Introduction

Genetic modification (GM) science is a modern biotechnology used in medical and agricultural industries (Napier et al., 2004; Ruth et al., 2018). Biotechnology using GM to produce vaccines and pharmaceuticals has smoothly integrated into society, whereas biotechnology use in agriculture has not been embraced at the same level (Braun, 2002; Napier et al., 2004). GM science, in relation to agriculture, is commonly defined as the intentional alteration of the DNA of plants, animals, or insects to produce desirable traits (FDA, 2015; Ruth et al., 2018). GM science has introduced crops that are disease or pest-resistant and ultimately result in higher crop yields (Lamm et al., 2019).

GM food products have become a controversial topic even though multiple studies have concluded they are not harmful to human health (Mahgoub, 2016; National Academy of Sciences, 2016; Nicolia et al., 2014). Nicolia et al. (2014) found there is "no significant hazard" (p. 84) to human health related to GM crops. Domingo and Giné (2011) concluded GM plants, such as maize and soybean, are just as "safe and nutritious" (p. 741) as many non-GM products. However, many consumers are skeptical about GM science (Ruth & Rumble, 2017) relying on their emotions rather than science-based information when forming opinions about their consumption and purchasing of food with GM ingredients (Mahgoub, 2016). Many consumers believe GM food is worse for your health than organic food, and that GM food will create environmental issues (Funk et al., 2015; National Academy of Sciences, 2016). The disconnect between factual and emotion-driven decision-making may be impacted by the lack of knowledge consumers have regarding new agricultural technologies (Durant et al., 1998; Ruth & Rumble, 2017). This disconnect could be driven by consumers lack of expertise or time to discern scientific information about GM foods to determine any potential risk associated with purchasing and consuming the products (Kim & Paek, 2009).

Numerous studies have found consumers' demographics play a role in how they respond to GM food and its potential associated risks (Frewer et al., 2013; Pechar et al., 2018; Pusuri et al., 2010; Vecchione et al., 2014; Wunderlich et al., 2015). Pechar et al. (2018) examined the role of political ideology on consumers' trust in GM science and found liberal Americans are more trusting in GM science than conservative Americans. Additionally, Vecchione et al. (2014) conducted a study on the relationship between knowledge, attitude, and behaviors of consumers towards GM foods and GM food labeling in grocery stores and found age range and education effected consumers knowledge of GM foods. These studies highlight how consumers a need to understand how consumers cognitively process information about potential risks associated with GM science in order to share science-based information with consumers in a meaningful manner.

One potential communication channel for sharing science-based information is through the use of infographics. Infographics, or informational graphics, have recently increased in popularity (Atkinson & Lazard, 2015) and may be beneficial in increasing consumer GM literacy. Infographics enable consumers to visualize complex data through graphic drawings and text (Afify, 2018). The displays are designed to effectively communicate information and reach a large audience (Atkinson & Lazard, 2015; Mashable, 2013). Tu et al. (2018) concluded infographics are more useful than text-only information when delivering environmentally conscious messaging to consumers. Vanichvasin (2013) examined the role of infographics on undergraduate students and found infographics used as learning tools and for visual communication benefited students' quality of learning. Martin et al. (2019) examined participants' reading preference and cognitive effort used between infographics and text-only article summaries when presented with medical research and found infographics were more beneficial in summarizing literature than text-only summaries. Also, Claes and Moere (2013) investigated the influence of infographics placed on street signs in an urban neighborhood and found infographics increased neighborhood residents' "curiosity, personal reflection, social interaction, perceptional changes, discussion […] and […] public knowledge of social issues" (p. 138). Thus, infographics may also prove more beneficial than text only when sharing information with consumers about GM foods and science.

The two most prominent types of infographics are static and animated (Afify, 2018). Static infographics can be in-print or online, and do not include any motion or animations (Afify, 2018). Animated infographics include motions or animations that can only be presented on video screens, through YouTube, TV ads, or other video media channels (Afify, 2018). There are a limited number of studies conducted on the effectiveness of infographics within agriculture (Burnett, 2018) and about risk-related topics. Identifying infographics that attract consumers' attention may assist with individuals making more informed decisions about GM foods and GM science in the future.

Literature Review

Heuristic-Systematic Processing Model

Most information campaigns target enhancing an individual's understanding of a risk by enabling people to make informed choices and beneficial adjustments to their risky behaviors when attempting to inform the public of risks (Kahlor et al., 2003). One key component of understanding how people process messages related to risk-related behaviors is to understand the depth in which individuals process new information (Dunwoody & Griffin, 2015; Kahlor et al., 2003). When individuals process material quickly, or heuristically, their understanding of the contents is often more superficial than that of an individual who has taken significant time to systematically process the same material (Kahlor et al., 2003).

