ASSOCIATION FOR COMMUNICATION EXCELLENCE

Journal of Applied Communications

Volume 98 | Issue 4 Article 5

The Critical Target Audience: Communicating Water Conservation Behaviors to Critical Thinking Styles

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Recommended Citation

Gorham, Laura M.; Lamm, Alexa J.; and Rumble, Joy N. (2014) "The Critical Target Audience: Communicating Water Conservation Behaviors to Critical Thinking Styles," *Journal of Applied Communications*: Vol. 98: Iss. 4. https://doi.org/10.4148/1051-0834.1092

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Keywords
Water conservation, behavior, critical thinking style, and communication

Research

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Laura M. Gorham, Alexa J. Lamm and Joy N. Rumble

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Introduction

Water is a crucial part of life, needed every day for human survival. The development of the human race has depended upon the use of clean water and societies' ability to create clean water (Watkins, 2006). Societies have been dependent upon natural resources, such as rivers, lakes, wetlands, and aquifers, to supply water to support cities, farms, and industries for centuries (Flint, 2004).

Although water may seem plentiful in the United States due to the vast number of lakes, rivers, and surrounding coastline, the majority of the available water supply is not fresh or fit for human consumption (Flint, 2004). Although water covers approximately 70% of the planet, only a fraction is fresh water (Adler, 2002). Of the fresh water available, less than three-tenths of the Earth's fresh water serves as a major source of water (Adler, 2002).

The amount of water to support life, in addition to the increased amount of water used in modern standards of living, continually has increased the demand for water globally. Additionally, the

Presented at the 2014 Association for Communication Excellence Research Conference in Portland, Oregon. Funding for this study was provided by the UF/IFAS Center for Public Issues Education.

amount of water available is being stressed by irrigation, industrial, and other residential demands (Bartlett, 1999; Flint, 2004). With a world population of more than 7 billion and an expected world population of more than 9 billion in 2050, it is crucial that individuals learn to conserve water or the amount of water available may not support the world population in the future (Reba et al., 2013; U.S. Census Bureau, 2013).

The demand for water in the United States has more than doubled since the 1950s (Flint, 2004), and water consumption is expected to increase by 50% in developed countries, including the United States, by 2025 (United Nations Environment Programme, 2007). It has also been found Americans use a large amount of water, more than most other countries (Hart, 2008). As concern rises due to shortages of this essential resource, the American public and agricultural stakeholders are realizing the need to engage in water conservation. To ensure water conservation behaviors are most effective, agricultural communicators can select a target audience and then appeal to that selected audience by understanding how they think and developing approaches that will influence individuals with specific characteristics, such as their critical thinking styles (Monaghan, Ott, Wilbur, Gouldthorpe, & Racevskis, 2013). By using this approach, communication messages and strategies can be catered directly to the particular target audience (Monaghan et al., 2013). Thus, the purpose of this study was to determine if critical thinking style can be used in the development of future communications strategies to improve water conservation behaviors.

Literature Review

Water Conservation

The practice of water conservation is a growing trend in many parts of the United States. With a growing population, excess water pollution, and extreme weather, Americans are experiencing a decline in the amount of water available for human consumption (Jorgensen, Graymore & O'Toole, 2009), and, therefore, are willing to take some action. Many bodies of water already are experiencing a decrease in the water level due to weather conditions, such as lack of rainfall, or over extraction of water (United Nations Environment Programme, 2007).

For example, the High Plains aquifer runs below 450,000 km^2 in the central United States and serves as a principal source of water for irrigation and drinking water (Konikow, 2013). High evaporation rates, low precipitation rates, and substantial pumping of water has resulted in large water table declines and ground-water depletion (Konikow, 2013). Additionally, issues affecting water availability in the Lower Mississippi Water Basin are related directly to the decline in the quantity of groundwater available. The decreases are caused by water withdrawal rates that are greater than recharge rates (Reba et al., 2013).

