

# Using Critical Thinking Styles to Inform Food Safety Behavior Communication Campaigns

Arthur Leal

Joy N. Rumble

Alexa J. Lamm

Follow this and additional works at: <http://newprairiepress.org/jac>

## Recommended Citation

Leal, Arthur; Rumble, Joy N.; and Lamm, Alexa J. (2017) "Using Critical Thinking Styles to Inform Food Safety Behavior Communication Campaigns," *Journal of Applied Communications*: Vol. 101: Iss. 2. <https://doi.org/10.4148/1051-0834.1002>

This Research is brought to you for free and open access by New Prairie Press. It has been accepted for inclusion in Journal of Applied Communications by an authorized administrator of New Prairie Press. For more information, please contact [cads@k-state.edu](mailto:cads@k-state.edu).

---

# Using Critical Thinking Styles to Inform Food Safety Behavior Communication Campaigns

## **Abstract**

Consumers have struggled with maintaining consistent food safety behaviors over the years, which has been affected partly by their limited food safety knowledge. Researchers in this study set to determine Florida residents' food safety behaviors while also assessing their critical thinking styles. The social cognitive theory and the University of Florida critical thinking styles (UFCTI) inventory served as the guiding framework. The UFCTI has emerged as an effective tool in measuring how an individual's critical thinking is expressed, performed, or done. Online survey responses were collected from 510 Florida residents and data were analyzed using non-probability and weighting measures. The majority of respondents washed their fresh fruits and vegetables before eating and washed their hands before food preparation. However, respondents were not as likely to disinfect their countertops before food preparation. Respondents exhibited infrequent food label reading behaviors, as well. When receiving food related information, seekers of information preferred printed fact sheets, bulletins or brochures, and demonstration or displays. Whereas, engagers preferred websites. Recommendations included developing communication efforts focused on personalized messages and targeted mediums centered around each critical thinking style. Food safety communication should emphasize the importance and risks of not reading food labels and cleaning countertops. Future research should determine how each critical thinking style uses the mediums where no significant difference was established. Research efforts should focus on expanding the UFCTI and assessing the contributions the social cognitive theory can add.

## **Keywords**

Communication, Critical Thinking, Critical Thinking Styles, Food Safety, Social Cognitive Theory

## **Creative Commons License**



This work is licensed under a [Creative Commons Attribution-Noncommercial-Share Alike 4.0 License](http://creativecommons.org/licenses/by-nc-sa/4.0/).

# RESEARCH

## Using Critical Thinking Styles to Inform Food Safety Behavior Communication Campaigns

Arthur Leal, Joy N. Rumble, and Alexa J. Lamm

### ABSTRACT

Consumers have struggled with maintaining consistent food safety behaviors over the years, which has been affected partly by their limited food safety knowledge. Researchers in this study set to determine Florida residents' food safety behaviors while also assessing their critical thinking styles. The social cognitive theory and the University of Florida critical thinking styles (UFCTI) inventory served as the guiding framework. The UFCTI has emerged as an effective tool in measuring how an individual's critical thinking is expressed, performed, or done. Online survey responses were collected from 510 Florida residents and data were analyzed using non-probability and weighting measures. The majority of respondents washed their fresh fruits and vegetables before eating and washed their hands before food preparation. However, respondents were not as likely to disinfect their countertops before food preparation. Respondents exhibited infrequent food label reading behaviors, as well. When receiving food related information, seekers of information preferred printed fact sheets, bulletins or brochures, and demonstration or displays. Whereas, engagers preferred websites. Recommendations included developing communication efforts focused on personalized messages and targeted mediums centered around each critical thinking style. Food safety communication should emphasize the importance and risks of not reading food labels and cleaning countertops. Future research should determine how each critical thinking style uses the mediums where no significant difference was established. Research efforts should focus on expanding the UFCTI and assessing the contributions the social cognitive theory can add.

### KEY WORDS

Communication, Critical Thinking, Critical Thinking Styles, Food Safety, Social Cognitive Theory

### INTRODUCTION

Food safety was something exclusively discussed in the food industry, and not among consumers, during the 1960s and 70s. This was a time when consumers rarely questioned whether or not their food was safe and the newsworthiness of the topic was rarely pursued (Anderson, 2000). However, the United States has seen a growing trend of people interested in their food, concerned about food hazards and their health (Dimitri, Effland, & Conklin, 2005; Lusk & Norwood, 2011; Miles & Frewer, 2001). The health threats to the public make communicating about food risks unique and different than any other type of communication between the government, industry, consumer groups, and the public (Hallman & Cuite, 2010).

#### Behavioral Change

Technology has changed the way people obtain information and knowledge (Littlejohn & Foss, 2011). Health campaigns, like those that address food safety, ultimately target changing people's behaviors (Abbot, Policastro, Bruhn, Schaffner, & Byrd-Bredbenner, 2012). People are more receptive to changing their behaviors as the result of food safety educa-

tion when the risk of foodborne illnesses exists (Medeiros, Hillers, Kendall, & Mason, 2001a). Risk of foodborne illnesses serves as just one motivator that can be used to change consumers' food safety behaviors. Ellis, Arendt, Strohbehn, and Paez (2010) found that communication, reward-punishment, and informational sources were additional motivators that had the most impact on consumers' food safety behaviors. But in order for individuals to process and store information for future behavioral use, messages must be relevant and personalized (Abbot et al., 2012; Petty, Barden, & Wheeler, 2009).

### **Receiving Food Safety Information**

Mayer and Harrison (2012) looked at the use of social media to educate college students about food safety. Through the use of a pre-test, they found college students' lack of food safety knowledge was a result of limited "exposure to food safety education and opportunities to learn and practice safe food handling practices" (Mayer & Harrison, 2012, p. 1,460). This study also found that lack of time was the most frequent barrier between people receiving food safety information. YouTube, Facebook, videos, and the internet were not only found as the preferred method of receiving food safety information, but researchers found these mediums contributed to an increase in food safety knowledge among participants (Mayer & Harrison, 2012). Abbot et al. (2012) similarly found that print media, electronic media, and interactive events improved participants' food safety behaviors: self-ratings of food safety knowledge and skills, actual food safety knowledge, food safety self-efficacy, stage of change for safe food handling, and reported hand washing behaviors.