> Information seeking and processing are critical components of risk decision making. Individuals vary greatly in the energy expended on these processes, and that variance may spell the difference between formation of volatile versus stable attitudes about a risk, as well as the difference between acting or not acting in response to a risk (Dunwoody & Griffin, 2015, p. 102).

Within the heuristic-systematic processing model (HSM), individuals process information in one of two ways: systematically or heuristically (Kahlor et al., 2003). The model is applied when people are presented with material they must make a judgement on or about (Kahlor et al., 2003). Individuals typically gravitate toward either heuristic or systematic processing due to their inherent capacity to interpret and comprehend the new material, as well as their willingness to invest in effortful material processing. Individuals can move back and forth between heuristic or systematic processing depending on the situation (Chaiken et al., 1989). Additionally, heuristic and systematic processing may be additive, such that both processes occur simultaneously (Steginga & Occhipinti, 2004).

A systematic processor exerts significant cognitive effort to process and understand the material's meaning (Kahlor et al., 2003). A person is more likely to be a systematic processor if the/she encounters novel information that is important to them or is perceived to be significant (Kahlor et al., 2003; Chen & Chaiken, 1999). Opposingly, within the heuristic approach to material comprehension, little effort and time is put into discerning the meaning of the material presented. Within the HSM, systematic processing is more likely to lead toward more stable attitudes. If an individual acknowledges his/her lack of information, systematic processing will be triggered and motivate that individual to seek more information to make an informed decision (Dunwoody & Griffin, 2015; Kahlor et al., 2003; Chen & Chaiken, 1999). Heuristic processors value the accessibility of information as well as the outlying components of the information (Kahlor et al., 2003). There is often a lower capacity to analyze information and the individual typically finds the information to be less consequential when processing heuristically (Dunwoody & Griffin, 2015; Kahlor et al., 2003). Kim and Paek (2009) examined how the lay public discern risk-related information about GM with the HSM and found respondents' processed information heuristically or systematically to change their attitudes depending on their motives for understanding. Therefore, within HSM individual characteristics and experiences can impact the type of processing an individual engages in to understand an issue; however, those attributes are not examined within model. The two types of information analytic processes are foundational components of the risk information seeking and processing model (Kahlor et al., 2003).

Risk Information Seeking and Processing Model

Information seeking is the act of an individual to voluntarily search, select, and attend to certain messages through available media channels to gain information about a given topic (Dunwoody & Griffin, 2015). The Risk Information Seeking and Processing Model combines several theories to further understand how individuals identify, seek, and process gaps in his/her knowledge about a topic with a level of uncertainty or risk (Griffin et al., 1999) (Figure 1). "RISP posits that risk information seeking and processing will be driven primarily by a person's subjective assessment of the gap between what he knows about a risk and what he feels he needs to know in order to respond to that risk adequately" (Dunwoody & Griffin, 2015, p. 106).

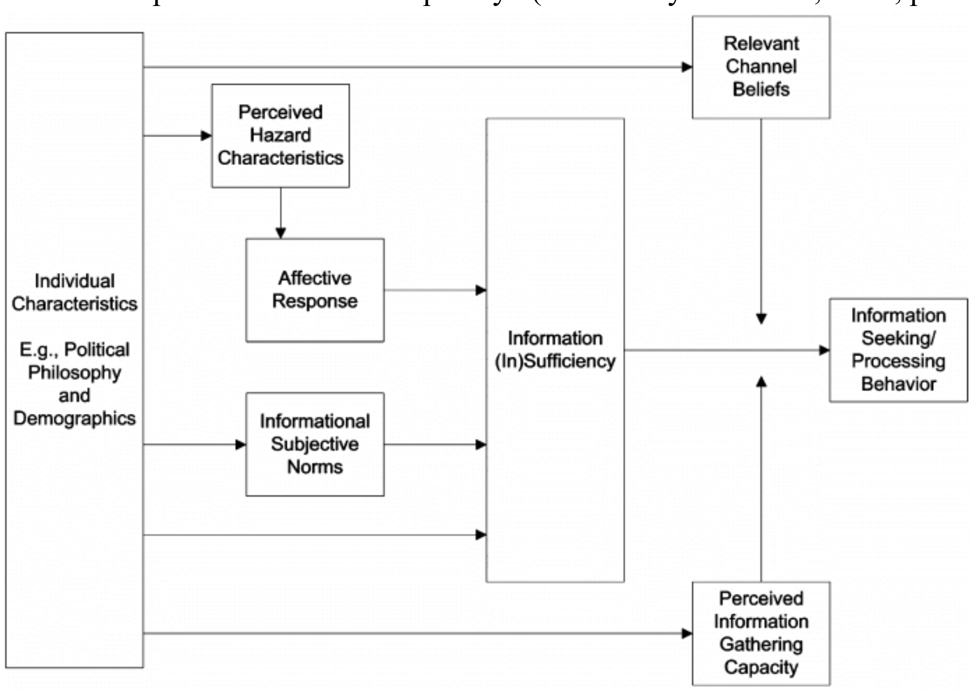

Figure 1. Risk Information Seeking and Processing Model (Dunwoody & Griffin, 2015)