Due to the decline in water available nationally, water conservation practices must become common practice for residential water users as well as agricultural and water distributors or suppliers (Olmstead & Stevens, 2009). Throughout the literature, the public shows an understanding that water needs to be conserved and individuals must begin to play a central role in water conservation (Monaghan et al., 2013). However, although the recent research shows residents are willing to support water conservation practices, some are unwilling or unable to partake in water conservation habits or behaviors (Delorme, Hagan, & Stout, 2010; Lamm, 2013). To change these behaviors, agricultural communicators need to inform individuals and stakeholders on how they can engage in water conservation behaviors. Communicators suggested communicating conservation strategies such as employing best management practices, including installing water-efficient fixtures, avoiding watering or irrigating during drought periods or the summer, and minimizing shower durations

DOI: 10.4148/1051-0834.1092

(Theodori & Fox, 2009). Additionally, to provide individuals with information about water conservation practices, many government and private organizations are implementing water conservation programs. For example, the U.S. Environmental Protection Agency's partner program, Water Sense, provides resources for state agencies and residents to conserve and recycle water (Water Sense, 2013).

Willis, Stewart, Panuwatwanich, Williams, and Hollignsworth (2011) determined water conservation strategies are related to attitudes and behaviors of environmental issues, such as water issues. Those who valued water as an important issue indicated they took an interest in how much water was being used (Corral-Verdugo, Bechtel, & Faijo-Sing, 2003; Hassell & Cary, 2007). Thus, the previous literature suggested an individual's preconceived notions or perceived values about water would influence their water conservation practices (Corral-Verduge, Becthel & Faijo-Sign, 2003; Hassell & Cary, 2007; Willis et al., 2009;).

Monaghan et al. (2013) suggested Extension personnel use a social marketing approach when dealing with conservation and sustainability programming. Through the social marketing approach, an audience analysis revealed important differences in the target audience (Monaghan et al., 2013), emphasizing the importance of knowing your audience. Understanding the differences in the target audience was shown to be of assistance when Extensions agents were working to cater their programs toward a particular segment of the population (Monaghan et al., 2013). For example, previous research suggested residents residing in Home Owner's Association (HOA) communities tended to hire contractors and lawn maintenance companies to cut and irrigate their lawns and thus would not be interested in learning science-based information about landscaping such as mowing, fertilizing, and turf grass health (Monaghan et al., 2013). In this study, we examined how understanding the target audience could allow for informational messages to be catered toward the correct audience that then would influence behavioral change.

Critical Thinking

Previous literature has examined how the primary focus of water conservation education and programming has emphasized the cost-effectiveness of partaking in water conservation (Geller, Erickson & Buttram, 1983; Michelsen, McGuckin, & Stumpf, 1999). In addition, other research has examined how environmental conservation behaviors and actions are dependent upon how an individual values an issue (Dietz, Fitzgerald & Schwom, 2005).

While the previous examples of water conservation education and programming have used methods such as emphasizing cost effectiveness, catering to specific values an individual may hold, or even social marketing techniques to get individuals to engage in water conservation behaviors, other influences on decision making may impact an individual's level of engagement in water conservation behaviors. Cognitive styles, or an individual's preferred way to process, organize, and retain information (Keefe, 1979), may be one way to target messaging so individuals are more likely to engage in water conservation behaviors. Cognitive styles often are used to explain how individuals prefer to gain knowledge or find a solution to a problem and to describe a particular method individuals use to processes information (Glaser, 1941; Lamm et al., 2011; Lamm & Irani, 2011; Kirton, 2003).