### **Food Safety Behaviors**

Consumers use their food safety knowledge as they evaluate food on many levels, consciously and unconsciously (McWilliams, 1997). Ultimately, deciding whether food is safe is the responsibility of the individual consumer (VanGarde & Woodburn, 1994), but American consumers have been notorious for participating in risky food handling and consumption behaviors (Byrd-Bredbenner, Abbot, Whaetley, Schaffner, Bruhn, & Blalock, 2008). Of the food-borne illness cases reported, large portions of those have resulted from eating raw foods or engagement in unsafe food preparation practices (Cody & Hogue, 2003; Klontz, Timbo, Fein, & Levy, 1995). Several studies have assessed consumers' self-reported food handling and sanitation practices (Abbot, Byrd-Bredbenner, Schaffner, Bruhn, & Blalock, 2009; Altekruise, Yang, Timbo, & Angulo, 1999; Cody & Hogue, 2003).

Cody and Hogue (2003) found that among the respondents in which a family member had experienced foodborne illness, 14% reported no change in cleaning activities. However, when respondents did increase their cleaning behaviors, it was typically in response to a family illness. The same study found that a high percentage of consumers reported washing their hands during food preparation (approximately 90%) but almost one half were extremely or very likely to forget to wash their hands before they began to cook (Cody & Hogue, 2003). Another study found that only 39% of participants reported washing their hands with soap and water before preparing food in their study (Abbot et al., 2009). Studies have also shown that consumers are less likely to wash their hands when handling raw meats, and at times, this includes when handling raw vegetables (Altekruise, Yang, Timbo, & Angulo, 1999; Cody & Hogue, 2003). Over the 3-year span of Cody and Hogue's (2003) study, consumers remained consistent in rinsing or wiping counter tops with soap and water after handling raw meat.

Wang, Zhang, Ortega, and Widmar (2013) evaluated consumers' participation in reading country of origin labels (COOL) on seafood products. These labels are effective vehicles to assess country safety standards and process quality, which differ from each country. COOL are often the only available and free source of information accessible to consumers (Wang et al., 2013). Researchers found that consumers believed country of origin (COO) information to be important. However, 41% of the participants did not observe the COO information on seafood packaging. Older consumers were more likely to care about COOs. Whereas, individuals with high seafood consumption cared more about safety labels (Wang et al., 2013). Loureiro and Umberger (2007) found consumers were more likely to purchase meat with COOL but still preferred food safety information over country of origin information, which is not on COOL. In addition to food safety behaviors, researchers have also explored consumers' food safety knowledge (Abbot et al., 2009; Finch & Daniel, 2005).

## Food Safety Knowledge

In a study of young adults, Abbot et al. (2009) found participants to be knowledgeable about foods that were known to cause foodborne disease but not aware of the pathogen causing the disease. Two-thirds of the participants in the same study were knowledgeable enough to keep raw meat separate from ready-to-eat food but only 3% used a thermometer to ensure their meat was cooked to a safe temperature (Abbot et al., 2009). Finch and Daniel (2005) found emergency food relief organization workers also had limited food safety knowledge. Participants were not familiar with proper hand washing practices and safe egg and meat practices. Regularly, peoples' behaviors and knowledge can stem from critically thinking about everyday decisions (Lamm, 2015; Lamm & Irani, 2011).

## Critical Thinking

Decisions are made every day, some minor (i.e., when to wake up, what to wear, what to buy at the store, etc.) and some major (i.e., who to marry, whether or not to have children, medical decisions, etc.) (Halpern, 1997). Some of the minor decisions are made without any thought and some major decisions are made with considerable deliberation (Halpern, 1997; Lannon & Gurak, 2014). "Critical thinking is the use of those cognitive skills or strategies that increase the probability of a desirable outcome" (Halpern, 1997, p. 4). It serves as a method of evaluation using purposeful, reasoned, and goal oriented consideration; critical thinking is used to calculate the outcomes of the thought process (Lamm, 2015a).

"Critical thinking calls for a persistent effort to examine any belief or supposed form of knowledge in the light of the evidence that supports it and the further conclusions to which it tends" (Glaser, 1941, p. 6). No different than any other skill mastered, critical thinking requires training and development (Pally, 1997). Reicks, Bosch, Herman, and Krinke (1994) found the use of role-playing, scenarios, personal relevance, and reflective thinking and practice were effective in encouraging people to critically thinking about food safety. Participants were able to recall previous situations they had experienced, which made the information more meaningful and germane (Reicks et al., 1994).

Consumers' risky food safety behaviors and limited food safety knowledge are likely to serve as a factor in the foodborne illnesses and diseases in the United States. Critically thinking about those decisions can affect food safety issues (Reicks et al., 1994). The focus of this study was to understand Florida residents' food safety behaviors and communication preferences, enabling the agricultural industry to engage consumers with effective communication strategies to encourage proper food safety behaviors, ultimately decreasing consumer-related foodborne illness. This study was in accordance with the American Association for Agricultural Education National Research Agenda priority seven, Addressing Complex Problems (Roberts, Harder, & Brashears, 2016). Empowering consumers through self-awareness can enable them to contribute in addressing complex problems and provide guidance in their decision-making process while creating a sustainable agricultural industry (Roberts et al., 2016).

## THEORETICAL AND CONCEPTUAL FRAMEWORK

### Social Cognitive Theory

Social cognitive theory served as the guiding theoretical framework for this study. In developing social cognitive theory, Albert Bandura combined the framework of social learning and human behavior (Stajkovic & Luthans, 1998). Social cognitive theory concentrates on individuals who socially interact with others to learn "knowledge, skills, strategies, beliefs, rules, and attitudes" (Schunk, 2012, p. 101). People simultaneously obtain new knowledge and learn behaviors through social environments. Within the social cognitive theory, learning is categorized into two distinct methods of obtaining knowledge: enactive and vicarious. Enactive learners are able to take past experiences, successful and unsuccessful, and apply them to future situations (Schunk, 2012). Some unsuccessful experiences are discarded but others are modified in efforts to produce positive outcomes. Social cognitive theory is unique in the scheme of other behavioral theories, with regards to consequences, in that it "informs people of the accuracy or appropriateness of behaviors" (Schunk, 2012, p.