RISP seeks to describe how and why some individuals choose to engage in effortful information seeking behaviors about topics with some degree of associated risk when others do not (Dunwoody & Griffin, 2015; Griffin et al., 1999). “While most individuals, when faced with information gaps, express a desire for additional information, circumstances typically limit the number who progress to actual information seeking behaviors” (Dunwoody & Griffin, 2015, p. 103). Employing systematic seeking and processing requires an effort on the part of the individual to select and attend to information when forming a judgement. A sufficiency threshold is defined as the amount of knowledge or information an individual must have in order to deal with the possible risk associated with an issue (Griffin, et al., 2009). Griffin et al. (2009) examined the role of the sufficiency threshold with risky information and found respondents who worry about risk and are pressured by norms were most likely to not think they have received enough information to deal with the risk. Therefore, systematic seeking processing requires individuals to be motivated to search for further information and reach a *sufficiency threshold* (Chaiken et al., 1989). When an individual has a low *sufficiency threshold*, heuristic processing is triggered and the individual may or may not form a judgement based on factual information, but rather information that quickly alleviates his/her concern (Chaiken et al., 1989; Dunwoody & Griffin, 2015).

The sufficiency principle indicates that an individual will seek out more information until they believe they have obtained enough (Kahlor et al., 2003; Lu, 2009). Informational insufficiency occurs when a gap arises between what an individual currently knows/understands and what they actually need to know to make a confident, informed decision (Lu, 2009). Once an information seeker feels confident, they have obtained enough material to make a decision, they have reached a sufficiency threshold (Lu, 2009). Heuristic and systematic processors may reach the information sufficiency threshold at different stages when processing risk. For example, one key motivator of systematic processing is the desire to obtain additional information (Kahlor et al., 2003). The need for more information stems from a desire to have confidence in personal judgement after processing risks. As the need to understand perceived risks increases for a systematic processor, so does the desire to increase confidence (Aleksejeva, 2012).

Informational subjective norms can play a role in where the information seeker sets their sufficiency threshold. Informational subjective norms illustrate the perceived role society has on whether or not an individual will or will not behave in a certain way (Lu, 2009). Therefore, it is expected societal norms depict an understanding of what significant individuals believe the public should know about a risky topic. If the opinion of certain influential members of society is valued it can increase the informational insufficiency gap and drive the seeker to find more information on the topic before making a decision (Lu, 2009). Thus, infographics that display information about society’s subjective norms toward GM may affect respondents’ level of information recall about GM.

Risk perception is influenced by demographic characteristics, including level of education (Aleksejeva, 2012), age, gender, household size, children in the home, and geographic location (Harrison, 2004). Harrison (2004) examined risk perceptions of consumers towards GM foods in the United States and Italy and found high levels of risk in both countries influenced consumers GM food purchasing behavior. Additionally, United States consumers purchasing behavior of GM foods was related to education, gender, household size, and children in the household (Harrison, 2004). Nardi et al. (2020) conducted a metanalysis on food safety risk perception and found socio-demographic characteristics, including age, gender, children in the household, and number of people in the household, are a driving force in respondents’ food safety risk perception. Wanlass (2020) examined risk perceptions of GM soybean oil and found household size, education level, gender, marital status, household income, children in the house, and rurality all influenced consumers GMO purchasing behavior and may be related to risk perception.

"To develop effective communication strategies, it is crucial to understand the processes through which consumers encounter and search for information from different sources, as well as through different channels" (Kuttschreuter et al., 2014, p. 10). With an abundance of communication channels available, seeking information from a variety of sources is at the consumers' fingertips. Within the RISP model, relevant channel beliefs are expected to contribute to how individuals seek information (Griffin et al., 1999). Relevant channel beliefs take into account an individuals' perceptions of utilizing media channels to search for process information about risk-related issues (Griffin et al., 2004).

Research related to food-risk situations has shown the RISP model to be an effective model to explain and account for information processing and engagement (Griffin et al., 2004; Kuttschreuter et al., 2014). Additionally, research has shown social media can effectively be used as a complementary channel to provide consumers information about food risk (Kuttschreuter et al., 2014). In a European study related to food risk, the researchers found an individual's motivation to seek additional information about food-related risks was a significant determinant in which channel he/she relied upon for seeking information because it indicated a higher intention to utilize multiple media channels for information (Kuttschreuter et al., 2014). Media channels that engage audiences with critical information about risk, such as the risks associated with GM food, and provide information to various audiences will continue to evolve with the continued integration of technology into consumers' lives.

