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The People or the Message: Which is Responsible for Cognitive Conflict?

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Abstract

While work on agricultural messaging is abundant, the way that audiences form perceptions of messages is not well understood and little research has examined the cognitive effects of image and word associations in an agricultural context. Previous knowledge gap research has shown that socioeconomic status and access to information could be one contributor of perception formation. We propose that these variables could also impact cognitive processing. Therefore, the purpose of this exploratory study was to examine how components of cognitive dissonance and knowledge gap theory apply in the context of a contentious agricultural issue. Data were collected from 1,049 United States' residents through an online survey with an embedded experimental design. Respondents randomly received one of two image and word association pairings. After viewing the treatment, measures of cognitive conflict, demographics, and desire to learn more were collected. The results showed that the cognitive conflict instrument performed differently in the context of a complex agricultural issue than in prior research. Additionally, the message pairings had a stronger influence on cognitive conflict components than demographic characteristics. Finally, the desire to learn more was impacted by the message treatments. Future research on cognitive conflict and advanced modeling is recommended.

Keywords: cognitive dissonance; cognitive conflict; messaging

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Introduction

Single words, or phrases, often cause us to create mental images. For example, when individuals hear the phrase *dairy farm*, an image probably comes to mind that is reminiscent of experiences, knowledge, or prior images they have seen before. However, not everyone has the same experiences, knowledge, or exposure to prior images. While some people may have imagined a modern dairy farm with a free stall barn and herringbone parlor, others may have imagined a farm situated on rolling hills with a big red barn and dairy cows out on pasture. This multiplicity of meanings is important for agricultural communicators to understand, as it could affect the way their audiences cognitively process and form perceptions about the images that they are presented with, including images of livestock housing. Furthermore, with less and less people having a direct relationship with

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the farm and agriculture, they are potentially more likely to have a mental image of the farm that is not consistent with modern reality and instead looks more like the farm that their grandparents or great-grandparents experienced (Rumble et al., 2019).

Communicators have known for some time that interpretation of words and images vary among individuals (Specht & Rutherford, 2013), and research on audience perceptions of agricultural messaging is plentiful (Goodwin et al., 2011; Abrams & Soukup, 2017; Ruth & Rumble, 2019). While the work on agricultural messaging is abundant, the way that audiences form perceptions of messages is not well understood. Several theories, such as cognitive dissonance and others, have been used historically to address communication issues. Theories such as knowledge gap have also attempted to explain the obstacles that different groups face to acquire knowledge through access of information. Knowledge gap research has shown that socioeconomic status and access to information could be one contributor of perception formation (Tichenor et al., 1970). We propose that these variables could also impact cognitive processing. For instance, we predict that cognitive dissonance would be impacted if someone of low socioeconomic status is presented with information on a topic for which they are lacking knowledge access. In this study, we seek to explore perception formation by examining if the socioeconomic variables used in knowledge gap theory or message components have a greater influence on cognitive conflict related to livestock housing systems. This research also adds to the literature by examining the cognitive effects of image and word associations in an agricultural context. In a time where agricultural issues are becoming more nuanced, it is important to reevaluate if historical models and theories are still relevant in addressing complex issues, as well as to evaluate the relationship between these models and theories. As a result, this research seeks to fulfill the American Association of Agricultural Education Nation Research Priority 7: Addressing Complex Problems from the American Association for Agricultural Education (Roberts et al., 2016).

Key Literature and Theoretical Framework

A review of literature examining image perceptions, cognitive dissonance, and knowledge gap theory informed this study. A description of these frameworks is provided in the sections that follow.

Images and Meaning

Cognitive dissonance and the interpretation of images both play roles in the way audiences may process complex issues in the agricultural industry. Rhetoric, while once considered purely verbal or written, has evolved into a concept that includes visual images and symbols open for the interpretation of the audience (Specht & Rutherford, 2013). Images are thought to be very impactful and hold the same weight as words in terms of conveying meaning (Bulmer & Buchanan-Oliver, 2006). Visual images are affected by selection, emphasis, and framing, which communicators can use to influence how an audience interprets an image (Allen, 1996). While images can be framed to be interpreted in a certain way, audiences assign meaning to images based on each individual audience member's background, lifestyle, and consumption of mass media (Glaze et al., 2013). Past research has identified that individuals assign different meaning to traditional and conventional images of agricultural practices and cautioned that use of traditional images may be creating idealistic ideas about the industry (Rumble & Buck, 2013).