104). People strive to perform behaviors that have positive consequences rather than behaviors resulting in negative consequences. While enactive learning is driven by what people have learned, vicarious learning emphasizes the observation of others (Schunk, 2012).

Vicarious learning occurs more through the observation of others. This may occur in a classroom, from a film, or through everyday interactions with others (Schunk, 2012). "Human self-development, adaptation, and change are embedded in social systems" (Bandura, 2001, p. 266). Vicarious learning is the most common method of learning for people and is generally a result of being a part of society (Schunk, 2012; Stajkovic & Luthans, 1998). The benefit of vicarious learning is that it comes without the consequences of actually performing actions, even while learning still occurs, and is a quicker method of learning versus performing each action (Schunk, 2012). Through the process of observation, individuals choose what events will have an impact on them and how they will act based on this new information (Bandura, 2001). Several factors play a role in the performance of learned information, which may occur at a later time: "motivation, interest, incentives to perform, perceived need, physical condition, special pressures, and competing activities" (Schunk, 2012, p. 105).

The concept behind the social cognitive theory is the idea that a change in one element will exhibit a change in another (Winham, Quiroga, Underiner, Woodson, & Todd, 2014). Using the concept of the social cognitive theory, Medeiros, Hillers, Kendall, and Mason (2001b) suggested that to change food safety behaviors, individuals must realize the risks associated with a particular action. The expectation of a certain outcome will motivate individuals to change their behaviors associated with food safety. Schafer, Schafer, Bultena, and Hoiberg (1993) found the risk of unsafe food leads to personal health threats (self-efficacy), the notion that an individual has the power to address the threat, and the motivation to maintain good health all served as predictors of food safety behaviors. Respondents who had high self-efficacy scores in this study did not ignore food safety threats but responded by engaging in safe food handling behaviors. The perception that food safety risks exist, and individuals have the ability to control their own food safety, encourages safe food behaviors (Schafer et al., 1993). Knowledge alone does not change behaviors, but rather, as established in the social cognitive theory, the interaction between personal factors, behavioral patterns, and environmental events address behavioral change (Bandura, 2001; Winham et al., 2014). Mayer and Harrison (2012) linked the social cognitive theory with social interactions through social networking, which served as a tool to engage the cognitive development of learners and provided a social learning environment.

## **Critical Thinking Styles**

Although everyone engages in some form of critical thinking (Halpern, 1997), this study focused on critical thinking styles; this is not in reference to the degree to which an individual critically thinks but rather the process of obtaining new information or knowledge (Lamm, 2015b). Individuals typically operate within one of two distinct critical thinking styles: those individuals who seek information when thinking critically and those who engage when thinking critically (Lamm, 2015b). No one source of material contains all the information about a topic, which illustrates the need for individuals to exhibit a balanced critical thinking style. Most individuals tend to naturally work within a specific style, but the ideal critical thinker would be able to operate in both styles when necessary.

Critical thinking styles directly correlate with how individuals express, perform or complete critical thinking (Gay, Terry, & Lamm, 2015; Lamm, 2015b). Individuals who seek information are able to see the larger picture and are genuinely hungry for information. In a desire to understand complex problems in which a multitude of solutions exist, even some that might go against an individual's beliefs and opinions, seekers insist on discovering diverse viewpoints (i.e., research, readings, and questioning; Gay et al., 2011). Seekers are able to identify their own biases, predispositions, and opinions in the pursuit of better understanding complex situations (Lamm, 2015b). They then identify how those factors might influence their understanding and decisions. Engagers, conversely, tend to be more confident in their ability to assess their surroundings and use their reasoning skills in situations: reasoning, problem solving, and decision making. Engagers prefer collecting new information from their environment and via word of mouth. As a confident communicator, engagers are able to articulate the reasoning behind their resolution to others (Lamm, 2015b).

Lamm, Strickland, and Irani (2010) assessed college students' critical thinking styles. The researchers explained through their findings that critical thinking styles were a method of understanding how individuals learn and the necessity of tailoring information to encourage people to seek and engage with information. In creating informational material, educators and/or communicators have the ability to encourage critical thinking and enhance an individual's learning experiences.

Another study explored respondents' water conservation behaviors as it relates to critical thinking styles (Gorham, Lamm, & Rumble, 2014). The findings established that individuals who were seekers of information were more likely to participate in more conservative water behaviors. Conversely, engagers of information were less likely to participate in water conservation behaviors. Gorham et al. (2014) found that individuals' water conservation behaviors were associated with their critical thinking style.

## PURPOSE

Researchers in this study sought to determine the relationship between consumers' critical thinking styles and food safety behaviors and to assess Florida consumers' communication preference when receiving information concerning food related issues.

RO1: Determine Florida consumers' food safety behaviors.

RO2: Determine Florida consumers' critical thinking styles.

RO3: Identify preferred communication mediums for seekers and engagers of information

RO4: Determine whether a relationship exists between Florida consumers' critical thinking style and food safety behaviors.

## METHODS

An online survey was distributed via Qualtrics survey software to 827 Florida residents, 18 years of age and older; 510 completed responses were recorded. The data for this study were part of a larger survey that assessed Florida consumers' food-related perceptions. However, only three sections were used to meet this study's objectives: critical thinking styles, food safety behaviors, and preferred communication medium. Question development was generated from research-developed questions and previous studies. Respondents were presented with five items to measure food safety behaviors, using a five-point Likert-type scale ranging from 1 = *Never*, 2 = *Rarely*, 3 = *Sometimes*, 4 = *Often*, and 5 = *Always*. A food safety behavior index was created to assess the relationship between food safety behaviors and critical thinking styles by using the summation and average of the five items to create an overall food safety behaviors index score. Respondents' critical thinking style was measured using the University of Florida Critical Thinking Inventory (Lamm & Irani, 2011), which requires respondents to react to 20 items on a Likert-type scale ranging from 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Agree nor Disagree*, 4 = *Agree*, and 5 = *Strongly Agree*. The UFCTI identifies learners as either an engager or seeker of information. Critical thinking style scores for engagement were reverse coded, then calculated by the summation of related items from the construct and then multiplied by 1.866. The critical thinking style score was calculated by the summation of items in the respective construct. The summation of both respondents' engagement and seeker scores produced the overall critical thinking style score for respondents (Lamm & Irani, 2011). Critical thinking scores range from 26-130. Scores 79 and above denoted a seeker of information and scores 78 and below denoted an engager of information (Lamm & Irani, 2011).

