Journal of Agricultural Education, 60(3), 47-61
https://doi.org/10.5032/jae.2019.03047

Integrating Personal Involvement, Goal Orientation, and Characteristics of Innovations to Inform Fertilizer Best Practice Video Communications

Laura A. Warner[1], Joy N. Rumble[2], and Tiffany Rogers-Randolph[3]

Abstract

Water quality is a complex issue and residential fertilizer can be one of the many contributors to poor water quality. Working with residential audiences to help them understand and reduce their impacts on water quality is an important task among many agricultural education and Extension professionals. In order to effectively work with residential audiences, we must first understand what influences their intent to engage in fertilizer best management practices. In this research, we paired the Diffusion of Innovations and Elaboration Likelihood Model to examine the influence of perceptions of an innovation's characteristics, personal involvement with water, and communication on intent to engage in fertilizer best management practices. The communication was presented to experimental groups as a 35-second video about fertilizer best management practices. Data were collected via a survey instrument and were analyzed using inferential procedures. Four of the five characteristics of innovations significantly influenced intent to engage in fertilizer best management practices among the control group. However, all five characteristics were significant among the entire sample but the influence was less compared to the control group. Involvement increased intent while the video treatments had little effect. The results of the research support existing findings, but also offer areas of new discovery as well as insights for practice and additional study. Future research should examine the repetition of communication as well as different dimensions of involvement.

***Keywords*:** behavior change, diffusion of innovations, elaboration likelihood model, fertilizer best management practices, personal involvement, water quality protection

***Authors' Note*:** Correspondence concerning this article should be addressed to Dr. Laura Warner, Department of Agricultural Education and Communication, University of Florida, Gainesville, FL, 32601. Email: lsanagorski@ufl.edu. This work was supported by the University of Florida Center for Landscape Conservation and Ecology.

Introduction

Increasing precipitation intensity, worsening drought conditions, increases in water temperatures, and non-point source pollution can all contribute to decreased water quality (Georgakakos et al., 2014; Shober, Denny, & Broschat, 2010). The human impact on water quality

[1] Laura A. Warner is an Associate Professor of Extension Education in the Department of Agricultural Education and Communication and the Center for Landscape Conservation and Ecology at the University of Florida, PO Box 112060, Gainesville, FL, 32611, lsanagorski@ufl.edu.

[2] Joy N. Rumble is an Assistant Professor of Agricultural Communication at The Ohio State University in the Department of Agricultural Communication, Education, and Leadership and the Agricultural Technical Institute, 1328 Dover Road, 089C Halterman Hall, Wooster, OH 44691, rumble.6@osu.edu.

[3] Tiffany M. Rogers-Randolph is an Assistant Professor of Agricultural Communications and Journalism in the Department of Communications and Agricultural Education at Kansas State University, 301 Umberger Hall, 1612 Claflin Road, Manhattan, KS 66506-3402, trogersrandolph@ksu.edu.

through the addition of excess nutrients is expected to worsen on a global scale (Howarth, Sharpley, & Walker, 2002). Some of these nutrients come from fertilizers which are applied in a variety of contexts (Howarth et al., 2002). When residents use fertilizers improperly, nutrient runoff from their landscapes can contribute negatively to water quality (Shober et al., 2010). The best way to manage water quality is to reduce the amount of sediment, nutrients, and other pollutants to water bodies (Georgakakos et al., 2014).

Those working in agricultural education, such as Extension professionals, are positioned to positively contribute to solutions for a number of water resource issues (McKim, Forbush, & McKendree, 2018) including the degradation of water quality (Andenoro, Baker, Stedman, & Weeks, 2016). Huang and Lamm (2015) contended Extension educators need to play a role in increasing awareness of water quality issues by helping people to see how the issues are relevant to them. Extension programs across the United States address water quality issues in various ways. One such way water quality is being addressed is through the education of Master Gardeners on topics such as fertilizer best management practices (BMPs), sources of water pollutants, and the concept of watersheds (UGA, 2018).

Extension professionals are actively seeking new methods that prepare people to solve complex problems (Andenoro et al., 2016). Residents have become a key audience in addressing water issues because their yards and landscape management practices may impact water quality (Shober et al., 2010). There is a need to develop programs that motivate residents to use good landscape management practices that protect water resources (Shober et al., 2010) and Extension clientele are more likely to change their behaviors when programs integrate and emphasize the personal relevance of water quality issues (Huang & Lamm, 2015). The study reported here integrated personal involvement with water, motivation to protect water, and perceived characteristics of fertilizer BMPs to inform communication with residents about water quality.

Conceptual Framework

Elaboration Likelihood Model

The concept of personal involvement with water derives from the elaboration likelihood model (ELM). The ELM provides an illustration of the thought processes and attitude formation that occur as a result of being exposed to persuasive communication (Petty, Brinol, & Priester, 2009). The ELM is driven by the premise that people are motivated to have appropriate attitudes, but may not have the capacity or time to dedicate the cognitive resources to evaluate every persuasive argument (Cacioppo, Petty, Kao, & Rodriguez, 1986). There are different factors associated with persuasive arguments that prompt individuals to engage with the information at different cognitive levels described as elaboration, which is the degree to which a person engages with a persuasive message and considers issue-relevant arguments (Petty & Cacioppo, 1986). "The ELM holds that the processes that occur during the 'yielding' stage of influence can be thought of as emphasizing one of two relatively distinct 'routes to persuasion'" (Petty et al., 2009, p. 132), which include central and peripheral processing routes (Petty & Cacioppo, 1986).