The cognitive style of critical thinking explains how an individual prefers one particular method to another when processing information, or critically thinking about a particular topic. There is not a single definition of critical thinking, but rather, a range of definitions from simple to complex (Lamm & Irani, 2011). Glaser (1941) first defined critical thinking as the "(1) attitude of being disposed to consider in a thoughtful way the problems and subjects that come within the range of one's experiences, (2) knowledge of the methods of logical inquiry and reasoning, and (3) some skill

in applying those methods" (p. 5-6). In 1988, Chaffee defined critical thinking as "our active, purposeful, and organized efforts to make sense of our world by carefully examining our thinking, and the thinking of others, in order to clarify and improve our understanding" (p. 29). Halpern (1989) defined critical thinking as "thinking that is purposeful, reasoned and goal directed. It is the kind of thinking involved in solving problems, formulating inferences, calculating likelihood, and making decisions" (p. 5). Paul (2007) further defined critical thinking as the "art of analyzing and evaluating thinking with a view to improving it" (p. 4).

Paul (2007) discussed core skills of a critical thinker, showing the critical thinker will (1) raise clear questions and problems, (2) gather and analyze relevant information, (3) come to conclusions though reasoning and testing, (4) be open to different opinions, and (5) communicate effectively about key findings and solutions. Irani (2006) stated, "critical thinking, and especially the core skill of explanation, is directly related to communication and expression" (para. 4). Thus, individuals will express their thoughts about a specific issue through communication (Irani, 2006).

Communication directly relates to an individual's critical thinking style, as a specific critical thinking style will lead to a different viewpoint on a topic or issue (Irani, 2006). As individuals process certain situations, critical thinking allows individuals to explain "what they think and how they arrived at the judgment" (Facione, 1998, p. 5).

Critical thinking style represents the "way critical thinking is expressed, or performed, or done by an individual" (Lamm & Irani, 2011, p. 6). The University of Florida Critical Thinking Inventory (UFCTI) is an instrument that measures an individual's critical thinking style based on two constructs: seeking information and engagement (Lamm & Irani, 2011, p. 6). The UFCTI measures critical thinking style based on a specific score on an inventory; individuals exhibiting a high score are seekers and those exhibiting a low score are engagers.

Individuals possessing the seeking information style are "aware of their own predispositions and biases, recognizing current opinions and positions have been influenced by who he is, his environment, and experiences;" in addition, these individuals actively seek information through reading, research, and questioning (Lamm & Irani, 2011, p. 7). Individuals possessing an engagement style are aware of their environment and surroundings and often are found using reasoning to solve problems and make decisions. Often, engagers gain information through conversation and engagement in a conversation. Engagers then will use their reasoning abilities to arrive at a decision or communicate a solution to a problem (Lamm & Irani, 2011).

Seekers and engagers gather and process information in two different ways (Lamm & Irani, 2011). The seeker prefers to think critically about information they actively have sought out; whereas, the engager gains information from their environment, such as information gained through word-of-mouth communication, and then cognitively processes this information (Lamm & Irani, 2011).

Although previous literature has examined how individuals seek health information (Brodie, Kjellson, Hoff, & Parker, 1999; Cotton & Gupta, 2004), the same process can be used with water conservation behaviors. Broadly, it has been found individuals rely on traditional modes of communication, magazines, newspapers, television, and radio to name a few (Brodie et al., 1999). In addition, the Internet has provided a fast and convenient way for individuals to search and seek new information to help them in their daily lives (Cotton & Gupta, 2004). Due to the vast amount of information that can be found on the Internet, individuals have a tendency to seek sources of information from a variety of sources including websites and online newspapers (Cotton & Gupta, 2004).

Print media, static webpages, and other forms of one-way communication may be suitable for the seeker; however, the engager prefers to engage in conversation through two-way communication