Respondents were presented with 12 communication mediums and were asked to indicate their preferred communication medium when receiving food related information by selecting all that applied. Reliability was calculated post hoc for the food safety behaviors index and resulted in a Cronbach  $\alpha$  of .79. The reliability was also assessed for each construct in the UFCTI and resulted in a Cronbach  $\alpha$  of .90 for the seeker construct and Cronbach  $\alpha$  of .87 for the engager construct.

Six individuals with expertise in food science, agricultural policy and national affairs, horticulture, and survey design served on the panel of experts to ensure content and face validity of the survey instrument. A soft launch was also used to ensure the validity of the survey instrument. Respondents were recruited via non-probability sampling measures. To ensure validity and selection of a sample representative of the Florida population, demographic information was weighted according to geographic location, age, gender, and race from the 2010 U.S. Census data. Weighting methods allow researchers to compensate for nonresponse, noncoverage, and conform to external values. Weighting methods also allow the data to better represent the population of interest (Kalton & Flores-Cervantes, 2003). Several studies have shown that non-probability samples yielded results that are as good as or even better than probability sampling (Baker et al., 2013).

Data were analyzed using SPSS ® version 22 statistical software. Descriptive statistics were calculated to record respondents' food safety behaviors and critical thinking style. To determine seekers' and engagers' preferred communication medium when receiving information concerning food related issues, a chi square analysis was calculated. A two-tailed Pearson correlation was calculated to establish the relationship between critical thinking style and food safety behaviors. Davis' (1971) convention was used in the interpretation of the correlation coefficient where relative association values were .01-.09 = *negligible*, .10-.29 = *low*, .30-.49 = *moderate*, .50-.69 *substantial*, and over .70 = *very strong association*.

A descriptive analysis was completed to report the demographics of the respondents in this study (Table 1). Respondents were composed of 52.7% female ( $n = 269$ ) and 47.3% male ( $n = 241$ ). Overall, there were 87.3% ( $n = 445$ ) Caucasian/White (Non-Hispanic), 10.6% ( $n = 54$ ) Hispanic, and 9% ( $n = 46$ ) African American respondents. Almost one half of the respondents were between 50-59 years old (24.7%,  $n = 126$ ) and 60-69 (23.5%,  $n = 120$ ). According to the rural-urban continuum code classification, using zip codes provided respondents, 91.8% of respondents lived in metropolitan counties (United States Department of Agriculture Economic Research Service, 2013).

**Table 1**  
*Demographics of Respondents*

Characteristic	<i>n</i>	%
Gender		
Female	269	52.7
Male	241	47.3
Race		
African American	46	9.0
Asian	7	1.4
Caucasian/White (Non-Hispanic)	445	87.3
Native American	5	1.0
Other	12	2.4
Hispanic Ethnicity	54	10.6
Age		
19 and under	10	2.0
20-29	61	12.0
30-39	63	12.4
40-49	75	14.7
50-59	126	24.7
60-69	120	23.5



70-79	42	8.2
80 and older	13	2.5
Rural-Urban Continuum Code Classification		
1 million or more metropolitan area	288	56.5
250,000 to 1 million metropolitan area	153	30.0
Few than 250,000 metropolitan area	27	5.3
20,000 or more, near metro area	30	5.9
20,000 or more, non-metro area	0	0.0
2,500 to 19,999 near metro area	8	1.6
<2,500 near metro area	1	0.2
<2,500 completely rural non-metro area	0	0.0

## RESULTS

### Determine Florida Consumers' Food Safety Behaviors.

Respondents were asked to indicate the frequency in which they practiced certain food safety behaviors (Table 2). Over 90% of respondents often or always made sure fresh fruits and vegetables were washed before eating (91.3%,  $n = 466$ ) and washed their hands before preparing food (94%,  $n = 479$ ). However, 31% ( $n = 158$ ) of respondents always read food labels for food safety information, and only 45.7% ( $n = 233$ ) always disinfected counters before preparing food.

**Table 2**  
*Respondents' Food Safety Behaviors (N = 510)*

	Never %	Rarely %	Sometimes %	Often %	Always %
Make sure that fresh fruits and vegetables are washed before you eat them	0.8	1.2	6.7	18.8	72.5
Read food labels for food safety information	3.7	11.0	27.1	27.3	31.0
Disinfect counters before preparing food	2.2	7.3	8.0	26.9	45.7
Wash hands before preparing food	0.8	1.2	4.1	17.3	76.7
Wash hands before eating food	1.2	2.2	9.4	23.5	63.7

### Determine Florida Consumers' Critical Thinking Styles.

The 20-item UFCTI instrument for measuring critical thinking styles was used to fulfill objective 2 (Table 3). A continuum is used to measure critical thinking style, indicating that a high or low score is not better than the other. Respondents with scores 79 and above were identified as seekers, and respondents with scores 78 and below were identified as engagers. A total of 268 (53%) engagers and 242 (47%) seekers were identified in this study. Respondents' overall UFCTI scores ranged from 66.45 to 94.98 ( $M = 79.09$ ,  $SD = 4.04$ ).

After reviewing construct scores, scores in the engager construct ranged from 13.06 to 57.85 ( $M = 26.20$ ,  $SD = 7.30$ ), with a lower score signifying a respondents' likelihood to engage more with information. Scores in the seeker construct ranged from 31.00 to 65.00 ( $M = 52.90$ ,  $SD = 6.51$ ), with a higher score signifying an individual's likelihood of seeking information when thinking critically.

**Table 3**  
*Respondents' Critical Thinking Styles*

	<i>N</i>	<i>M</i>	<i>SD</i>
Overall UFCTI Score	510	79.09	4.04
Engager Score	510	26.12	7.30
Seeker Score	510	52.90	6.51

### Identify Preferred Communication Mediums for Seekers and Engagers of Information.

Respondents' preferred communication mediums for food information were identified for each critical thinking style. Both seekers and engagers preferred websites; printed fact sheets, bulletins, or brochures; TV coverage; newspaper article or series; and videos when receiving food communication, order indicating preference.