Engagement through the central processing route demands effortful cognitive activity grounded in prior experiences and knowledge to fully assess the integrity of the message (Petty & Cacioppo, 1986). Motivation and ability to engage in central route processing serve as the precursors to a careful appraisal of the merits of the message. During this message evaluation, favorable or unfavorable thoughts are constantly being generated in response to the communication (Petty et al., 2009). Due to the high-level of evaluation that occurs during central processing, attitudes influenced through this route are typically "easy to access from memory, held in high confidence, persistent over

time, predictive of behavior, and resistant to change" (Petty et al., 2009, p. 134). The positive or negative orientation of the resulting attitude relies on the initial attitude that was held and the determined quality of the persuasive communication (Petty et al., 2009).

It must be noted that individuals will not always engage at such a high level with the persuasive message as they will not find every message interesting, important, or relevant (Petty & Cacioppo, 1986). When the recipient of persuasive communication finds themselves in a situation that does not inspire motivation or ability to process issue-relevant information, or they lack the time or resources to do so, they will retain their initial attitude, or the peripheral processing route will be pursued (Petty et al., 2009). Elaboration that occurs as a result of peripheral processing typically relies on cues to evaluate the message such as a source, a word, or an attractive image. Resulting attitude changes are often short-term, less accessible, and less resistant to counter-arguments (Petty et al., 2009). When attitudes change through the peripheral route they are passively and vaguely accepted. Attitude changes through the central route, however, become actively assimilated into a person's thoughts (Petty et al., 2009). Applied to Extension programming, it would be advantageous to identify ways to develop educational messages that stimulate processing through the central route.

Motivation and ability serve as key determinants in selecting the processing channel that will be utilized to evaluate a message. Within the ELM, personal involvement has the potential to increase interest in media messages and serves as a motivation variable (Petty et al., 2009). The concept of involvement is valuable in that it can "increase the amount of effort that the individual is willing to expend in processing a persuasive message" (Petty & Krosnick, 1995, p. 197). Increased involvement has been shown to increase motivation and therefore increase the generation of message-relevant thoughts. Additionally, the higher the personal involvement, the more resistant attitudes are to change. As a result, it has been established that strong arguments are more persuasive to high-involvement individuals and they are less likely to be persuaded by weak arguments than their low-involvement counterparts (Petty & Krosnick, 1995). Message-irrelevant cues such as likability (Chaiken, 1980) and expertise (Petty, Cacioppo, & Goldman, 1981) of the communicator hold less influence over highly involved individuals. In the context of water issues, we operationalized personal involvement as exposure to water bodies, considering more exposure to water as a greater level of personal involvement. Extension clientele with higher levels of personal involvement might be expected to have greater motivation to process a message.

An additional motivation variable is goal orientation, or an individual's motivation to process a message. Mackenzie and Spreng (1992) explored the impact of goal orientation on central and peripheral processing in the context of brand attitudes. The provision of various goal orientation messages impacted the processing goals and subsequent motivation of message receivers. Goal orientation messages had the potential to increase motivation which fortified the influence of central processing on brand attitudes. While individuals were not found to generate more brand-relevant thoughts when engaged in central processing, there was evidence that they "gave greater heed to the [brand-relevant thoughts] they have" (Mackenzie & Spreng, 1992, p. 528). In this sense, the increase of motivation increased the probability that attitudes would be formed based on these thoughts and the confidence of individuals to base future behavioral intentions on these attitudes (Mackenzie & Spreng, 1992). The works of Keller (1991), Shavitt, Swan, Lowery, and Wanke (1994), and Gurhan-Canli and Maheswaran (2000) offered additional support for the influence of goal orientation messages on elaboration processes. In the context of this study, goal orientation was operationalized as the delivery of a goal orientation message that conveyed the research purpose and emphasized the value of using good fertilizer practices.

The literature has repeatedly shown a dominance of peripheral processing occurring with messages in the context of agriculture and natural resources. This could be due to the fact suggested

by Abrams and Meyers (2012) that "most people are not motivated or highly involved" (p. 64) with issues in this context. With respect to water conservation messages, Rumble, Lamm, Martin, and Warner (2017) reported that individuals participating in water conservation practices were motivated and had the ability to process water conservation messages, but they did not have a change in cognitive structure to reach central processing when viewing a persuasive message. When exposed to a water conservation message, participants demonstrated limited thoughts and referenced peripheral cues, leading the researchers to believe the participants either retained their initial attitude or participated in peripheral processing (Rumble et al., 2017).