Cognitive Dissonance Theory

While it is known that individuals ascribe different meaning to traditional and conventional agricultural images, it is relevant to discover the cognitive dissonance caused within individuals by those meanings. Cognitive dissonance theory states that "individuals experience a psychological state of discomfort (i.e., cognitive dissonance) when faced with inconsistencies between two or more held cognitions" (Ong et al., 2017, p. 60). As a result of being faced with inconsistencies in their thought processes, individuals will seek to relieve the discomfort that the inconsistencies cause in their minds (Festinger, 1962). Individuals will either change their attitudes to be consistent with the new

information, or they will reject the new information and stand by their previously held cognitions, to relieve this discomfort (Festinger, 1962). Furthermore, individuals will attempt to avoid information that discredits their beliefs altogether, if they are able (Frey, 1986). Cognitive conflict as a result of dissonance is experienced when an individual has negative feelings about a decision they make, or the decision is inconsistent with their beliefs.

Research has suggested that due to different understandings of food and agricultural definitions, as well as the way individuals process messages, cognitive dissonance may occur when audiences receive messaging about agriculture. In a 2015 study, it was found that participants had varying definitions of local food. Some defined it as food grown in a certain location, while others interpreted it as food grown anywhere from within the state or within the entire region (Gorham et al., 2015). The study suggested that when individuals purchase food products, they may experience cognitive dissonance, but will reject conflicting information and still purchase products that they are comfortable with (Gorham et al., 2015). Other research has connected cognitive dissonance to natural disaster perceptions and environmental issues (Gorham et al., 2016; Taylor et al., 2017). A 2018 qualitative study identified that audiences experienced cognitive dissonance after reading a negative book about animal agriculture and then discussing their own meat-eating behaviors, but the researchers did not measure the amount of dissonance that these individuals felt (Spolarich et al., 2018). The authors concluded that, "As one might assume, the increased controversy surrounding the U.S. food system has resulted in feelings of dissonance for many individuals when it comes to their own food-based behaviors" (Spolarich et al., 2018). Research has examined the relationship between images and cognitive dissonance, but in the context of body image, rather than visual images and none that looked at agricultural images specifically (Halliwell & Diedrichs, 2014; Steele et al., 1993).

An instrument for determining levels of cognitive conflict was first identified by Lee et al. (2003). This instrument identified four potential components to cognitive conflict that an individual may feel when processing new information: recognition of anomaly, interest, anxiety, and reappraisal of the cognitive conflict situation (Lee et al., 2003). Recognition of anomaly was operationally defined as "recognizing one's conceptions are not consistent with the results of the experiment/discourse/textbook, etc." (Lee et al., 2003, p. 592). The interest component represented the level of interest in the information. Anxiety resulting from the information was identified as the anxiety component. Finally, reappraisal of the cognitive conflict situation was defined as "reappraising the anomalous situation; the cognitive conflict and the problem" (Lee et al., 2003, p. 592). This component was present when individuals reassessed the information that differed from their preexisting thoughts. Based on the instrument, individuals are given a score for each cognitive conflict component after responding to a series of statements that correspond with each stage (Lee et al., 2003). Although the instrument was utilized originally in secondary classrooms, it is composed of general statements, which makes it easily adaptable to a variety of situations (Lee et al., 2003). The instrument was found to be both valid and reliable when measuring the cognitive conflict of students in a classroom (Lee et al., 2003). This instrument was later adapted for a study that added a fifth cognitive dissonance component, state of consonance, that accounted for respondents who do not experience cognitive dissonance after receiving new information (Dietrich, 2016). The study identified which agricultural practices caused the most dissonance in audiences and the impact that dissonance had on the respondents' attitudes toward the agricultural industry (Dietrich, 2016). Using the instrument, it was found that cognitive dissonance related to agricultural issues has a negative impact on feelings of safety and trust in the food industry (Dietrich, 2016). The cognitive conflict instrument was further adapted for this study, which will be discussed in the methods.