Respondents' communication preferences were then compared with each critical thinking style (engagers and seekers) using a Chi square analysis (Table 4). More seekers ( $n = 155$ ) than engagers ( $n = 147$ ) preferred *printed fact sheets, bulletins, or brochures* ( $n = 298$ ;  $p = .04$ ). A significant association was observed between seekers and printed fact sheets, bulletins, or brochures when receiving food related information. The effect size for this finding, Cramer's *V*, was *negligible*, .09 (Rhea & Parker, 2014). A similar finding was observed with respondents who chose *demonstrations or displays* ( $n = 80$ ) as a preferred method of receiving information concerning food related issues. Seekers ( $n = 47$ ) preferred these mediums more than engagers ( $n = 35$ ;  $p = .05$ ). This finding also denoted a significant association between seekers and demonstrations and displays when receiving food-related information. Using Cramer's *V*, the effect size was negligible, .09. When receiving food related information from *websites* ( $n = 377$ ), engagers ( $n = 205$ ) preferred this medium more often than seekers ( $n = 172$ ) ( $p = .05$ ). This finding indicated a significant association between engagers interest in websites when receiving food related information. The effect size for this finding, Cramer's *V*, was negligible, .09.

**Table 4**  
*Respondents' Preferred Communication Methods for Receiving Food Related Information by Individual Critical Thinking Style*

	<i>n</i>	Seekers ( <i>f</i> )	Engagers ( <i>f</i> )	$\chi^2$	<i>p</i>
Printed fact sheets, bulletins, or brochures	302	155	147	4.46	.04*
Demonstration or display	82	47	35	3.81	.05*
Website	383	172	211	3.99	.05*
Attend a short course or workshop	55	22	33	1.37	.24
Fair or festival	37	15	22	0.76	.38
Seminar or conference	58	30	28	0.48	.49
Newspaper article or series	217	100	117	0.28	.59
Video	166	76	90	0.28	.60

TV coverage	267	129	138	0.17	.68
Other	12	5	7	0.17	.69
Get trained for a regular volunteer position	29	13	16	0.09	.77
One-time volunteer activity	45	22	23	0.04	.84

Note. \*  $p < .05$

Determine whether a relationship exists between Florida consumers' critical thinking style and food safety behaviors. To determine whether a relationship existed between respondents' critical thinking style and food safety behaviors, a summated scale was created for the five food safety behaviors ( $M = 4.31$ ,  $SD = .67$ ). Using respondents' overall critical thinking style and the food safety behaviors summated scale, a two-tailed Pearson correlation was conducted to identify whether a relationship existed between the variables. In accordance with Davis' (1971) convention, the relationship observed was negligible ( $r = -.04$ ), where  $r = 0$  signifies the absence of any linear relationship.

## DISCUSSION

The researchers recognize respondents' self-reported food safety behaviors may not completely represent actual food safety behavior engagement (Abbot et al., 2012; Clayton et al., 2002; Mayer & Harrison, 2012) and serves as a limitation. Recognizing this, several interesting findings provided insight into consumers' self-reported food safety behaviors, preferred communication styles, and critical thinking styles, even though no substantial relationship between Florida residents' critical thinking style and food safety behaviors was found.

In the course of determining consumers' food safety behaviors, the majority of respondents often or always reported making sure fresh fruits and vegetables were washed before eating and washed their hands before preparing food. This finding was similar to Cody and Hogue's (2003) study where a high percentage of consumers reported washing their hands before food preparation. In contrast, just under one half of respondents reported always disinfecting counters before preparing food. Although the potential exposure to foodborne illnesses was reduced by washing their hands, respondents appeared to increase the chances of contracting foodborne illnesses by failing to disinfect their counters as often. Unwashed counter tops still serve as a vector for foodborne illnesses.

Respondents in this study also reported reading food labels for safety information on an infrequent basis. Food labels serve as the most practical method for consumers to receive product and country safety information (Wang et al., 2013). Respondents in this study reported even lower observation of food safety information on labels than what Wang et al. (2013) reported. These results illustrate unsafe behaviors from consumers and possible exposure to several unknown food safety risks (Wang et al., 2013). Consumers appeared to not be taking advantage of all resources to receive the correct information concerning their food, even though Loureiro and Umberger (2007) found that consumers would be more likely to pay for food products with food safety labels on them.

In addition to food safety behaviors, respondents' critical thinking styles were identified in this study. Approximately one half of the respondents were found to be seekers and one half engagers of information. The results show a balanced representation of each critical thinking style, which was consistent with Gorham et al. (2014). Respondents' individual seeking and engaging scores were also compared to preferred communication methods when receiving information concerning food related issues. A significant preference for printed fact sheets, bulletins or brochures, and demonstration or displays was reported among seekers. These results support Lamm and Irani's (2011) findings in which these individuals seek out information and welcome others viewpoints. The effect size for these preferences was found to be negligible, but the findings were still interesting for this exploratory research.

A significant preference for websites when receiving food related information was reported among engagers. Large-

ly, both seekers and engagers used this medium. However, how they use websites may differ. This finding is similar to Mayer and Harrison's (2012) study in which respondents preferred mediums, regarding food safety, that were more web-based (i.e., YouTube, Facebook, videos, and internet). Although it was outside the scope of this study to determine how respondents of each critical thinking style used websites, how individuals' in each critical thinking style prefer to retrieve information has been documented in the literature. Focusing on the needs of engagers to communicate with others and their desire to utilize reasoning skills through interactions with others, engagers may favor websites as a word of mouth method (i.e., public discussion boards/forums, blogs, vlogs, social networking sites, personal websites, etc.) (Blackshaw & Nazzaro, 2006; Lamm & Irani, 2011).