Diffusion of Innovations

The ELM can help Extension professionals understand how target audiences interact with communications, and in the current study context, how audiences respond to messages about using good fertilizer practices. The Diffusion of Innovation (DOI) theory can be brought in to help us better understand the adoption process of best practices among target audiences (Rogers, 2003). Diffusion of something new, or an innovation, is the cycle of communication about that innovation among members of a social group (Rogers, 2003). The rate at which an innovation is diffused will vary based on people's reactions to the innovation and is referred to as the rate of adoption. Individuals' adoption decisions can be influenced by factors that include the promotional strategies and channels used to communicate about the innovation, characteristics of the community, and the positioning of an innovation in relation to "existing beliefs and past experiences of potential adopters" (Rogers, 2003, p. 219). Mass-media channels, such as video, can be the most effective and quickest way to increase knowledge and change weak attitudes (Rogers, 2003).

Mass-media sources are typically more important when clientele are learning about something new while interpersonal communications are more important when an audience is developing perceptions of attributes of the innovation (Rogers, 2003). These attributes are trialability, complexity, compatibility, relative advantage, and observability, which together may account for 49 - 87% of the variance in the adoption of an innovation (Rogers, 2003). If an innovation is viewed as being better in an economic or social dimension than the idea it supersedes, it is said to have relative advantage. The extent to which an innovation aligns with potential adopters' needs, past experiences, and values is described as compatibility. The difficulty of use and understanding of an innovation is known as its complexity and as people perceive higher levels of complexity the rate of adoption decreases. The availability to be tested on a limited basis, or trialability, allows adopters to eliminate some of the uncertainty around a new idea and create their own meaning for the innovation. Lastly, "observability is the degree to which the results of an innovation are visible to others" (Rogers, 2003, p. 258).

DOI theory operates under another key assumption that impacts the rate of adoption. The assumption is that not everyone in a social system adopts an innovation at the same time (Rogers, 2003). Based on the speed of their adoption, individuals can be classified into five categories of adopters: innovators, early adopters, early majority, late majority, and laggards. One of the key distinguishing factors between categories is the innovativeness of the individuals within them, or how quickly someone adopts an innovation compared to other members of a community (Rogers, 2003). The five adopter groups have unique individual and social characteristics which include their access to financial and other resources, education, and social relationships, all of which relate to adoption decision-making (Moser & Mosler, 2008; Rogers, 2003).

ELM and DOI

While extensive research has examined behavior through the lens of ELM and DOI, this work has often remained independent of one another. Rather than remain in their individual silos, it has been recommended that these two concepts be explored in partnership (Lewis, 2016; Moser & Mosler, 2008). Lewis (2016) postulated that the process of elaboration could provide insight into the persuasion that occurs at various stages of DOI that prompts adoption. Furthermore, Moser and Mosler (2008) insisted the motives of innovators and early adopters can be illuminated through the ELM. In their study examining the adoption of solar water-disinfection technology, the researchers found that involvement played an important role in the diffusion process. The prediction that involvement projected early adoption was confirmed. Additionally, it was concluded that involvement continued to have a lasting impact on middle adopters as well (Moser & Mosler, 2008).

During the second state, the influence of involvement on the diffusion process may contribute to a rapid increase in adoption which is not only a function of initial social impacts as Rogers (2003) asserted, but that "this phenomenon could rather be the result of a multiplicity of different personal motivations and social impacts" (Moser & Mosler, 2008, p. 502).

Given the value of DOI and ELM, it could be advantageous to see how the two concepts might together provide more clarity into behavior than either on their own. Within the current study, we wanted to first explore how components of DOI and ELM related to behavioral intent. Next, we wanted to examine how adding involvement and goal orientation to the perceived characteristics of innovations, along with a video treatment, could potentially increase the predictive power of DOI.

Purpose and Objectives

The purpose of this study was to examine how goal orientation and involvement could be integrated with characteristics of innovations (fertilizer BMPs) to inform Extension communications to promote actions that positively influence water quality. The specific research questions were: 1) Do DOI characteristics predict intent?, 2) Does greater involvement relate to greater perceptions of innovations pertaining to fertilizer BMPs or intent to engage in fertilizer BMPs?, 3) Do video messages with or without goal orientation change perceptions of innovations pertaining to fertilizer BMPs or intent to engage in fertilizer BMPs?, and 4) Does greater involvement paired with goal orientation prior to receiving a video message increase intent to engage in fertilizer BMPs?

Methods

We collected data using purposive sampling and accessed our sample with a professional survey sampling company. We used an opt-in panel with the following criteria: 18 years of age or older, Florida residents, having a lawn or landscape to which fertilizer was applied. We collected data in December of 2017 and secured 1,198 complete responses. Before collecting data, we secured approval to conduct the study from the University of Florida Institutional Review Board.

Instrumentation

Our variables of interest were involvement; the five DOI characteristics (perceived trialability, complexity, compatibility, relative advantage, and observability) of fertilizer BMPs; and behavioral intent to engage in fertilizer BMPs. We measured these using a researcher-designed instrument with a combination of Likert-type scales, semantic differentials, and a multiple-choice question (Table 1). We adapted involvement from Warner, Diaz, and Gusto (2019) and the DOI characteristics from Warner, Lamm, White, Fisher, and Beattie (in press).