Infographics

Infographics have been used to visually convey complex information to a variety of audiences. While infographics can be designed in many ways, generally, infographics consist of data graphics, maps, and diagrams (Otten et al., 2015). Research has shown "infographics are a powerful way to distill and convey complex scientific information as a visual narrative" (Otten et al., 2015, p. 1903).

Animation utilizes movement and dynamic elements to attract attention and enhance visualization (Lai et al., 2009). Animated visualizations have been perceived as more engaging and imaginative than static elements (Jiang & Benbasat, 2007; Sundar & Kalyanaraman, 2004). In retail research, animation has been found to improve recall, values, and attitude toward certain products (Lai et al., 2009). Additionally, with eye-tracking research, animation has been shown to increase consumer attention. However, this increased visual attention to the animated product decreased the respondents' visual attention to static elements presented at the same time (Cheung et al., 2017). Increased attention has been posited to have direct relationship to consumers' arousal related to viewing an item; therefore, increasing their ability to retain and recall the animated objects' information (Cheung et al., 2017; Sundar & Kalyanaraman, 2004; Heo & Sundar, 2000). Increased recall ability of information with animation is continually being explored with the more varied applications.

Infographics used in research related to science and agricultural messages have suggested an increase in cognitive interaction and attitude (Burnett et al., 2019) and greater understanding in source credibility (Li et al., 2018). Interactive infographics utilize data through graphs, charts, and other visual depictions to allow the viewer to engage with the content at a level of their choosing (Burnett et al., 2019). When presented with complex science information, Li et al. (2018) found viewers relied upon the, "heuristic cues, such as design quality and source attribution, to judge the credibility of the visualized data" (p. 15). When comparing interactive and animated infographics, interactive infographics allow viewers to select specific attributes to attend to with the graphic (Li et al., 2018), whereas animated infographics have limited peer-reviewed research to draw upon. However, based on advertising research, animation allows the designer to select key messages to draw the viewers' attention through movement and dynamic displays (Cheng et al., 2017).

Numerous studies have found infographics benefit an individual's information recall (Al Hosni, 2016; Alrwele, 2017; Bateman et al., 2010; Pjesivac et al., 2017; Yildirim, 2016). Pjesivac et al. (2017) examined the effect of infographics on television displaying graphics about sexually transmitted diseases on information recall of young Americans and found infographics increased information recall as compared to voice only information. Al Hosni (2016) examined the effectiveness of infographics in the classroom and found infographics increased students' comprehension of material and information recall. However, some studies suggested infographics are not beneficial for information recall (Damman et al., 2018; Gareau et al., 2015). Therefore, consumer information recall from infographics about risky agricultural topics must be studied in order to determine infographics future use as an agricultural communication tool.

Previous research has shown demographics, including age (Harrison et al., 2015; Li et al., 2015; Young & Hinesly, 2015), ethnicity (Chin, 2018), gender (Harrison et al., 2015), and education level (Harrison et al., 2015) influenced how an individual engages with an infographic. Young and Hinesly (2015) examined the effect of text-only messages and infographics on information comprehension between generational groups and found infographics were more effective with Millennials, whereas Baby Boomers preferred the text-only version. Harrison et al. (2015) examined the characteristics that make an infographic appealing and found age, gender, and education level influenced engagement with infographics of a certain complexity and color.

As issues in science and society that can be perceived as risky emerge, factual information must be presented in meaningful and relevant forms to encourage systematic processing (Otten et al., 2015) and infographics may be one way to do this. Considering the risk associated with GM, infographic designs must consider how individuals process and seek information about risk. Many factors may influence risk processing, including demographics, social norms, and sufficiency thresholds. Therefore, engaging consumers with relevant communication material, such as infographics, that also addresses risk factors is imperative to increasing GM information recall, one of agriculture's most contentious and risk-laden topics.

Purpose and Objectives

The purpose of this study was to explore the impact static and animated infographics have on consumers' information recall when information about GM is presented. The following research objectives guided the study:

RO1. Describe respondents' level of information recall after being presented with a static or animated infographic.

RO2. Determine if respondents' level of recall differs depending upon whether they were presented a static or animated infographic.

R03. Determine if respondents' level of recall after being presented with a static or animated infographic is moderated by demographic characteristics.

H1. Respondents receiving the animated infographic treatment will exhibit a higher level of information recall than respondents receiving the static infographic treatment.

H2. Demographic characteristics will moderate a respondent's level of recall despite receiving the static or animated infographic treatment.

Methods

A quasi-experimental design, delivered through an online survey, was used to answer the research questions. United States (U.S.) citizens age 18 or older were the population of interest. The research presented here was part of a larger study striving to identify the best way to communicate with U.S. consumers about GM science as a solution to citrus greening, a devastating disease impacting the future viability of the citrus industry. Two sections of the survey instrument were germane to the findings in this study: level of information recall and demographic characteristics. The study was funded by the United States Department of Agriculture, National Institute of Food and Agriculture, through the Specialty Crops Research Initiative/Citrus Disease Research and Extension USDA NIFA Award No. 2015-70016-23028.