DOI: 10.4148/1051-0834.1092

to think critically about a particular topic (Lamm & Irani, 2011). Social media has been considered the new or modern word-of-mouth as social media "describes a variety of new sources of online information that are created, initiated, circulated and used by consumers intent on educating each other about products, brands, services, personalities, and issues" (Blackshaw & Nazzaro, 2004, p. 4). Previous literature explains how word-of-mouth communication was observed during oral communication: in small groups, over back-yard fences and on the telephone (Blackshaw & Nazzaro, 2004). However, through the use of the Internet and the consumer-generated content in social media, the Internet has turned word-of-mouth behavior into content that can be seen by the masses (Blackshaw & Nazzaro, 2004). Similarly to media content designed and developed by practitioners and journalists in print materials, social media has become a major influence in consumer behavior (Mangold & Faulds, 2009). Through the various word-of-mouth forums, such as blogs, social media network sites, consumer email, forums, and email, social media has allowed for the creation of conversation on the web and, ultimately, an impact on "consumer awareness, information acquisition, opinions, attitudes, purchase behavior, and post purchase communication and evaluation" (Mangold & Faulds, 2009, p. 358). Communicators can use this information to tailor water conservation messages and message strategies to reach both critical thinking styles to change behavior more broadly (Monaghan et al., 2013).

Purpose and Objectives

The purpose of this study was to determine if critical thinking style can be used in the development of future communications strategies to improve water conservation behaviors. The following research objectives guided this study:

Objective 1. Describe respondents' critical thinking style.
Objective 2. Describe respondents' level of engagement in water conservation behaviors.
Objective 3. Identify the relationships between critical thinking style and levels of engagement in water conservation behaviors.

Methods

The study presented here was descriptive and correlational in nature. It used a web-based survey design to collect data on a variety of water-related topics from residents in the State of Florida. The study was limited to Florida residents because of the stressed importance of engagement in water conservation behaviors due to a rapidly declining water supply. The decrease in available water is largely due to the rapid population growth Florida has experienced over the past several decades (Delorme et al., 2010). While residents of Florida are becoming more aware of the need to conserve water, adoption rates for these practices are low (Lamm, 2013; Stanford, 1996; Syme, Nancarrow, & Seligman, 2000) and communicators may be able to target their intervention strategies by using residents' natural cognitive style. Therefore, the two sections of the survey instrument germane to the findings of this study were water conservation behaviors and critical thinking disposition score.

The water conservation behavior questions were adapted from the 2012 RBC Canadian Water Attitudes Study (Patterson, 2012). To measure respondents' engagement in water conservation behaviors, respondents were asked to indicate whether or not they had engaged in 11 water conservation behaviors. Four of the behaviors could be deemed as negative (e.g. letting sprinklers run when it is raining and hosing down their driveway) and the other seven could be deemed as positive (e.g. shutting the water off when brushing their teeth and limiting shower time to five minutes). If a re-

spondent indicated they engaged in a negative behavior, they received a score of zero for that item. If a respondent indicated they did not engage in the behavior, they were assigned one point. In addition, if a respondent indicated they engaged in a positive behavior they received a score of one for that item. If the respondent indicated they did not engage in the positive behavior, they received a score of zero for that item. Therefore, a respondent could receive a total water conservation score ranging from zero to 11, with an 11 indicating they engaged in all of the positive behaviors and did not engage in any of the negative behaviors and a zero indicating they did not engage in any of the positive behaviors and all of the negative behaviors.

To measure respondents' critical thinking score, the University of Florida Critical Thinking Inventory (UFCTI) was used (Lamm & Irani, 2011). The UFCTI is an instrument that measures critical thinking disposition on a continuum between engagement and seeking information. The UFCTI requires respondents indicate their level of agreement with 20 items on a five-point Likert-type scale that ranges from 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree, 5 = Strongly Agree. Each respondent was assigned a seeking information score based on their responses to 13 items that ranged from 13 to 65 and an engagement score based on their responses to 7 items that ranged from a 7 to 35. The raw engagement score then was altered by transposing each item result, summing the result, and then multiplying the summed score by 1.866 (Lamm & Irani, 2011). The altered engagement score then was added to the seeking information score to achieve the overall UFCTI score. Respondents receiving a score of 79 or higher were considered seekers while those with a 78 or lower were considered engagers (Lamm & Irani, 2011). Reliability was calculated a priori with the overall UFCTI resulting in a Cronbach's α of .95, the engager construct a Cronbach's α of .89, and the seeker construct a Cronbach's of .92.