This finding with engagers supports the vicarious learner in the social cognitive theory, where individuals obtain new knowledge and behaviors from others by being embedded into social systems (Bandura, 2001; Schunk, 2012; Stajkovic & Luthans, 1998). The diversity of these mediums allows them to be personalized and more relevant for engagers, which can aid in promoting the processing and storage of information for future behavioral use (Abbot et al., 2012; Petty et al., 2009). Seekers desire new information while considering multiple viewpoints on topics and acknowledging their own biases with an objective perspective. Therefore, seekers are more likely to search for information that observes the same principles. These characteristics resemble enactive learners, which use past experiences as a gauge to evaluate themselves when critically thinking. The desire to seek out the truth could likely result in retrieving information from trustworthy and researched-based sources, which could be provided through access to the internet. The difference in how seekers and engagers both use this medium would be based on the interpretation of the information they receive and the sources they use. Seekers' objectivity and decision-making skills would allow them to process the information differently to reach a solution (Lamm & Irani, 2011). The ability to identify where people fall within the critical thinking inventory and social cognitive theory could allow communicators to better understand how and why they process new information while also understanding some of the logic behind their behaviors. The advantage to using the critical style inventory in conjunction with the social cognitive theory is that it allows researchers to quantify the method in which people learn new information, strengthening what communicators know about their audiences.

Even though only three communication methods were found to be significantly preferred by engagers and seekers of information, there was no significant preference with any other mediums in this study. This finding implies the need for more than one communication medium to be used when delivering information concerning food related issues to reach individuals with seeking and engaging critical thinking styles.

The last objective for this study was to determine if a relationship existed between respondents' overall critical thinking style and food safety behaviors. The relationship observed was negligible and not large enough to indicate a substantial relationship between respondents' food safety behaviors and critical thinking styles. But reflecting back on previous literature, researchers have found that certain motivators, informational sources, and demographic characteristics served to influence consumers' food safety behaviors (Abbot et al., 2012; Medeiros et al., 2001; Schafer et al., 1993; Schunk, 2012). This may suggest that some moderating variable(s) could help to better explain the strength and/or direction of the relationship between consumers' critical thinking styles and food safety behaviors (Baron & Kenny, 1986). It is also important to remember that these are self-reported food safety behaviors, and with the limitations of non-probability sampling and weighting in mind, the correlation between food safety behaviors and critical thinking styles might be stronger or weaker in a different or larger population.

## RECOMMENDATIONS

In coordination with the results from this study and previous literature, communicators should focus message development and medium selection based on the two critical thinking styles addressed in this study: engagers and seekers of information. Critical thinking style considerations should guide communicators and be purposively executed, using the preferred mediums established in this study. Overall, both engagers and seekers preferred websites, printed fact sheets, bulletins, brochures, TV coverage, and newspaper articles or series when receiving food related information. Although both critical thinking styles preferred similar mediums, the way they use these mediums may differ. Communicators need to identify their target audiences' critical thinking style, using the social cognitive theory concept of interacting personal factors, behaviors factors, and environmental events, to personalize their efforts and content to their audience. Establishing these criteria would eliminate unnecessary efforts and create a more meaningful and personalized experience for consumers, resulting in consumers participating in more thoughtful, informative, and safe food behaviors (Abbot et al., 2012; Petty et al., 2009).

Food safety message development should highlight the benefits of proper food safety behaviors while emphasizing the threats associated with unsafe food behaviors. Messages should address risks associated with certain food safety behaviors and reinforce the control consumers possess to reduce these risks (Medeiros et al., 2001b; Schafer et al., 1993). Various mediums can be used to disperse these food safety messages, but communication campaigns should focus on stressing the importance of reading food safety labels. Food labels are the most convenient and factual tool in educating and reducing food safety risks for consumers and communicators need to take advantage of this opportunity. Messages should reiterate the risks associated with not reading food labels. Additionally, consumers may require training to decipher the material on food labels and provided guidance on where they can locate food safety information on the labels. Food safety messages should also emphasize the risks associated with unclean countertops and the impact disinfecting them can have on foodborne diseases/illnesses. Communicators and food safety experts should place a similar amount of importance on disinfecting countertops as they have on washing hands. Consumers need to understand that countertops are regularly used to prepare food and serve as a vector for foodborne illnesses/diseases. Efforts should include when and how countertops are to be properly disinfected to have the maximum impact on consumer safety. The use of scenarios, personal relevance, and reflective thinking and practice may be additional methods to encourage consumers to critically think about food safety (Reicks et al., 1994).

Future research should continue to explore critical thinking styles to better understand how to implement the findings of this study and others in various fields. While the UFCTI instrument defines each construct well, researchers have the opportunity, through further study, to contribute to the attributes, preferences, and behaviors associated with each critical thinking style. Using the social cognitive theory in conjunction with critical thinking styles may provide the human behavior element, which could further explain learners' behaviors. Considering consumers' internal dispositions may also serve to better understand their behavioral change. A national and international study might also explain how different factors (i.e., culture, geography, etc.) affect critical thinking styles. A broader approach could also build to the current critical thinking literature, by providing a better understanding of each critical thinking style, and clarifying the accuracy of methods used in this study to represent a larger population. Even though a negligible relationship was found between critical thinking styles and food safety behaviors, further research should examine whether certain motivators or influential factors impact the relationship between critical thinking styles and food safety behaviors. Consumers could be presented with food safety issues in scenario-based simulations that are designed to encourage critical thinking and researchers could assess participants' critical thinking style with food safety behaviors. Future research could also benefit from establishing how each critical thinking style uses the mediums where no significant difference was found. Researchers should also explore a wider variety of food safety behaviors. In doing this, certain unknown risks may surface that could be communicated to consumers, ultimately reducing the prevalence of foodborne illnesses.