To establish face and content validity, we engaged an expert panel in reviewing the instrument prior to its use (Hardesty & Bearden, 2004; Haynes, Richard, & Kubany, 1995). We selected panel members who had expertise in water quality issues, horticultural extension programming, agricultural communications, and survey methodology. We clarified some of the language in the survey following input from the expert panel, and then conducted a pilot test of the instrument. We used the pilot test data to estimate reliability using Cronbach's alpha and all values exceeded .70 (data not presented). We did not include pilot test responses in the full study.

Table 1

Variables, Question Types, Individual Items, and Possible Choices

Variable	Question Type	Question type, stem, and individual items	Possible responses	*M*	*SD*
Involvement	Likert-type scale: How often do you see a water body for any reason?	Lakes Rivers Canals Streams Oceans Springs Stormwater retention ponds	Never (1) Less than once a month (2) 1-3 times a month (3) Once a week (4) 2-3 times a week (5) More than 3 times a week (6)	3.38	.97
Trialability index	Likert-type scale: Please indicate your level of agreement or disagreement with the following statements as they pertain to good fertilizer practices.	Good fertilizer practices are easy to try Good fertilizer practices can be tested before I commit to changing my lawn/landscape management routine If given the opportunity, I would try a few good fertilization practices before investing my time	Strongly disagree (1) Disagree (2) Neither disagree nor agree (3) Agree (4) Strongly agree (5)	3.97	.62
Complexity	Semantic differential: Overall, good fertilizer practices are...	Complex, Simple Easy to understand, Difficult to understand* Clear, Unclear* Confusing, Straightforward Complicated, Not complicated	Five points between each word pair (1, 2, 3, 4, 5)	1.73	.87

Table 1

Variables, Question Types, Individual Items, and Possible Choices Continued…

Compatibility index	Likert-type scale: Please indicate your level of agreement or disagreement with the following statements as they pertain to good fertilizer practices. Good fertilizer practices are easy to integrate into my existing landscape maintenance routine Good fertilizer practices are simple to use Good fertilizer practices are easy to follow	Strongly disagree (1) Disagree (2) Neither disagree nor agree (3) Agree (4) Strongly agree (5)	3.80	.60
Relative advantage	Likert-type scale: Please indicate your level of agreement or disagreement with the following statements as they pertain to good fertilizer practices. Good fertilizer practices are better than the fertilizer practices I have used in the past Good fertilizer practices could be a solution to combat poor water quality Using good fertilizer practices will improve the quality of my home landscape	Strongly disagree (1) Disagree (2) Neither disagree nor agree (3) Agree (4) Strongly agree (5)	3.96	.62
Observability	Multiple choice: How likely are you to adopt good fertilizer practices you observed someone else using? [a]	I will not use good fertilizer practices (1) Not very likely (2) Somewhat likely (3) Likely (4) Very likely (5)	4.22	.95

Table 1

Variables, Question Types, Individual Items, and Possible Choices Continued…

Intent	Likert-type scale: Please indicate how likely or unlikely you are to engage in the following fertilization behaviors in the future. Apply fertilizers carefully to reduce their runoff into the ground Reduce the application of fertilizers to lawn/landscape Engage in good lawn/landscape fertilization practices Prevent spilling of fertilizers on paved surfaces	Very unlikely Unlikely Undecided Likely Very likely	4.47	.61

Note: *Indicates items that were reverse-coded. [a]Respondents received this question only if they indicated *yes* to *Have you had the opportunity to observe others using or demonstrating good fertilizer practices you are not currently using*? Therefore, multiple imputation was used to complete missing data points. Cronbach's alpha values were .69 (involvement), .60 (trialability), .89 (complexity), .88 (compatibility), .56 (relative advantage), and .83 (intent).

We also embedded an experimental design into the survey with a control group as well as two possible treatment groups: a video message group that did not receive a goal orientation message and a video message group that received the same video along with a goal orientation message. Respondents were randomly assigned to one of these three groups. The 35-second video was designed to appeal to social values because previous research has demonstrated the strength of social frames with the residential audience (Rumble et al., 2017; Warner, Rumble, Martin, Lamm, & Cantrell, 2015). The video began with footage of a person reading a fertilizer bag carefully, then applying it and sweeping spilled fertilizer back onto the lawn, and then ended with aerial footage of people recreating around a spring. The viewer could see text highlights and hear the following audio:

> Florida's rivers, lakes, and springs rely on us to do our part in ensuring a positive impact on the environment. Before you fertilize your lawn or landscape, be a role model for others by reading the label on the fertilizer bag to make sure you apply the right amount. Use fertilizer responsibly by sweeping any spilled fertilizer back onto your lawn or into the bag. Your efforts to properly apply fertilizer can ensure that Florida's rivers, lakes, and springs remain a safe place for your friends and neighbors to enjoy.

Those who were assigned to the video treatment without goal orientation group received instructions to "examine the video just as you would if it were a video you were interested in viewing." Those who were assigned to the goal orientation group received the same instructions and were also informed, "[p]articularly, we are interested in how you consume information about proper fertilizer practices. Proper fertilizer practices are important in helping to protect our water resources. If proper fertilizer practices are not followed, we may damage our ecosystem."

