industry was as profitable in Georgia" and "Blueberries and peaches suffered due to odd weather patterns in 2017." These thoughts were considered positive as they support the value and validity of the stimulus message. Thoughts were coded as neutral or irrelevant if they, "express no affect with regards to the referent," (Cacioppo & Petty, 1981, p. 319). Examples of thoughts scored as neutral/irrelevant included, "I love to make dessert from both," and "I like University of Georgia because it is a good university to be at." All other thoughts were coded as negative as they, "mention specific undesirable attributes or negative associations, challenges to the validity of the stimulus or situation, and statements of negative affect," (Cacioppo & Petty, 1981, p. 319). Examples of thoughts scored as negative included, "information laid out in a really boring unnatractive [*sic*] way," and "I think they're downplaying the importance of the peaches." Overall attitude scores were calculated by (favorable thought - unfavorable thought)/(favorable thought + unfavorable thought) as recommended by Petty and Cacioppo (1981, p. 319). The computed attitude scores were then converted to z and t scores in order to enhance interpretation.

Hypothesis Testing

H1: Interactive message elements will produce an overall positive effect on user elaboration and attitude. The hypothesis was confirmed where mean elaboration for the interactive condition ($n = 195$) was 51.39 and mean elaboration for the static condition ($n = 269$) was 48.99 (Mann-Whitney $U = 23564.5$, $n_1 = 269$, $n_2 = 195$, $p = .022$).

DISCUSSION

An overall positive effect of interactivity was found in this study, meaning people responded more favorably and thought more critically about an interactive agricultural message. This positive effect presents certain theoretical, pedagogical, and practical implications for agricultural communicators who seek to use cutting-edge communication strategies to better tell the story of agriculture.

Implications

The overall positive effect of interactivity on message elaboration calls for further research on the effects of interactivity on agricultural communications. This study found the likelihood of creating negative attitudes or elaboration affects through the use of interactive messages is minimal, so long as messages are kept to medium or low interactivity levels. Because greater elaboration is the path to increasing positive attitudes, deeper critical thinking, and more resilient beliefs and behavior changes, this was an important realization that encourages agricultural communicators to increase the interactivity of their messages to increase consumer engagement with agricultural information (Petty & Cacioppo, 1986). Therefore, to enhance consumers' engagement with information related to agriculture, the inclusion of interactive messages could lead to a more critically engaged audience.

Past research also confirmed that interactivity can be a useful tool for enhancing elaboration, further indicating that agricultural communicators should move forward with interactive strategies based on the recommendation of past research and the overall positive effect of interactivity on agricultural message elaboration found in this study (Sundar et al., 2003; Weber & Rall, 2012; Wojdynski, 2015).

Another practical significance of this study is that it supported the call for greater cross-training of communicators in digital and interactive strategies as well as more accessible software programs for data visualization (Reilly, 2017; Weber & Rall, 2012). Reilly (2017) particularly focused on the need for smaller, local news outlets to remain relevant through increased use of data visualization and digitalization of content. This study supports the notion that interactive strategies could help communicators in both rural and urban areas. As professional agricultural communicators are often crisis communicators, public relations managers, social media experts, writers, and graphic designers all rolled into one, training in interactive strategies and the software needed to create interactive data visualizations will not only pay dividends currently but will also continue to increase in value as both internet adoption and literacy increase.

This notion presents the pedagogical implication that interactivity training should be provided to agricultural communicators within college curriculums in order to provide students the tools they will need to stay relevant within the quickly-changing communication realm.

Suggestions for future research

Through the course of this research, the researcher recognized several avenues for future research. One recommendation would be to re-run the experiment with different manipulations. The first recommended manipulation was the increase of interactivity to the high levels defined by Weber & Rall (2012). Replicating this study with a more interactive message could lead to a better understanding of the consumer's relationship with interactivity and help identify the point at which interactivity suffers from the law of diminishing returns in agricultural communication.

The second recommended replication could be conducted by changing the message stimulus to a more neutral or optimistic agricultural topic. Other additional dimensions on which to manipulate the stimulus could include relevance, for example a Georgia-focused message versus a nationally focused message, or timeliness. For example, one respondent wrote, “old news” in the thought-listing exercise of this study in response to the data from 2017. Replicating the study with a message less than a year old could increase the perceived relevance.

Finally, the researcher also recommends that future studies similar to this one actively include more farmers and agriculturalists. Due to the sample limitations, it is likely that few agriculturalists took this survey despite the high involvement scores exhibited and fairly high percentage of rural respondents. Practical rather than experimental hypothesis testing could be carried out through publications like the Farmers and Consumers Market Bulletin, which boasts a large subscription base of agriculturalists.

The overall positive effect of interactivity in terms of attitudes and critical thinking exhibited in this study confirms that interactivity is a useful strategy to add to the toolbox of agricultural communicators. This should be recognized as both a theoretical and pedagogical call for further research and education on interactivity strategies and effects, as well as a practical push for agricultural communicators to pursue more interactive communication strategies to better tell the story of agriculture.

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