Prior to answering any questions about science in general or GM, the respondents were randomly assigned to one of two treatment groups where they were presented with either a static or animated infographic. The two infographics were identical except for the movement introduced in the animated version. The static version of the infographic can be viewed in Figure 1. Animations included the complexity wheel spinning, the tractor driving on and off the page and the agreement wheel turning.

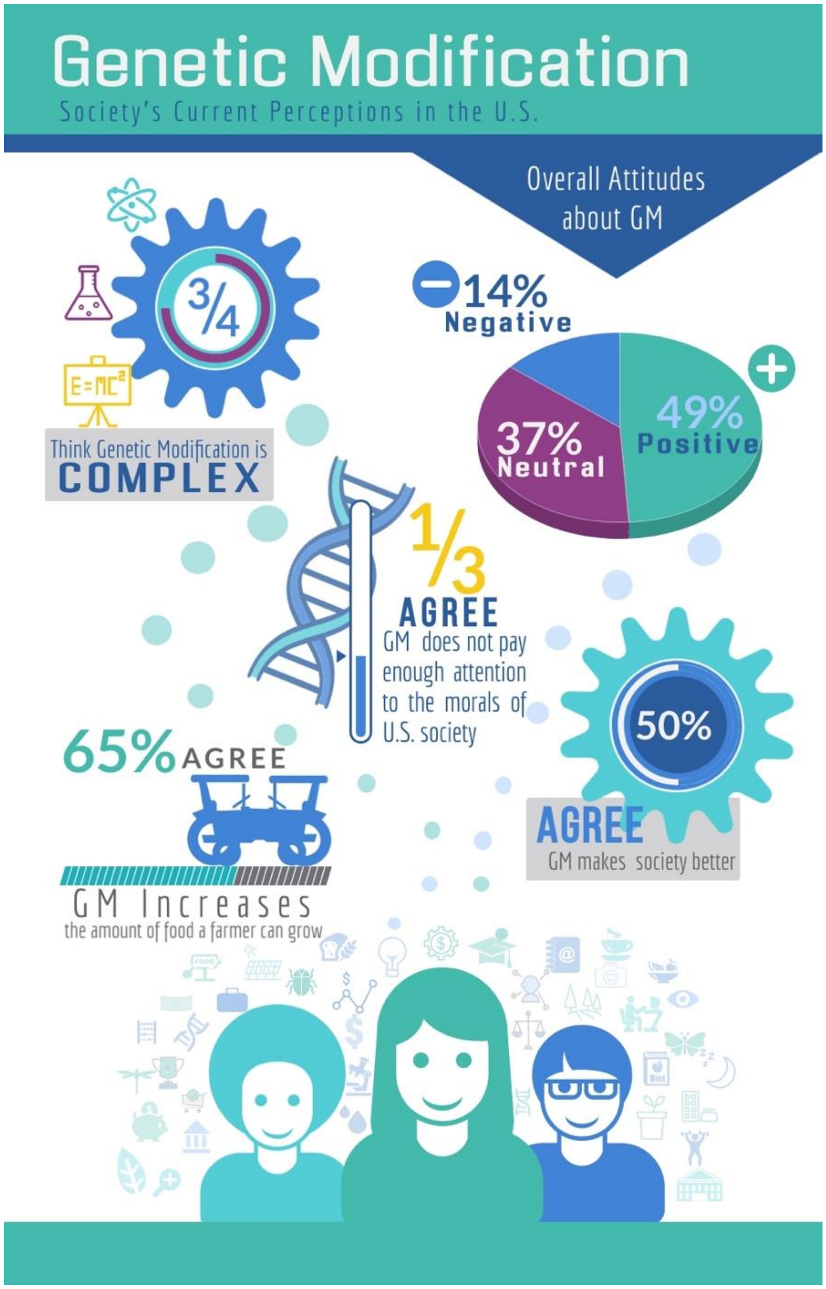

Figure 1. Static infographic design

Timing was set on both treatments to ensure each respondent spent the minimum amount of time deemed necessary to view the entire infographic. At the conclusion of the time allotted, respondents were asked to respond to a multiple-choice question asking what the infographic they just viewed was about. There was one correct response and three incorrect responses. If the respondents did not indicate the correct response, as an indicator of their ability to view the infographic, they were exited out of the survey and were not included in the analysis.