Knowledge Gap Theory

Knowledge gap theory states that there is a gap in knowledge between those of higher and lower socioeconomic status, which then effects the way individuals in each group process new information (Tichenor et al., 1970). The gap is caused because those with higher socioeconomic status

tend to gain access to information more quickly than those with lower status, and this further widens the gap between the two groups (Tichenor et al., 1970). Research has suggested that those who reside in rural areas and have a lower income experience knowledge gap due to less access to media outlets and online sources (Rainie et al., 2003). Further research has established that even when media access is achieved, knowledge gaps may continue to persist in rural areas due to low adoption and barriers to technology literacy (Xiaojing, 2017). Representations and information about agriculture in the media have often been found to be incorrect, inaccurate, or biased (Whitaker & Dyer, 2000; Helliwell & Burton, 2021). In addition, a knowledge gap has been identified in consumers' beliefs of what agricultural practices produce safe and wholesome food (Rumble & Buck, 2013). Research has shown that members of demographics thought to have gaps in knowledge about agricultural issues, have self-reported that they are motivated to pay attention to media coverage about agricultural issues, specifically animal welfare, environment, nutrition, and food safety issues (Ruth et al., 2018). Audiences that have a knowledge gap on agricultural topics are most motivated to gain knowledge about food safety, but their self-reported motivation to gain knowledge about other issues suggests that they may be interested in learning more when presented with information that falls within their gap in knowledge (Ruth et al., 2018).

The foundational literature on image perception, cognitive dissonance, and knowledge gap theory will help us explore perception formation by examining if the socioeconomic variables used in knowledge gap theory or message components have a greater influence on cognitive conflict related to livestock housing systems. To our knowledge these frameworks have not previously been combined or examined in this way.

Purpose and Objectives

The advent of complex and contentious issues provides communicators an opportunity to pause and reexamine theoretical concepts that had been tested and proven in less contentious times. The purpose of this exploratory study was to examine how components of cognitive dissonance and knowledge gap theory apply, in the context of a contentious agricultural issue, to inform modern communication practices. The objectives of the study were to

1. Test and develop measures of cognitive conflict applicable to a context of agricultural images.
2. Determine the influence of demographics and message characteristics on cognitive conflict levels identified in the instrument.
3. By treatment group, determine if cognitive conflict components differ between those who want to learn more about livestock housing practices and those who do not want to learn more about livestock housing practices.

Methods

This study was a part of a larger experimental study, which included several dependent variables, some of which have been previously reported (Rumble et al., 2019). The study's population was United States' residents over the age of 18. The 1,049 respondents in the sample were recruited via non-probabilistic sampling (Rumble et al., 2019). Kitchenham and Pfleeger (2002) identified that non-probabilistic samples are used, "because they are easily accessible or the researchers have some justification for believing that they are representative of the population" (Kitchenham & Pfleeger, 2002, p. 19). They also suggested that non-probabilistic sampling should be used when the target population is hard to identify or very specific and limited in availability (Kitchenham & Pfleeger, 2002). To account for some of the limitations associated with non-probabilistic samples, post hoc weighting procedures were used (Baker et al., 2013). Data were weighted to the U.S. Census statistics for gender, age, and race/ethnicity. Additionally, an attention filter and manipulation check were used in the survey to ensure that respondents were reading the questions carefully and attending to the experimental treatment. If the attention filter or manipulation check was answered incorrectly, the response was removed from the sample.

The survey was administered through the survey company Qualtrics, which also recruited, qualified, and incentivized the sample (Rumble et al., 2019). In a large online survey, respondents were randomly presented with one of two researcher developed image and word association pairings. Image and word pairings were chosen in this study because pairings are often observed in the new media landscape and have been known to have higher interaction than photo only or text only information (SnapRetail, 2020). We chose to treat each pairing as a holistic message in this study. We present the two pairings in this manuscript with bold emphasis to aid readers in identifying the differences, but no bolding was present in the experiment. The first pairing was an **outdoor image of small-scale** cage-free poultry housing, accompanied by the caption "This image depicts cage-free housing for egg laying hens. The hens may roam around and are able to enter and exit the enclosed nesting area as they please. The hen's housing **is not** climate controlled" (Rumble et al., 2019) (See Figure 1). In place of that pairing, other respondents received an image of **indoor, large-scale** poultry housing, along with the caption "This image depicts cage-free housing for egg laying hens. The hens may roam around and are able to enter and exit the enclosed nesting areas as they please. The hen's housing **is** climate controlled" (Rumble et al., 2019) (see Figure 2).