A panel of experts with a background in water quality and quantity issues, public opinion research, and survey design were used to validate the survey instrument. The panel of experts included the director of the UF/IFAS Center for Public Issues Education, the director of the UF Water Institute, the director of the Center for Landscape Conservation and Ecology, and a professor with a specialty in survey design.

A sample of Florida residents, 18 years and older, were recruited through non-probability opt-in procedures. Non-probability sampling is commonly used as a sampling method for public opinion research and is regarded acceptable for population estimates (Baker et al., 2013). To overcome the limitations of non-probability sampling, including selection, exclusion, and non-participation biases (Baker et al., 2013), post-stratification weighting methods were used (Kalton & Flores-Cervantes, 2003). Through post-stratification weighting procedures, the respondents' demographics were balanced to ensure the sample was representative of the population. The demographics were weighted according to the 2010 census statistics for gender, race, ethnicity, age, and community size.

A total of 516 individuals were invited to take the survey by a public opinion research company. Complete and usable data were collected from 469 individuals, resulting in a 90.9% response rate. The data were analyzed with descriptive and correlational statistics using Statistical Package for the Social Sciences® 21.0. A significance level of $p \leq .05$ was established a priori.

To find a relationship between respondents' level of engagement in water conservation behaviors and critical thinking style scores, a correlation coefficient (r) was developed (Kotrlik, Williams, & Jaber, 2011). The correlation coefficient (r) measured the effect size between the two parameters of water conservation behaviors and critical thinking style scores. The correlation coefficients were interpreted using Davis' (1971) set of descriptions for correlation coefficients.

A complete description of the demographic breakdown of respondents can be found in Ta-

DOI: 10.4148/1051-0834.1092

ble 1. The respondents represented an equal distribution of gender with 240 (51.1%) females and 229 (48.9%) males. As for race, the respondents were primarily Caucasian/White (Non–Hispanic) (77.1%, n = 362), followed by African American (17%, n = 80). When asked about ethnicity, 22.5% (n = 106) of the respondents reported they were Hispanic. Over half of the respondents reported being between the ages of 20 and 59 (52.7%, n = 247) and the vast majority (96.3%) resided in a metropolitan area when their ZIP code was compared to the rural/urban continuum code system as a representation of community size (United States Department of Agriculture Economic Research Service, 2013).

Table 1
Demographics of Respondents

Characteristic	*n*	%
Sex		
Female	240	51.1
Male	229	48.9
Race		
African American	17	17.0
Asian	14	3.0
Caucasian/White (Non–Hispanic)	362	77.1
Native American	1	0.2
Hispanic Ethnicity	106	22.5
Age		
18 - 29	66	14.1
30 - 39	57	12.2
40 - 49	67	14.2
50 - 59	63	13.5
60 - 69	52	11.1
70 - 79	35	7.4
80 and older	23	4.9
Rural-Urban Continuum Code Classification		
1 million or more metropolitan area	296	63.1
250,000 to 1 million metropolitan area	121	25.7
Few than 250,000 metropolitan area	23	4.8
20,000 or more, non-metro area	16	3.5
2,500 to 19,999 non-metro area	12	2.6
<2,500 completely rural non-metro area	1	0.3
Political Affiliation		
Republican	113	24.3
Democrat	188	40.7
Independent	142	30.6
Other	20	4.3

Results

Objective 1: Describe respondents' critical thinking style.

Each respondent was assigned a UFCTI score between 26 and 130 based on their responses (see Table 2). A score of 79 or higher indicated the respondent was an information seeker, or an individual who tended to seek out information on their own and use reasoning to understand the information sought out. A respondent with a score of 78 or lower indicated the respondent preferred to engage in word of mouth communication and then critically think about the topic at hand and was considered an information engager. Respondents' overall critical thinking style scores ranged from 58 to 91 (M = 78.45, SD = 4.21). When construct scores were reviewed, the mean information seeking score was 52.50 with a standard deviation of 7.80 (f = 459). The mean engagement score was 25.80 with a standard deviation of 8.00 (f = 460).