Data Analysis

To determine whether the characteristics of innovations predicted intent to engage in fertilizer BMPs, we conducted a multiple linear regression analysis with the five characteristics as input

variables and intent as the outcome variable. We used Spearman's correlations to determine whether there was a relationship between involvement and perceived characteristics of innovations as well as intent. We used only the control group (n = 398) for these two analyses because we wanted to exclude any effects from the treatments.

We used one-way analysis of variance to compare the control and two treatment groups' perceived characteristics of innovations as well as intent. We used multiple linear regression to determine the influence of the five characteristics of innovations on intent and evaluate whether involvement and treatment group increased the predictive power of these characteristics. To integrate goal orientation and video treatments into the model, we created dummy variables for both goal orientation and video treatment, with goal orientation and video treatments coded as 1 and the absence of either coded as a 0. We conducted each of these analyses using SPSS (version 25.0; IBM Corp., Armonk, NY).

Results

Do DOI characteristics predict intent?

A multiple linear regression revealed four of the five characteristics of innovation significantly predicted about 27% of the variance in intent to engage in fertilizer BMPs, $F(5, 392) = 30.946$, $p < .001$, $R^2 = .274$ (see Table 2). The significant characteristics individually explained about 15% - 23% variance in intent when the other independent variables were held constant, with observability making the most substantial contribution. The relationship was positive for each of the significant characteristics except for complexity, meaning when respondents perceive fertilizer BMPs to be less complex, they are more likely to intend to engage in them.

Table 2

Intent Predicted by Compatibility, Complexity, Trialability, Relative Advantage, and Observability

	R^2	F	B	p
Model**	.274	30.946		<.001
Observability**			.232	<.001
Relative advantage*			.162	.001
Trialability*			.161	.006
Complexity*			-.145	.009
Compatibility			.080	.214

Note. * significant at $p = .05$ ** significant at $p < .001$. Reported β are standardized coefficients.

Does greater involvement relate to increased perceptions of DOI or behavioral intent?

Spearman's correlations revealed there were no significant relationships between involvement and relative advantage, involvement and trialability, involvement and observability, or involvement and complexity. There was a significant positive relationship between involvement and compatibility (r_s (396) = .099, $p < .047$). There was also a significant positive relationship between involvement and intent (r_s (396) = .111, $p = .027$). Both significant relationships were small but positive, meaning as involvement increased, compatibility and intent increased, but the practical significance of these associations was small. These findings reveal that compared to those with lower levels of involvement, people with higher levels of involvement perceive using fertilizer BMPs to be

more compatible and more readily observed, and they also have greater intent to engage in fertilizer BMPs.

Do video messages with or without goal orientation change perceptions of innovations or intent?

One-way analysis of variance among the three groups indicated the control group (CON) perceived lower trialability and compatibility and greater complexity than the two video groups (see Table 3). This means that compared with those who did not view a video, individuals who received a video treatment perceived using fertilizer BMPs was more compatible, was less complex, and was something they could try. However, the non-goal-orientation (NGO) and goal-orientation (GO) video groups were not different from one another, meaning goal orientation alone did not influence any of the outcome variables. The NGO video group had slightly greater intent than the control group. The effect sizes were small for trialability and intent and medium for complexity and compatibility, as measured using partial eta squared (η2; Huck, 2012).

Table 3

Comparison of Trialability, Complexity, Compatibility, Relative Advantage, Observability, and Intent among Control, Non-Goal-Orientation Video, and Goal-Orientation Video Treatment Groups

	Control (n = 398)		NGO (n = 400)		GO (n = 400)				
	M	*SD*	*M*	*SD*	*M*	*SD*	*F*	*p*	η^2
Complexity**	$2.15^{NGO,GO}$	.94	1.55^{CON}	.78	1.49^{CON}	.73	79.35	< 0.001	0.12
Compatibility**	$3.87^{NGO,GO}$	.68	4.27^{CON}	.64	4.28^{CON}	.68	49.15	< 0.001	0.08
Trialability**	$3.82^{NGO,GO}$	.58	4.03^{CON}	.62	4.07^{CON}	.62	19.53	< 0.001	0.03
Intent*	4.43^{NGO}	.63	4.54^{CON}	.53	4.46	.67	3.13	.044	0.01
Relative advantage	3.90	.57	3.99	.62	3.98	.63	2.65	.071	0.00
Observability	4.25	.41	4.27	.52	4.29	.50	.59	.555	0.00

Note. * Post-hoc Tukey HSD test significant at $p = .05$ **Post-hoc Tukey HSD test was significant at $p < .001$. ^{CON}Control, ^{NGO}Video without goal orientation, ^{GO}Video with goal orientation. Tukey HSD used for trialability, compatibility, and intent. Games Howell post-hoc test used for complexity, relative advantage, and observability.

Does more involvement paired with goal orientation prior to receiving a video message increase intent?