Figure 1

Outdoor, Small-Scale Treatment (Rumble et al., 2019)

This image depicts cage-free housing for egg laying hens. The hens may roam around and are able to enter and exit the enclosed nesting area as they please. The hen's housing **is not** climate controlled.

Figure 2

Indoor, Large-Scale Treatment (Rumble et al., 2019)

This image depicts cage-free housing for egg laying hens. The hens may roam around and are able to enter and exit the enclosed nesting areas as they please. The hen's housing **is** climate controlled.

After viewing the images, the respondents responded to 14 statements related to cognitive conflict on a five-point Likert Scale (real limits = 1.00 – 1.49 = strongly disagree, 1.50 – 2.49 = disagree, 2.50 – 3.49 = neither agree nor disagree, 3.50 – 4.49 = agree, 4.50 – 5.00 = strongly agree). Respondents were also asked to indicate whether or not they would like to learn more about a variety of livestock practices including the "housing of livestock raised for human consumption." Several demographic questions were also asked. The demographic variables of interest in this manuscript were age, sex, home location, education, and household income. Prior to data collection, the instrument and stimuli were validated through a panel of experts that included a social scientist, an animal scientist, and two livestock commodity organization representatives (Rumble et al., 2019).

The cognitive conflict scale was adapted from Dietrich (2016) who examined cognitive dissonance toward a series of agricultural images. The scale used by Dietrich (2016) was adapted from Lee et al.'s (2003) instrument for measuring cognitive conflict. While Lee et al's instrument included

subscales of recognition of anomaly, interest, anxiety, and reappraisal of cognitive conflict, Dietrich (2016) also added a component of consonance to her adapted instrument. Dietrich's (2016) study examined the instrument components descriptively and individually, thus there was an opportunity to further assess the adapted instrument in an agricultural context.

To analyze objective one, a factor analysis was performed on the instrument to determine if the subscales were still reliable after the adaptation and in the context of agriculture. The Kaiser-Meyer-Olkin Measure and Bartlett's Test of Sphericity were sufficient and allowed for a varimax rotation. A varimax rotation maximizes "the dispersion of loadings within factors...resulting in more interpretable clusters of factors" (Field, 2013, p. 681). The factor analysis resulted in three components further described in the results for objective one. The reliability on each component was assessed using Cronbach's alpha before creating indexed components for use in objectives two and three.

Objective two was analyzed using multiple regression to determine what message and demographic variables influenced the cognitive conflict components resulting from the factor analysis. The demographic variables of sex (male*, female), home location (rural, urban or suburban*, city), education (High school or less, some college*, college degree), and income (Less than $25,000, $25,000-$49,999*, $50,000-$74,999, $75,000 or more) were all dummy coded. The asterisks for in each list of categories denotes the category treated as the constant. Age was not dummy coded as it was a continuous variable. Message treatment was also dummy coded, with image and word pairing of the outdoor image of small-scale cage-free poultry housing serving as the constant. The assumptions of normality, linearity, multicollinearity, and homoscedasticity were assessed for the regression models. There was a slight violation to homoscedasticity for the anxiety model. The anxiety variable was transformed to correct for the violation. The anxiety model reported is a result of the transformed data.

Objective three was analyzed using an independent t-test for each treatment group. The desire to learn more about livestock housing or not served as the grouping variable, while cognitive conflict components discovered in the factor analysis served as the dependent variables. The assumptions of normality and outliers were met. However, the assumption of Homogeneity of Variance was violated per the Levene's test for the outdoor large-scale treatment and equal variances could not be assumed and corrections were run per the recommendations provided by Field (2013). The statistics reported for the treatment account for the correction.