After viewing the assigned infographic, respondents were asked three multiple-choice information recall questions (see Table 1). For each question answered correctly, a respondent received a score of one; an incorrect response resulted in a score of zero for that question. The scores for the three questions were summed to create an overall information recall score. An overall score of zero indicated a respondent did not get a single answer correct. A score of three indicated a respondent was able to accurately answer all three questions. Reliability was calculated *ex post facto* and was found to be sufficient (α = .80).

Table 1
Information recall questions utilized

Question	Possible responses (Correct response is in bold)
Overall, the majority of society's attitude toward genetic modification is	**Positive** Negative Neutral
What word did most of society think of genetic modification?	Unimportant **Complex** Uninteresting
How do the majority of people feel about genetic modification's ability to increase the amount of food a farmer can grow?	**Agree** Disagree Neutral

An expert panel with expertise in food issues, GM, science communication, and public opinion research reviewed the instrument for content, face validity, and survey design. The individuals on the expert panel were external to the research process. Institutional Review Board approval was obtained. The panel of experts included three assistant professors from [University 1], [University 2], and [University 3] with a background in science communication, agricultural communication and survey design and construction.

A non-probability opt-in sampling technique was utilized to test the infographics with a geographically representative sample of the U.S. public. A public opinion survey research company, Qualtrics, was contracted to obtain the sample. Non-probability samples are often used in public opinion research (Baker et al., 2013) and commonly accepted as a sampling technique in agricultural communication research (Lamm & Lamm, 2019). Given this study was utilizing a quasi-experimental design with the random assignment of treatments, the typical adjustments for nonrandom selection done with non-probability samples was not required. However, since previous literature has shown non-probability samples that utilize weighting techniques to adjust for the error introduced in nonprobability sampling yield results that are as good and sometimes better than probability-based samples (Abate, 1998; Twyman, 2008; Vavreck & Rivers, 2008), the research team weighted the dataset *post hoc* using post-stratification methods (Kalton & Flores-Cervantes, 2003) based on the 2010 Census data. Data were weighted on geographic location, age, gender, and race. A total of 657 responses were obtained. Of the respondents, 53.1% were male and 46.3% were female. The respondents ranged in age with the largest group (18.9%) being between the ages of 60-69 years and were predominantly white (77.9%). Only 9.3% identified as Hispanic. Almost 40% of the respondents had children in their home and level of education ranged widely. Religious beliefs were fairly spread out, with the majority of respondents being Protestant (25.4%), nothing in particular (19.6%), Roman Catholic (18.7%), and something not listed (15.5%; Huber & Huber, 2012). Detailed demographics can be viewed in Table 2.

Table 2
Demographics of Respondents (N = 657)

	n	%
Sex		
Male	349	53.1
Female	304	46.3
Unidentified	4	0.6
Age		
18-19 years	19	2.9
20-29 years	119	18.1
30-39 years	111	16.9
40-49 years	111	16.9
50-59 years	91	13.9
60-69 years	124	18.9
70-79 years	78	11.9
80+ years	4	0.6
Race		
White	508	77.9
Black	74	11.3
Asian	39	6.0
Multiracial	12	1.8
American Indian or Alaska Native	4	0.6
Other	15	2.3
Ethnicity		
Hispanic	61	9.3
Non-Hispanic	592	90.7
Children in Household		
At least 1 child	257	39.4
No children	396	60.6
Education		
Less than 12th grade	17	2.6
High school	135	20.7
Some college	127	19.4
2-year college degree	105	16.1
4-year college degree	152	23.3
Graduate or Professional degree	117	17.9
Religious Beliefs		

Protestant	166	25.4
Roman Catholic	122	18.7
Mormon	5	0.1
Orthodox (Greek or Russian)	9	1.4
Jewish	22	3.4
Muslim	17	2.6
Buddhist	14	2.1
Hindu	5	0.1
Atheist	30	4.6
Agnostic	33	5.1
Something else	101	15.5
Nothing in Particular	128	19.6
Political Beliefs		
Very Liberal	58	8.8
Liberal	126	19.2
Moderate	246	37.4
Conservative	138	21.0
Very Conservative	85	12.9

Data was analyzed descriptively, using frequencies and means, and inferentially using ANOVAs, Chi-Square tests, and an ANCOVA to address the research objectives and test the hypotheses.

Results

Respondents' level of information recall after viewing a static or animated infographic

Respondents were randomly assigned to two treatment groups: static and animated. After viewing their assigned infographic, participants were asked to answer a multiple-choice question about what they viewed at the bottom of the infographic. The only correct answer to this participant check was "people" for both treatment groups. If the participant did not answer this check correctly, they were exited out of the survey. If they answered the check question correctly, respondents were then asked to answer three multiple-choice recall questions. Each question had only one correct response. The percentage of respondents answering each of the three questions correctly can be seen in Table 3. More respondents receiving the animated infographic answered all three questions correctly than those receiving the static infographic.