The results of the first model in the multiple regression analysis demonstrated the five characteristics of innovations predicted about 18% of the variance in intent (see Table 4), which is notably less than variance predicted by these variables in the control group only. When the other variables were held constant, each of the variables contributed significantly to the model. Compatibility ($\beta = .148$) predicted the greatest amount of variance when the other variables were held constant. Adding involvement ($\beta = .093$) increased the prediction of intent by about 1%. Adding goal orientation ($\beta = -.072$) increased this prediction by another approximately 1%.

Table 4

Intent To Engage in Fertilizer Bmps Among Florida Residents Predicted by DOI Characteristics, Video Treatment, and Involvement (*N* = 1,198)

	R^2	R^2 change	*F*	*p*	*β*
Model 1	.180	.180	53.570	< .001	
Compatibility**				< .001	.148
Trialability**				< .001	.134
Complexity**				< .001	-.128
Observability**				< .001	.116
Relative advantage*				.007	.083
Model 2	.192	.012	47.177	< .001	
Compatibility**				< .001	.141
Trialability**				< .001	.131
Complexity**				< .001	-.131
Observability**				< .001	.113
Relative advantage*				.005	.085
Involvement**				< .001	.093
Model 3	.201	.009	37.283	.002	
Compatibility**				< .001	.151
Trialability**				< .001	.133
Complexity**				< .001	-.152
Observability**				< .001	.111
Relative advantage*				.008	.081
Involvement*				.001	.091
Goal orientation*				.017	-.072
Video				.230	-.038

Note. Model 1 = five characteristics of innovations (trialability, complexity, compatibility, relative advantage, observability). Model 2 = Model 1 + involvement. Model 3 = Model 2 + goal orientation + video treatment. * significant at $p = .05$ ** significant at $p < .001$. Reported β are standardized coefficients.

Conclusions

Together, four of the five DOI characteristics predicted just over 25% of the variance in intent to engage in fertilizer BMPs. While all four characteristics were significant predictors, observability had the strongest relationship with intent with a one-unit increase in this variable accounting for a .23-unit increase in intent when the other variables were held constant. Notably, complexity accounted for the least amount of variance among the significant predictors.

Greater involvement positively related to perceptions of better compatibility and greater intent to engage in fertilizer BMPS. However, the strength of these relationships was weak, indicating there are other influential factors at play, and involvement alone only helps us to partially understand intent to engage in fertilizer BMPs.

When considered the treatments only, the video messages, regardless of goal orientation, increased perceived compatibility and trialability and decreased perceived complexity associated with engaging fertilizer BMPs. Overall, goal orientation did not make a difference in the ANOVAs, while

the act of viewing a video positively influenced three of the five DOI characteristics. The video message without goal orientation increased intent to engage in fertilizer BMPs.

Evaluating the relationships of DOI characteristics along with involvement, goal orientation, and videos revealed a different relationship. When considered among people who had watched a video, the relationship changed somewhat. Among the control group members, all DOI characteristics except for compatibility predicted intent, while all five DOI characteristics predicted intent among our entire sample. These five variables predicted intent to a lesser extent than the control group. Among the three groups, when considered together, compatibility had the strongest predictive power among the five DOI characteristics while observability had the strongest predictive power in the control group.

Recommendations and Discussion

Four of the five DOI characteristics were significant predictors of intent in the control group, which is mostly consistent with the DOI theory (Rogers, 2003). Because the DOI characteristics remained the greatest powers among variables studied when involvement and video treatments were introduced, Extension professionals should work to foster positive perceptions of fertilizer BMPs. Following Rogers (2003), Extension can best influence these perceptions through interpersonal communications, although our findings show videos can be used to positively influence characteristics of innovations. The findings imply Extension professionals should concentrate on strategies to make the benefits of using fertilizer BMPs easily observable and provide opportunities for Extension clients to test them out on a trial basis. Extension does this very well through demonstrations, field days, and trial gardens. Extension professionals should also consider ways to help clients recognize how the use of fertilizer BMPs is better than fertilizer methods clientele may have used in the past, compatible with their current routines and values, and not overly complex.

Consistent with ELM, people with higher involvement were impacted slightly more by the videos (Petty & Krosnick, 1995). Although involvement and goal orientation played small roles in comparison to the DOI characteristics, their significance is important. Because of these findings, Extension professionals should find ways to increase involvement among clientele. In practice, this could mean providing opportunities for Extension clients to spend time around various water bodies, through field trips or possibly through innovative virtual experiences. These findings leave unanswered questions as to how thoughtfully-designed communications can play a role in shaping behavioral intent. In face-to-face settings, it is possible these communications could play a bigger role when interpersonal communications are integrated (Rogers, 2003). Additionally, repeated exposure to communication could also have a greater influence on behavioral intent (Rumble et al., 2017).