Results

Objective 1: Test And Develop Measures Of Cognitive Conflict Applicable To A Context Of Agricultural Images

The factor analysis revealed three components, rather than four components suggested by the original cognitive conflict model (Lee et al., 2003) and the five components suggested by Dietrich (2016). The components included anxiety and consonance as well as a combined interest and recognition of anomaly component (see Table 1). The anxiety subscale included 5 items and had a Cronbach's alpha of .90. The interest and recognition of anomaly subscale had six items and a Cronbach's alpha of .822. Finally, the consonance subscale had three items and Cronbach's alpha of .487. Due to the low reliability of the consonance subscale, these items were disregarded for the remainder of the study.

Table 1

Factor Analysis Of Cognitive Conflict Scale In Context Of Consumer Reactions To Image And Word Associations Of Complex Livestock Housing Systems

	Rotated Loading Factors		
Items	Anxiety	Interest and Anomaly	Consonance
Seeing the cage-free hen housing featured in this image makes me uncomfortable	**.856** [a]	.182	.048
The cage-free hen housing featured in the image concerns me	**.838**[a]	.254	.061
I wish I had not seen this image	**.816** [a]	.055	-.056
Upon seeing this image, I have doubts about cage-free hen housing [bh]	**.810** [a]	.219	.093
The cage-free hen housing featured in the image confused me	**.772**[a]	.130	.013
Since seeing the image, I am more curious about cage-free hen housing	.063	**.812** [f]	-.045
The cage-free hen housing featured in the image attracted my attention [c]	-.119	**.733** [f]	-.190
I intend to seek more information about cage-free hen housing featured in this image [dh]	.309	**.673** [f]	-.013
My feelings about cage-free hen housing have changed after seeing this image [b]	.353	**.669** [f]	.012
I need more information about the cage-free hen housing featured in this image [c]	.390	**.617** [f]	.096
I am surprised by the cage-free hen housing featured in this image [b]	.447	**.564** [f]	.010
The cage-free hen housing featured in this image is a proper representation of U.S. agriculture [g]	-.066	-.214	**.732** [e]
This image does not impact my thoughts about cage-free hen housing [g]	-.089	.353	**.685** [e]
My perceptions about cage free hen housing are supported by this image [g]	.352	-.190	**.676** [e]

Note. [a] = Anxiety component, [b] = Recognition of Anomaly component in original instrument, [c] = Interest component in original instrument, [d] = Reappraisal of cognitive conflict component in original instrument, [e] = State of consonance component, [f] = Combined interest and recognition of anomaly component, [g] = Reverse coding, [h] = Factor loading different from original instrument

Objective 2: Determine The Influence Of Demographics And Message Characteristics On Cognitive Conflict Levels Identified In The Instrument

To determine the influence of demographics and the message treatments on the cognitive conflict components two regression models were ran. In each model, the demographics and the message treatment served as the independent variables and were dummy coded. Age was the only demographic variable not dummy coded since it was continuous in nature. In one model anxiety served as the dependent variable and in the other interest and anomaly served as the dependent variable. The model for the anxiety variable was significant and explained 11% of the total variance in anxiety ($p = .000$, $R^2 = .110$, $F = 12.78$). The interest and recognition of anomaly model was also significant, but only explained 5.9% of the variance in interest and recognition of anomaly ($p = .000$, $R^2 = .059$, $F = 6.54$).

The predictors for each model are seen in Table 2. In both models the message treatment had the largest influence. Anxiety increased by .620 and interest and recognition of anomaly increased by .288 among those who received the indoor, large-scale poultry housing image and corresponding cage-free text. Anxiety and recognition of anomaly both decreased for those who resided in rural locations (-.164 and -.204, respectively). Interest and recognition of anomaly also decreased among those with a college degree. Finally, anxiety decreased by .005 and interest and recognition of anomaly decreased by .004 for each increase in age.