## REFERENCES

- Abbot, J. M., Byrd-Bredbenner, C., Schaffner, D., Bruhn, C. M., & Blalock, L. (2009). Comparison of food safety cognitions and self-reported food-handling behaviors with observed food safety behaviors of young adults. *European Journal of Clinical Nutrition*, 63, 572-579. doi: 10.1038/sj.ejcn.1602961
- Abbot, J. M., Policastro, P., Bruhn, C., Schaffner, D. W., & Byrd-Bredbenner, C. (2012). Development and evaluation of a university campus-based food safety media campaign for young adults. *Journal of Food Protection*, 75(6), 1117-1124. doi: 10.4315/0362-028X.JFP-11-506
- Altekruse, S. F., Yang, S., Timbo, B. B., & Angulo, F. J. (1999). A multi-state survey of consumer food-handling and food consumption practices. *American Journal of Preventive Medicine*, 16(3), 216-221. doi: 10.1016/S0749-3797(98)00099-3
- Anderson, W. A. (2000). The future relationship between the media, the food industry and the consumer. *British Medical Journal*, 56(11), 254-268.
- Baker, R., Brick, J. M., Bates, N. A., Battaglia, M., Couper, M. P., Dever, J. A., ... Tourangeau, R. (2013). *Report of the AAPOR task force on non-probability sampling*. American Association for Public Opinion Research. Retrieved at <http://www.aapor.org/AM/Template.cfm?Section=Reports1&Template=/CM/ContentDisplay.cfm&ContentID=5963>
- Bandura, A. (2001). Social cognitive theory of mass communication. *Media Psychology*, 3(3), 265-299.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51(6), 1173-1183.
- Blackshaw, P., & Nazzaro, M. (2006). *Consumer generated media (CGM) 101: Word-of-mouth in the age of web-fortified consumer* (2nd ed.). A Nielsen BuzzMetrics White Paper. Retrieved from [http://www.nielsenonline.com/downloads/us/buzz/nbzm\\_wp\\_CG\\_M101.pdf](http://www.nielsenonline.com/downloads/us/buzz/nbzm_wp_CG_M101.pdf)
- Byrd-Bredbenner, C., Abbot, J. M., Whaetley, V., Schaffner, D., Bruhn, C., & Blalock, L. (2008). Risky eating behaviors of young adults—implication for food safety education. *Journal of American Dietetic Association*, 108, 549-552. doi: 10.1016/j.jada.2007.12.013
- Cody, M. M., & Hogue, M. A. (2003). Results of the home food safety—it's in your hands 2002 survey: Comparisons to the 1999 benchmark survey and healthy 2010 food safety behaviors objective. *Journal of The American Dietetic Association*, 103(9), 1115-1125. doi: 10.1016/S0002-8223(03)01064-2
- Davis, J. A. (1971). *Elementary survey analysis*. Englewood, NJ: Prentice-Hall
- Dimitri, C., Effland, A., & Conklin, N. (2005, June). *The 20th Century Transformation of U.S. Agriculture and Farm Policy*. Retrieved February 2012, from United States Department of Agriculture: <http://www.ers.usda.gov/publications/EIB3/eib3.pdf>
- Ellis, J. D., Arendt, S. W., Strohbehn, J. M., & Paez, P. (2010). Varying influences of motivation factors on employees' likelihood to perform safe food handling practices because of demographic differences. *Journal of Food Protection*, 73(11), 2065-2071. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/21219719>
- Finch, C., & Daniel, E. (2005). Food safety knowledge and behavior of emergency food relief organization workers: Effects of food safety training intervention. *Journal of Environmental Health*, 67(9), 30-34. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/15957320>
- Gay, K., Terry, B., & Lamm, A. J. (2015). Identifying critical thinking style to enhance volunteer development. *Journal of Extension*, 53(6). Retrieved from <http://www.joe.org/joe/2015december/tt2.php>
- Glaser, E. M. (1941). *An experiment in the development of critical thinking*. New York, NY: AMS Press.
- Gorham, L. M., Lamm, A. J., & Rumble, J. N. (2014). *Does critical thinking style predict water conservation behaviors?* Paper presented at the annual meeting of the Association for Communication Excellence in Agriculture, Natural Resources, and Life and Human Sciences, Portland, OR.
- Hallman, W. K., & Cuite, C. L. (2010). *Food Recalls and the American Public: Improving Communications* (Publication number RR-0310-020). Retrieved from The State University of New Jersey, Food Policy Institute website: [http://foodpolicy.rutgers.edu/docs/pubs/Impr\\_Food\\_Recall\\_%20Comm\\_FPI\\_2010.pdf](http://foodpolicy.rutgers.edu/docs/pubs/Impr_Food_Recall_%20Comm_FPI_2010.pdf)