Goal orientation prior to a video should have impacted participants' consumption of the information (Mackenzie & Spreng, 1992), and it very subtlely, but negatively related to intent when we incorporated the influence of DOI characteristics and involvement at the same time. Video treatments influenced some of the DOI characteristics, but were not significant predictors of intent when considered along with DOI characteristics and involvement. While interpersonal communications would be expected to have a greater influence on DOI characteristics (Rogers, 2003), in this study, mass media (video) did have an effect. Given the lack of strong influence from goal orientation and video treatments, there is still a need to determine how Extension professionals should develop short videos and the most effective ways to guide viewers on consuming educational content. It may be possible they should consider a different type of goal orientation or the use of different words than those we studied.

Considering the weakened relationship between DOI characteristics and intent when videos were introduced, it may be possible that video treatments somewhat make up for a lack of strong positive perceptions of characteristics of innovations. It was interesting to note the weakened relationship between observability and intent among those who viewed a video compared with those who did not. When respondents had an opportunity to observe behaviors in the videos, their observability scores went up while this characteristic's impact on intent was reduced. However, intent itself was higher among those who saw a video. It is possible people think they have seen fertilizer BMPs and that they have the ability to use them, but after they see them in the videos, they are less sure. It could also be the fertilizer practices or equipment, such as the hand spreader presented in the video, were different from what they had previously used or observed, which may have created some dissonance.

Considering the greatest influence on intent was compatibility in the final model, Extension professionals should pay special attention to helping clientele see how fertilizer BMPs are compatible with their existing yard care practices. Extension videos should be designed to convey how fertilizer BMPs align with the audience's beliefs, values, existing landscape components, and yard maintenance routines. Ideally, such videos would be accompanied by interpersonal communications that also emphasize compatibility.

Due to the purposive sample used, findings cannot be generalized to a larger population. However, they reveal important insights that are not often available to agricultural education and Extension practitioners. We advise caution in interpreting the findings and suggest future work should be conducted to modify the questions with less than desirable reliability, possibly with factor analysis to examine whether different dimensions are loading, to continue to improve the instrument.

This study explored how components of DOI and ELM might together guide Extension communications about fertilizer BMPs. We did not measure individuals' current engagement in fertilizer BMPs in this study, and did not consider how the relationships between involvement, perceived DOI characteristics, video treatments, and goal orientation might have presented differently among early adopters or innovators. A follow-up study could reveal such differences, especially in regard to involvement (Moser & Mosler, 2008), if considered in this way. Greater involvement may influence early and middle adopters more than later adopters (Mosler & Mosler, 2008, and the possibility of a relationship between adopter category and personal involvement should be explored.

Looking ahead to other future research, we suggest designing messages of different levels of strength to determine whether strong arguments are more persuasive to those with higher involvement in this context (Petty & Krosnick, 1995). Additionally, repetition of these messages is highly important and could lead to different findings (Rumble, et al., 2017). Our findings correspond to a single view of the videos. In an authentic Extension context, clientele may view the videos multiple times and through multiple communication channels, in which case the actual influence could be different. It would be interesting to embed the videos in social media sites or Extension newsletter to examine how the findings translate. Future research should also more closely evaluate the influence of involvement. It may be important to characterize involvement by examining the quality and type of time spent around water to see how a deeper understanding of this variable relates to engagement in fertilizer BMPs.

References

Abrams, K. & Meyers, C. (2012). From opposite corners: Comparing persuasive message factors and frames in opposing organizations' websites. *Journal of Applied Communications, 96*(1), 54–67. Retrieved from https://newprairiepress.org/jac/vol96/iss1/6/

Andenoro, A. C., Baker, M, Stedman, N. L., & Weeks, P. (2016). Research priority 7: Addressing

complex problems. In T. G. Roberts, A. Harder, & M. T. Brashears, M. T. (Eds.), *American Association for Agricultural Education national research agenda: 2016-2020* (pp. 57–62). Gainesville, FL: Department of Agricultural Education and Communication.

Cacioppo, J. T., Petty, R. E., Kao, C. F., & Rodriguez, R. (1986). Central and peripheral routes to persuasion: An individual difference perspective. *Journal of Personality and Social Psychology, 51*(5), 1032–1043. doi:10.1037/0022-3514.51.5.1032

Chaiken, S. (1980). Heuristic versus systematic information processing and the use of source verses message cues in persuasion. *Journal of Personality and Social Psychology, 39*(5), 752–766. doi:10.1037/0022-3514.39.5.752

Cohen. J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum.

Georgakakos, A., Fleming, P., Dettinger, M., Peters-Lidard, C., Richmond, T. C., Reckhow, K., … & Yates, D. (2014). *Water Resources. Climate change impacts in the United States: The third national climate assessment*. In J. M. Melillo, T. C. Richmond, & G. W. Yohe (Eds.), U.S. global change research program (pp. 69–112). doi:10.7930/J0G44N6T

Gurhan-Canli, Z., & Maheswaran, D. (2000). Determinants of country-of-origin evaluations. *Journal of Consumer Research, 27*(1), 96–108. doi:10.1086/314311

Hardesty, D. M., & Bearden, W. O. (2004). The use of expert judges in scale development: Implications for improving face validity of measures of unobservable constructs. *Journal of Business Research, 57*(2), 98–107. doi:10.1016/S0148-2963(01)00295-8

Haynes, S. N., Richard, D., & Kubany, E. S. (1995). Content validity in psychological assessment: A functional approach to concepts and methods. *Psychological Assessment 7*(3): 238–247. doi:10.1037/1040-3590.7.3.238

Howarth, R. W., Sharpley, A., & Walker, D. (2002). Sources of nutrient pollution to coastal waters in the United States: Implications for achieving coastal water quality goals. *Estuaries*, *25*(4b), 656–676. doi:10.1007/BF02804898

Huang, P-w, & Lamm, A. J. (2015). Impact of experience and participation in extension programming on perceptions of water quality issues. *Journal of International Agricultural and Extension Education, 22*(3), 35–49. doi:10.5191/jiaee.2015.22303

Huck, S. W. (2012). *Reading statistics and research*. Boston, MA: Pearson Education.