Table 3
Information recall after viewing a static or animated infographic

	Correct Answer %			
Question	Static *n* = 347	Animated *n* = 310	X^2	*p*
Society's attitude toward GM	43.5	57.4	12.66	.00
Word society associates with GM	87.6	92.9	5.15	.02
How society feels about GM's ability to increase food yield	58.2	70.7	10.99	.00

An overall information recall score was then obtained by summing the responses to the three recall questions. Each correct response received one point; an incorrect response received zero points. Therefore, an overall information recall score could range from zero to three. The static treatment group had a lower overall mean score (*M* = 1.89, *SD* = .95). than the animated group (*M* = 2.21, *SD* = .91).

Differences in level of information recall after viewing a static or animated infographic

An ANOVA was used to determine if the difference in overall information recall scores between the two treatment groups had a statistically significant difference. The results indicated a statistically significant difference in information recall between the two groups ($F_{1, 656} = 19.07$, $p < .00$, $n_p^2 = .024$). To further explore the differences, a series of Chi-square tests were used to determine if there were statistically significant differences between the expected and actual percentage of positive responses within the two treatment groups. The results revealed a statistically significant difference between the two groups in the level of correct answers to all three questions (Table 3). The findings confirmed the first hypothesis (H1) indicating information recall is greater when a respondent views an animated infographic versus a static infographic.

Moderation of level of recall after being presented with a static or animated infographic by demographic characteristics

A series of Chi-square tests were performed within each treatment group to determine if they were statistically significant differences in recall based on sex, if children were living in the home, level of education, religion, and political beliefs (Table 4). A Chi-square test was used due to the categorical nature of the demographic variables. Sex, children living in the home, level of education, and religion did not moderate the information recall within either treatment group. Political beliefs did moderate information recall within the static treatment group ($X^2 = 31.58$, $p < .05$).

Table 4

Examining Recall within Static and Animated Infographic Treatments by Demographic Variables

	Static $N = 347$			Animated $N = 310$		
	%	*M*	X^2	*%*	*M*	X^2
Sex			6.20			2.94
Male	51.9	1.97		55.2	2.27	
Female	48.1	1.79		44.8	2.14	
Children in Home			5.40			1.78
None	60.5	1.82		39.2	2.20	
1+ child	39.5	2.00		60.8	2.29	
Education			13.10			23.78
Less than H.S.	3.7	1.60		1.3	2.50	
High School	20.7	1.83		20.6	2.00	
Some College	20.2	1.82		18.6	2.17	
2-Year College	17.3	1.76		14.7	2.02	
4-Year College	20.5	1.97		26.5	2.44	
Graduate Degree	17.6	2.13		18.3	2.42	
Religion			38.88			38.47
Protestant	25.1	1.85		25.8	2.21	
Roman Catholic	19.9	2.08		17.3	2.33	
Mormon	0.3	1.00		1.3	1.75	
Orthodox	4.0	2.25		1.6	2.00	
Jewish	4.0	2.35		2.6	2.12	
Muslim	3.2	2.18		2.0	2.33	
Buddhist	1.4	1.80		2.9	2.00	
Hindu	0.3	3.00		1.3	2.50	
Atheist	4.0	2.21		5.2	2.25	
Agnostic	4.9	2.00		5.2	2.75	
Something Other	15.3	1.60		15.7	2.18	
Nothing Particular	20.2	1.74		19.0	2.12	
Political Beliefs			31.58*			9.38
Very Liberal	9.5	2.42		8.2	2.56	
Liberal	19.0	1.96		19.6	2.28	
Moderate	37.2	1.86		38.2	2.15	
Conservative	20.2	1.64		22.2	2.22	
Very Conservative	14.1	1.87		11.8	2.25	

Note. $*p > .05$

Age was a continuous variable, therefore an ANCOVA was used to determine if age moderated information recall. Respondents' ability to recall GM science information was not moderated by age ($F_{1, 656} = .50$, $p = .48$). The finding confirmed the second hypothesis (H2) indicating the effect of the treatment group on information recall was moderated by a single demographic characteristic, political beliefs, but not others.

Discussion

Static infographics have been the most common way agricultural information has been communicated since the emergence of infographics (Burnett, 2018). Based on the literature, one would expect the visual imagery found in an infographic to resonate and engage the consumer in systematic processing more than a static website or social media post (Kahlor et al., 2003) yet the findings indicated recall was limited. Less than half of the respondents receiving the static infographic answered the first question correctly related to society's attitude toward GM. This implied they are processing this piece of information heuristically. Many consumers already have strong opinions about GM science (Funk et al., 2015; National Academy of Science, 2016) and may be unable to process information contradictory to their already held belief. The findings are similar to Damman et al. (2018) and Gareau et al. (2015) who found infographics did not improve consumers' information recall; however, they contradict a large body of literature suggesting infographics improve information recall (Al Hosni, 2016; Alrwele, 2017; Bateman et al., 2010; Pjesivac et al., 2017; Yildirim, 2016). Findings from the current research suggest the risk associated with GM foods may outweigh the impact of infographics as a learning tool.