- Halpern, D. F. (1997). *Critical thinking across the curriculum: A brief edition of thought and knowledge*. Mahwah, NJ: Lawrence Erlbaum Associates
- Kalton, G., & Flores-Cervantes, I. (2003). Weighting methods. *Journal of Official Statistics*, 19(2), 81-97.
- Klontz, K. C., Timbo, B., Fein, S., & Levy, A. (1995). Prevalence of selected food consumption and preparation behaviors associated with foodborne disease. *Journal of Food Protection*, 8, 927-930.
- Lamm, A. J. (2015a). *Integrating critical thinking into extension programming #1: Critical thinking defined*. Florida Cooperative Extension Service Electronic Data Information Source AEC544. Retrieved from <http://edis.ifas.ufl.edu/wc206>
- Lamm, A. J. (2015b). *Integrating critical thinking into extension programming #3: Critical thinking style*. Florida Cooperative Extension Service Electronic Data Information Source AEC546. Available at <http://edis.ifas.ufl.edu/wc208>
- Lamm, A. J., & Irani, T. (2011). *UFCTI manual*. Gainesville, FL: University of Florida.
- Lamm, A., Strickland, R., & Irani, T. (2010, May). How are students thinking critically? Measuring the difference between seeking information and engagement [Abstract]. *Proceedings of the Annual Conference of the American Association of Agricultural Education*, 37. Retrieved from [http://www.aaaeonline.org/uploads/allconferences/5-29-2010\\_20\\_AAAE\\_2010\\_Poster\\_Session\\_Proceedings\\_-\\_Complete\\_4.pdf](http://www.aaaeonline.org/uploads/allconferences/5-29-2010_20_AAAE_2010_Poster_Session_Proceedings_-_Complete_4.pdf)
- Lannon, J. M., & Gurak, L. J. (2014). *Technical communication* (Rev. ed. 13). Upper Saddle River, NJ: Pearson Education.
- Littlejohn, S. W., & Foss, K. A. (2011). *Theories of human communication*. Long Grove, IL: Waveland Press.
- Loureiro, M. L., & Umberger, W. J. (2007). A choice experiment model for beef: What U.S. consumer responses tell us about relative preferences for food safety, country-of-origin labeling and traceability. *Food policy*, 32, 496-514. doi: 10.1016/j.foodpol.2006.11.006
- Lusk, J. L., & Norwood, F. B. (2011). Animal welfare economics. *Applied Economics Perspectives and Policy*, 33(4), 463-483. doi: 10.1093/aep/pper036
- Mayer, A. B., & Harrison, J. A. (2012). Safe eats: An evaluation of the use of social media for safety education. *Journal of Food Protection*, 75(8), 1453-1463. doi: 10.4315/0362-028X.11-551
- Medeiros, L. C., Hillers, V. N., Kendall, P. A., & Mason, A. (2001a). Food safety education: What should we be teaching to consumers? *Journal of Nutrition Education*, 33(2), 108-113. doi: 10.1016/S1499-4046(06)60174-7
- Medeiros, L., Hillers, V., Kendall, P., & Mason, A. (2001b). Evaluation of food safety education for consumers. *Journal of Nutritional Education*, 33, S27-S34.
- McWilliams, M. (1997). *Foods: Experimental Perspectives*. Upper Saddle River, NJ: Prentice-Hall.
- Miles, S., & Frewer, L. J. (2001). Investigating specific concerns about different food hazards. *Food Quality and Preference*, 12(1), 47-61. doi: 10.1016/S0950-3293(00)00029-X
- Pally, M. (1997). Critical thinking in ESL: An argument for sustained content. *Journal of Second Language Writing*, 6(3), 293-311.
- Petty, R., Barden, J., & Wheeler, S. (2009). The elaboration likelihood model of persuasion: Developing health promotions for sustained behavior change. In R. DiClemente, R. Crosby, & M. Kegler (Eds.), *Emerging theories in health promotion practice and research* (1-32). Retrieved from <http://jamiebarden.org/uploads/HealthChapter2Galley.pdf>
- Rhea, L. M., & Parker, R. A. (2014). *Designing and conducting survey research: A comprehensive guide* [EBL Reader version]. Retrieved from [http://reader.eblib.com.proxy.lib.utk.edu:90/\(S\(l35bl0bmpirjijw1st1u2da1\)\)/Reader.aspx?p=1757959&o=1098&u=Zav5ak%2bH2eU%3d&t=1484254094&h=08B08BDB71B42ACC8E24FC7419C3E6DBCDAEC2D7&s=52254425&ut=3602&pg=1&r=img&c=-1&pat=n&cms=-1&sd=2#](http://reader.eblib.com.proxy.lib.utk.edu:90/(S(l35bl0bmpirjijw1st1u2da1))/Reader.aspx?p=1757959&o=1098&u=Zav5ak%2bH2eU%3d&t=1484254094&h=08B08BDB71B42ACC8E24FC7419C3E6DBCDAEC2D7&s=52254425&ut=3602&pg=1&r=img&c=-1&pat=n&cms=-1&sd=2#)
- Reicks, M., Bosch, A., Herman, M., & Krinke, B. (1994). Effectiveness of a food safety teaching strategy promoting critical thinking. *Journal of Nutritional Education*, 26(2), 97-100.
- Roberts, T. G., Harder, A., & Brashears, M. T. (2016). *American Association for Agricultural Education national research agenda: 2016-2020*. Gainesville, FL: Department of Agricultural Education and Communication.
- Schafer, R. B., Schafer, E., Bultena, G. L., & Hoiberg, E. O. (1993). Food safety: An application of the health belief model. *Journal of Nutritional Education*, 25(1), 17-24. 10.1016/S0022-3182(12)80183-X

- Schunk, D. H. (2012). Social cognitive theory. In K. R. Harris, S. Graham, T. Urdan, C. B. McCormick, G. M. Sinatra, & J. Sweller (Eds.), *APA educational psychology handbook: Theories, constructs, and critical issues* (Vol. 1, pp. 101-123). Washington, DC: American Psychological Association.
- Stajkovic, A. D., & Luthans, F. (1998). Social cognitive theory and self-efficacy: Going beyond traditional motivational and behavioral approaches. *Organizational Dynamics*, 26(4), 62-74. doi: 10.1016/S0090-2616(98)90006-7
- United States Department of Agriculture Economic Research Service. (2013). *Rural-urban continuum codes overview*. Retrieved from <http://www.ers.usda.gov/data-products/rural-urban-continuum-codes.aspx#UkL2IRZRoyE>
- VanGarde, S. J., & Woodburn, M. (1994). *Food preservation and safety: Principles and practice*. Ames, IA: Iowa State University Press
- Wang, H. H., Zhang, X., Ortega, D. L., & Widmar, N. J. O. (2013). Information on food safety, consumer preference and behavior: The case of seafood in the US. *Food Control*, 33, 293-300. doi: 10.1016/j.foodcont.2013.02.033
- Winham, D. M., Quiroga, S. S., Underiner, T. L., Woodson, S. E., & Todd, M. A. (2014). Integration of theatre activities in cooking workshops improves healthy eating attitudes among ethnically diverse adolescents: A pilot study. *Infant, Child, & Adolescent Nutrition*, 6(2), 99-108. doi: 10.1177/1941406413520323

## ABOUT THE AUTHORS

Arthur Leal is an assistant professor of agricultural communication in the Department of 4-H/Agricultural Leadership, Education and Communication at the University of Tennessee, Knoxville. Arthur's research areas focus on public perception of various agricultural issues and post-secondary education.

Joy Rumble is an assistant professor of agricultural communication within the Department of Agricultural Education and Communication. Joy focuses her efforts in the Center for Public Issues Education in Agriculture and Natural Resources (PIE Center) where she conducts research and outreach initiatives around effective communication in agriculture. Her research concentrates on consumer perceptions of agriculture and has included studies examining perceptions of local food, livestock legislation, and transparent communication in the livestock industry.

Alexa Lamm is an assistant professor in the Department of Agricultural Education and Communication and the associate director of the UF/IFAS Center for Public Issues Education in Agriculture and Natural Resources. Alexa specializes in conducting research on agricultural and natural resource public policy implementation and the use of evaluation methodology as it applies to programmatic and organizational change theory.