Table 2

Regression Models For Anxiety And Interest And Recognition Of Anomaly

Predictor	*B*	*t*	*p*
Anxiety Model			
Message Treatment	.620	10.075	.000**
Home Location_ Rural	-.164	-2.083	.038*
Age	-.005	-2.625	.009**
Home Location _City	-.096	-1.335	.182
Income_Less than $25,000	-.147	-1.775	.076
Income $50,000 - $74,999	-.032	-.361	.718
Income_More than $75,000	.155	1.722	.085
Education_High school or less	-.002	-.030	.976
Education_College degree	-.121	-1.560	.119
Sex_Female	.058	.923	.356
Interest and Recognition of Anomaly Model			
Message Treatment	.288	5.848	.000**
Home Location_ Rural	-.204	-3.237	.001**
Education_ College Degree	-.149	-2.391	.017*
Age	-.004	-2.835	.005**
Home Location _City	-.088	-1.529	.127
Income_Less than $25,000	-.015	-.221	.825
Income $50,000 - $74,999	-.039	-.553	.580
Income_More than $75,000	.069	.952	.341
Education_High school or less	.003	.046	.963
Sex_Female	.079	1.565	.118

Note. * $p < .05$, ** $p < .01$

Objective 3: By Treatment Group, Determine If Cognitive Conflict Components Differ Between Those Who Want To Learn More About Livestock Housing Practices And Those Who Do Not Want To Learn More About Livestock Housing Practices

In the indoor, large-scale treatment, 254 respondents indicated that they wanted to learn more about livestock housing and 280 indicated that they did not want to learn more. In the outdoor, small-scale treatment, 209 respondents indicated that they wanted to learn more and 306 indicated that they did not want to learn more.

When assessing the desire to learn more about livestock housing practices, descriptive and significant differences in anxiety and interest and recognition of anomaly were found among both treatment groups (See Tables 3 and 4). In the indoor, large-scale treatment group, those who reported wanting to learn more about livestock housing had significantly higher anxiety ($M = 2.95$) and higher interest and recognition of anomaly ($M = 3.69$), than those who did not want to learn more ($M = 2.57$, $M = 3.11$). A medium effect size was observed for interest and recognition of anomaly ($d = .769$), while a small effect size was observed for anxiety ($d = .368$)

In the outdoor, small-scale treatment group, those who reported wanting to learn more about livestock housing had significantly lower anxiety ($M = 2.01$), and higher interest ($M = 3.22$) than those who did not want to learn more ($M = 2.23$, $M = 3.03$). Small effect sizes were observed for both interest and recognition of anomaly ($d = .243$) and anxiety ($d = .234$) The anxiety and interest and recognition of anomaly were higher among all groups that received the indoor, large-scale treatment.

Table 3

Indoor, Large-Scale Treatment: Independent T-Test Of Differences In Cognitive Conflict Components Between Desires To Learn

Cognitive Conflict Component	*M* Learn More ($n = 254$)	*M* Don't Learn More ($n = 280$)	*t*	*p*	Mean Difference
Anxiety	2.95	2.57	-4.230	.000	-.376
Interest and Recognition of Anomaly	3.69	3.11	-8.925	.000	-.580

Table 4

Outdoor, Small-Scale Treatment: Independent T-Test Of Differences In Cognitive Conflict Components Between Desires To Learn

Cognitive Conflict Component	*M* Learn More ($n = 209$)	*M* Don't Learn More ($n = 306$)	*t*	*p*	Mean Difference
Anxiety	2.01	2.23	2.605	.009	.225
Interest and Recognition of Anomaly	3.22	3.03	-2.664	.008	-.189

Conclusions and Recommendations

The findings of the study suggest that cognitive conflict operates differently in the context of agricultural images that previously found in the literature (Dietrich, 2016; Lee et al., 2003). Additionally, components of cognitive conflict were more greatly influenced by the message than demographic characteristics. Thus, suggesting message perceptions rather than the socioeconomic variables associated with knowledge gap have a greater impact on cognitive dissonance. Furthermore, perceptions formed in response to the indoor, large-scale treatment were indicative of higher dissonance. We provide detailed discussion by objective below.