Table 2

Respondents Critical Thinking Styles

Critical Thinking Style	*n*	*M*	*SD*
Overall UFCTI Score	451	78.5	4.2
Seeker Score	459	52.5	7.8
Engager Score	460	25.8	8.0

Objective 2: Describe respondents' level of engagement in water conservation behaviors.

Respondents were asked to respond to sets of specific positive and negative water conservation behavior statements by indicating whether or not they engaged in the particular behavior (see Table 3).

Table 3

Respondent Water Conservation Behavior

Behavior Items	*f*	%
Positive		
I turn off the water while brushing my teeth	307	65.4
I have low-flow shower heads installed in my home	247	52.6
I have water-efficient toilets installed in my home	243	51.8
I avoid watering my lawn in the summer	224	47.8
I shower no more than five minutes each time I bathe	184	39.2
I have low-water consuming plant materials in my yard	155	33.0
I use rain barrels to collect water for use in my garden/lawn	87	18.7
Negative		
I leave the water running in the kitchen when washing and/or rinsing dishes	276	59.5
I let my sprinklers run when rain is predicted in the forecast	109	23.8
I hose down my driveway	105	22.6
I let my sprinklers run when it has rained or it is raining	82	17.8

The results indicated that respondents were most likely to engage in positive water conservation behaviors that require minimal effort. More than 65% of the respondents turned off the water while

DOI: 10.4148/1051-0834.1092

brushing their teeth (f = 307, 65.4%). In addition, respondents indicated they used bathroom fixtures to conserve water as 52.6% of respondents reported having low-flow shower heads installed in their homes (f = 247), and 51.8% reported having water-efficient toilets installed in their homes (f = 243).

Positive water conservation items were each assigned a point for engagement and negative water conservation items were assigned a point for lack of engagement. The total water conservation scores, which could have ranged from zero to 11, had a mean score of 5.86 with a standard deviation of 2.23, indicating a moderate level of engagement in water conservation practices.

Objective 3: Identify the relationships between critical thinking style and levels of engagement in water conservation behaviors.

Upon examination of the results, the correlation between the respondents' level of engagement in water conservation behaviors and the respondents' seeker, engager, and overall critical thinking style scores were interpreted using Davis' (1971) description of correlational strengths (see Table 4). The overall UFCTI score was positively correlated with the respondents' level of engagement in water conservation behaviors (r = 0.11, p = .02). This result indicated the higher the UFCTI score (the stronger their tendency to seek information when thinking critically), the more the individual engaged in water conservation behaviors (see Figure 1).

Table 4

Relationship between water conservation and critical thinking style

	Water Conservation		
Critical Thinking Style	r	p	Interpretation of effect size (Davis, 1971)
Overall UFCTI Score	0.11	.02*	Low Association
Seeker	0.31	.00**	Moderate Association
Engager	-0.24	.00**	Low Association

Note. * p < .05; ** p < .01.