Animating the infographic, and thus strategically drawing attention to the data related to society's attitude toward GM science, increased recall by 13.9% compared to static infographics; however, only 57.4% of the respondents receiving the animated infographic answered the second question correctly. This finding implied that animating an infographic about society's attitude toward GM science increases recall but not to the degree that it is reaching consumers at a high level of information processing to modify existing perceptions. Considering the potential risk associated with GM food, perhaps there is little agricultural communicators can do to alter perspectives related to perceived social norms using infographics. This finding is in opposition to what Kuttschreuter et al. (2014) found in regard to social media effectively providing consumers information about food risk. However, in their study, motivation determined information seeking behavior and could be the cause for the difference considering consumers are likely unmotivated to change their opinions related to GM food. Moreover, considering the important role subjective norms play in where information seekers set their *sufficiency thresholds* (Lu, 2009), the finding should be of concern and further explored. The amount of potential risk associated with GM foods may affect how consumers seek and process information, and ultimately their sufficiency thresholds for GM food information. Furthermore, from a practical perspective, continuing to spend resources on one-way communication efforts (infographics, websites, direct messaging, blogs, etc.) where consumers have to seek out and read or explore information about GM science themselves without any (or very little) direct feedback may be a lost cause. Future research should be conducted to determine the benefits of two-way communication with consumers about potential risk-laden topics as compared to one-way communication channels, such as informational programs with extension personal. Having an open line of communication about a risky topic may increase consumers systematic processing.

Even with this thought, it is important to recognize that, as hypothesized, the animated infographic treatment did have a significantly greater effect on information recall than the static treatment. This implied animating an infographic with GM science information (a potentially risky agricultural topic) had the same effect on recall as it did with retail messages (Lai et al., 2009). Therefore, if infographics are going to be used in an online medium where animation is available it should be used to highlight key points to enhance recall as much as possible. Further research should be done to determine if the information in an infographic that is animated is processed more systematically than the information that is not animated in the same graphic.

Additionally, the integration of animation should be explored in other forms of communication media channels and how the public attends to certain attributes and messages surrounding complex and risk-laden science issues.

The second hypothesis, demographic characteristics will moderate a respondent's level of recall despite receiving the static or animated infographic treatment, was confirmed in this study. Given previous research has found level of education, age, gender, household size, children in the home, and geographic location influenced risk perception (Aleksejeva, 2012; Harrison, 2004), it was surprising only political beliefs moderated recall in this study. However, it was not surprising to find respondents who were very liberal had a significantly higher ability to recall the information in both treatment groups. Individuals who express liberal political beliefs have a greater trust in GM science than conservatives (Pechar et al., 2018). Therefore, liberal consumers may be more motivated to process information systematically, while moderate or conservative consumers are less motivated to internalize new information and are only processing heuristically. Future research should study the effects of political ideology and affiliation on consumers' information recall from infographics about potentially risky agricultural topics as well as how they process information with some level of risk associated.

Overall the findings from this study found it is difficult to communicate about GM science in a manner that attracts enough attention that consumers will process information systematically. This may be a result of established "knowledge" surrounding the topic of GM science in food and may indicate a threshold of information (in)sufficiency on this particular topic has been reached. While infographics have emerged as a dynamic way to distill and convey scientific information (Otten et al., 2015), their use is limited in the GM science space. Additional research should be conducted on the use of infographics to communicate about other risk-related agricultural topics such as climate change, food waste, and the rural-urban divide to determine their overall effectiveness, rather than in just one contextual area of inquiry. There were several limitations to this study. While GM infographics may not have been effective with respondents' information recall, the level of risk associated with GM may have influenced the results; thus, the findings are not generalizable beyond risky topics about agriculture, such as GM food. Infographics that portray information about other types of agricultural issues should be explored in future research. Additionally, the color and complexity of the infographic may have affected the results of the study (Harrison et al., 2015).

In terms of GM science, perhaps consumers need to be physically exposed to GM food in a hands-on experience to breakthrough already developed notions. Setting up educational experiences at farmer's markets or local grocery stores could provide an avenue for two-way communication to occur where questions can be asked and answered in real time rather than dismissed. In addition, it would remove the consumer from their day-to-day decision-making process and engage them in a reflective experience that might allow them to consider making their decisions about purchasing GM food out of fact rather than emotion. This area of inquiry is critical to creating research-based strategic plans for communicating complex science surrounding food to the public. Food science research is on the precipice of introducing revolutionary technology into the marketplace; however, in order for the public to be accepting of the products, communicators and scientists must share relevant and understandable information with the public in meaningful and relatable ways.

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