Keller, K. L. (1991). Cue compatibility and framing in advertising. *Journal of Marketing Research, 28*(1), 42–57. doi:10.2307/3172725

Lewis, J. (2016). *The need for cognition and the adoption of new technology: A study of how the elaboration likelihood model impacts diffusion of innovation* (Master's thesis). Retrieved from https://ir.ua.edu/handle/123456789/2705

Mackenzie, S. B. & Spreng, R. A. (1992). How does motivation moderate the impact of central and peripheral processing on brand attitudes and intentions? *Journal of Consumer Research, 18*(4), 519–529. Retrieved from http://www.jstor.org/stable/2489263

Moser, S. & Mosler, H. J. (2008). Difference in influence patterns between groups predicting the adoption of a solar disinfection technology for drinking water in Bolivia. *Social Science & Medicine, 67*, 497–504. doi:10.1016/j.socscimed.2008.04.002

McKim, A. J., Forbush, M., & McKendree, B. (2018). Sustainable water management within agriculture, food, and natural resources education. *Journal of Agricultural Education, 59*(2), 166–178. doi:10.5032/jae.2018.02166

Moser, S. & Mosler, H. J. (2008). Difference in influence patterns between groups predicting the adoption of a solar disinfection technology for drinking water in Bolivia. *Social Science & Medicine, 67*, 497–504. doi:10.1016/j.socscimed.2008.04.002

Petty, R. E., Brinol, P., & Priester, J. R., (2009). Mass media attitude change: Implications of the elaboration likelihood model of persuasion. In J. Bryant, & M. B. Oliver (Eds.), *Media effects: Advances in theory and research* (pp. 125–164). New York: Routledge.

Petty, R. E. & Cacioppo, J. T. (1986). The elaboration likelihood model of persuasion. *Advances in experimental social psychology, 19,* 123–205. doi:10.1016/S0065-2601(08)60214-2

Petty, R. E., Cacioppo, J. T., & Goldman, R. (1981). Personal involvement as a determinant of argument-based persuasion. *Journal of Personality Strength and Social Psychology, 41*(5), 847–855. doi:10.1037/0022-3514.41.5.847

Petty, R. E., & Krosnick, J. A. (1995). *Attitude Strength: Antecedents and Consequences.* New York, NY: Psychology Press.

Rogers, E. M. (2003). *Diffusion of Innovations.* New York, NY: Free Press.

Rumble, J. N., Lamm, A. J., Martin, E. T., & Warner, L. A. (2017). Examining thought processes to understand the impact of water conservation messages on attitudes. *Journal of Agricultural Education, 58*(3), 137–162. doi:10.5032/jae.2017.03168

Shavitt, S., Swan, S., Lowery, T. M., & Wanke, M. (1994). The interaction of endorser attractiveness and involvement in persuasion depends on the goal that guides message processing. *Journal of Consumer Psychology, 3*(2), 137–162. doi:10.1016/S1057-7408(08)80002-2

Shober, A. L., Denny, G. C., & Broschat, T. K. (2010). Management of fertilizers and water for ornamental plants in urban landscapes: Current practices and impacts on water resources in Florida. *HortTechnology, 20*(1), 94–106. Retrieved from http://horttech.ashspublications.org/content/20/1/94.full

University of Georgia [UGA] Extension. (2018). Our landscape, our stream, our watershed: A multi-state advanced master gardener program addresses urban water issues. Retrieved from https://ugaurbanag.com/our-landscape-our-stream-our-watershed-a-multi-state-advanced-master-gardener-program-addresses-urban-water-issues/

Warner, L. A., Diaz, J. M., & Gusto, C. (2019). Exploring blue space as a tool for promoting good fertilizer practices among Florida residential fertilizer users. *Applied Environmental Education and Communication*. Advance online publication. doi:10.1080/1533015X.2019.1586597

Warner, L. A., Lamm, A. J., White, S. A., Fisher, P. R., & Beattie, P. N. (in press). A new perspective on adoption: Delivering water conservation extension programming to nursery and greenhouse growers. *Journal of Agricultural Education*.

Warner, L. A., Rumble, J., Martin, E., Lamm, A. & Cantrell, R. (2015). The effect of strategic message selection on residents' intent to conserve water in the landscape. *Journal of Agricultural Education, 56*(4), 59–74. doi:10.5032/jae.2015.04059