Objective 1: Test And Develop Measures Of Cognitive Conflict Applicable To A Context Of Agricultural Images

In Lee et al.'s (2003) instrument, each of the items that were subjected to a factor analysis loaded equally into the four cognitive dissonance components that were identified in that study. Dietrich (2016) did not report completing a factor analysis to identify how the cognitive dissonance components loaded in an agricultural context. The factor analysis in this study showed a loading of three of the five proposed cognitive conflict components. While Lee et al.'s original instrument showed the components of anomaly and interest loading separately, our study showed them loading into a combined component in the context of an agricultural issue. This may be explained by the context and age of participants in the Lee et al. study compared to this study. Lee et al.'s (2003) study was completed with Korean adolescents in an educational setting. The interest of participants in this study may be more intrinsically motivating as our respondents were not in an educational setting and were over the age of 18. The

reappraisal of cognitive conflict item also loaded with the interest and anomaly component. This suggests that those who recognize an anomaly and are interested may be more likely to reappraise cognitive thoughts rather than immediately reject them. Further work should be done to better understand cognitive reappraisal either as its own subscale or as a separate outcome variable.

Additionally, the consonance component proposed by Dietrich (2016) did load but was not reliable in this study. Further work needs to be done to establish a consonance subscale with additional items as such a subscale could be beneficial to understanding cognitive conflict of complex issues. The anxiety component loaded closely to Lee et al.'s (2003) original anxiety subscale with the addition of one item that originally loaded as a recognition of anomaly item. The placement of this item should be further explored in subsequent studies. The differences in the cognitive conflict components identified in this study versus previous studies suggests that the cognitive conflict scale may operate differently in the context of a complex issue rather than in a classroom setting like the one studied by Lee et al. (2003).

Objective 2: Determine The Influence Of Demographics And Message Characteristics On Cognitive Conflict Components

This research found that messages account for greater influence on components of cognitive conflict than demographics. While there was an assumption that individuals with knowledge gaps related to agricultural issues would have more cognitive conflict, it was found that either the knowledge gap is not large enough to observe the differences or the messaging is more influential. This provides an interesting twist to previous literature that found that agricultural messages are misrepresented in the media (Whitaker & Dyer, 2000) and that consumers have a knowledge gap related to agricultural issues (Rumble & Buck, 2013). Our research shows that messaging has a greater impact over conflict than the demographic information, and therefore knowledge gaps.

Both those who reported living in rural areas and older respondents had lower cognitive conflict, which is likely explained by experience, but contradicts prior knowledge gap work regarding rural respondents (Rainie et al., 2003). The increased cognitive conflict experienced by younger respondents could be explained by younger people being further removed from production agriculture and having a greater knowledge gap. Furthermore, because those with a college degree showed a decreased level of interest and recognition of anomaly it could be inferred that their interests are more specialized due to receiving a college degree. This research found that many of the predictors of gaps in knowledge about agricultural issues are not holistically predictors of cognitive conflict or higher levels of interest, as we previously expected.

Objective 3: By Treatment Group, Determine If Cognitive Conflict Components Differ Between Those Who Want To Learn More About Livestock Housing Practices And Those Who Do Not Want To Learn More About Livestock Housing Practices

In general, we expected more participants to want to learn more about livestock housing than not, but that desire may be reflective our own interests. In both treatments, more respondents did not want to learn more than those who did want to learn more. The wording of this question may have impacted these results. The question asked if they would like to learn more about "housing of livestock raised for human consumption." The question did not ask specifically about the housing of poultry. If the wording was specific to learning about poultry housing the results may have been different. Additionally, the results may simply be reflective of the respondents' lack of interest or a desire to remain willfully ignorant, as seen in other studies of livestock perception (Bell et al., 2017).

When individuals have higher interest and recognition of anomaly, theory tells us to expect individuals to either seek additional information so that they can align their attitudes with new information or, reject the new information and stand by their previously held cognitions in order to remove dissonance (Festinger, 1962). The reappraisal of cognitive conflict item loading with interest

and recognition of anomaly in objective one suggests that individuals with higher interest and anomaly may be more likely to align their attitudes with new information and the results in objective three also support this thought. In objective three, those who wanted to learn more about livestock housing, in both treatment groups, reported higher levels of interest and recognition of anomaly. Thus, suggesting that they may be seeking to align attitudes rather than reject the information. The medium effect size for interest and anomaly among those who received the indoor housing treatment may suggest a stronger desire to align attitudes among those who reported wanting to learn more.

However, when looking at the anxiety component, different desires to learn more were observed among the two treatments. Those who received the indoor, large-scale treatment reported higher anxiety in general, but anxiety was also higher among those who wanted to learn more. The opposite was true of the outdoor, small-scale treatment. Those in this treatment reported lower anxiety in general as compared to the large-scale treatment, but contrary to large-scale treatment those who wanted to learn more reported lower anxiety. Thus, the results suggest that there may be a range of anxiety scores where individuals are more inclined to reject and avoid information that discredits their beliefs altogether (Frey, 1986). However, those with anxiety below and above this range may be more likely to want to learn more and consider aligning their attitudes as suggested by the means. This may be explained by an interaction between anxiety and recognition of anomaly. Future research should explore how these two cognitive conflict variables interact in the settings purposed by this study.

Recommendations for Practitioners

Practitioners can use this research to understand the way that audiences are processing the messages that they are producing. Practitioners should recognize that messages have a greater impact on cognitive conflict of message receivers than their socioeconomic characteristics. This suggests that the message may be more important in creating or limiting cognitive conflict than considering the backgrounds and characteristics of message receivers. Although not explored in this study, these findings could have implications regarding indicators of agricultural literacy and may provide evidence of ways to combat problems associated with agricultural literacy through careful message selection. Future research should consider literacy components in combination with the variables presented here. Additionally, practitioners should be aware of audience's desires to learn more and how their desire to learn may be compounded with interest and anxiety. Specifically, there is an opportunity to capitalize on and research further those who desire to learn more about indoor, large-scale housing as their interest and anomaly could provide strategies for future communication.

In considering the pairing of image and word associations, practitioners should be careful in their selection and consideration of the cognitive conflict these pairings may produce. For example, in this study, pairing wording about cage-free housing with an image of indoor large-scale poultry production caused higher anxiety and higher interest and recognition of anomaly. However, pairing wording about cage-free housing with an image of outdoor small-scale poultry production caused lower anxiety and lower interest and recognition of anomaly, likely because this paring was more familiar to consumers. One could argue that producing higher anxiety and interest and recognition of anomaly may drive more people to action. On the other hand, choosing communication pairings to produce lower anxiety and lower interest and recognition of anomaly may keep audiences closer to a state of consonance and less likely to take action. Communicators should consider the goals of their communication when making these pairing decisions and continue to follow additional research in this area as it develops.

Educators should also consider using the cognitive conflict instrument (adapted for specific contexts) as a formative assessment of instruction in both formal and nonformal educational settings. Results could provide evidence of how different topics and instruction may be impacting student anxiety as well as interest and anomaly. These results could then also be used in predictive modeling with academic performance variables.

Recommendations for Future Research

Due to the limited research related to the way that audiences cognitively arrive at interpretations of messages and the way that historically accepted theories interact with complex agricultural issues, there are many opportunities for researchers to further explore this research area. Future research should explore the components of cognitive conflict in the context of other complex agricultural issues and with other audiences, to see if the components load in a consistent manner across additional testing. Additionally, researchers may want to explore how action or behaviors may be influenced by levels of cognitive conflict. Researchers should seek to further develop the consonance component of the cognitive conflict instrument in order to increase reliability of the instrument. An opportunity also exists to develop the reappraisal of cognitive conflict component of the instrument or explore its suitability as an outcome variable. Research should also utilize the existing instrument to evaluate cognitive conflict when respondents learn about other agricultural issues, to assess if cognitive conflict varies between types of agriculture.

Educators may also wish to utilize and test the instrument in educational settings where complex agricultural issues are being discussed. Utilization of the instrument in this context would allow educators to determine and compare if anxiety and interest and recognition of anomaly is different among students than the general population in this context. This information could be helpful in facilitating learning around complex agricultural issues. In addition, future research should investigate how cognitive conflict is impacted when respondents view two conflicting images of agriculture instead of being presented with only one.

Finally, this study was exploratory in nature and is limited by the methods and statistical analyses used. Particularly the holistic pairing of the messages and images can only provide results about the pairings and conclusions about the stand-alone message or image cannot be made. Advanced statistical procedures and modeling may reveal further explanation of the variables of interest.

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