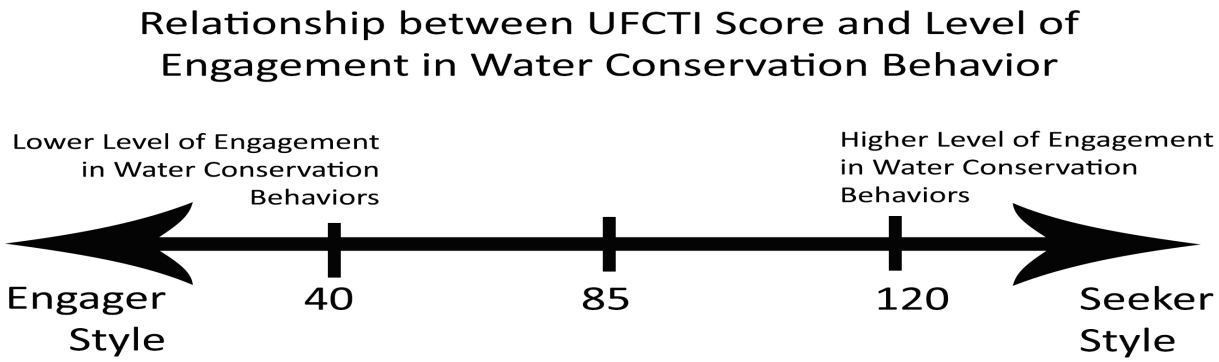

Figure 1. Relationship between UFCTI score and level of engagement in water conservation behavior

In addition, the seeking information score also was positively correlated with the level of engagement in water conservation behaviors ($r = 0.31, p < 0.01$) and was statistically significant. This result indicated the stronger tendency an individual had for seeking information, regardless of their interest in engagement when thinking critically, the higher their level of engagement in water conservation behaviors.

The critical thinking style of engagement had a negative correlation ($r = -0.24, p = .00$) with the level of engagement in water conservation behaviors. This result shows the more a respondent indicated they engaged when thinking critically, the lower the respondents' level of engagement in water conservation behavior.

Conclusions

This study identified Florida residents' level of engagement in water conservation behaviors. It also provides communicators with an indication of where further communication needs to be directed to improve water conservation behaviors. Although the majority of respondents indicated they are participating in some water conservation behaviors, such as turning off the faucet when brushing their teeth, installing low-flow shower heads, and installing water-efficient toilets, communication may be beneficial in the promotion of additional water conservation behaviors respondents were less likely to engage in, such as limiting shower times to less than five minutes, using low water consuming plant materials in their yards, and using rain barrels to collect water for use in their garden or lawn. This study supports Jorgensen, Graymore, and O'Toole's (2009) study that found residents are willing to partake in some actions to reduce the amount of water they use.

In addition to identifying the level of engagement of Florida residents in water conservation behaviors, this study determined the critical thinking styles of respondents. The overall critical thinking score determined approximately half of the respondents were information seekers and the other half of respondents were engagers. In addition, the results of the study indicated a relationship between an individual's critical thinking style and his or her level of engagement in water conservation behaviors. The results indicated the higher the respondents UFCTI score (the stronger their tendency to seek information when thinking critically), the more the individual engaged in water conservation behaviors. In addition, the result also indicated the more a respondent indicated they engaged when thinking critically the lower the respondents' level of engagement in water conservation behaviors. In this study, the correlations fell into the low to moderate association category according to Davis' (1971) convention. Frequently, in the social sciences, researchers are unable to find perfect relationships as they do in the physical sciences; however, relationships are observed (Steinberg, 2011). Other variables such as motivation or prior knowledge may come into play. Therefore, individuals who express an engager style may have the extreme motivation to participate in water conservation behaviors. Similarly, an individual who expresses a seeking behavior may not participate regularly in water conservation behaviors due to lack of conservation motivation. These findings support previous literature that stated seekers and engagers process information in two different ways (Lamm & Irani, 2011) and a specific critical thinking style will lead to a viewpoint on a topic or an issue (Irani, 2006). As found by the results in this study, a different critical thinking style will lead to a different level of engagement in water conservation behaviors.

Implications and Recommendations

This study was developed to address how an individual's critical thinking style could be used in the development of future communications strategies to improve water conservation behaviors. The

DOI: 10.4148/1051-0834.1092

study's findings provided evidence of a relationship between critical thinking style and the level of engagement in water conservation behaviors. Throughout the previous literature, it was found an audience analysis might reveal important differences in a target audience (Monaghan et al., 2013). Lamm and Irani (2011) stated informational seekers and engagers gather and process information in two different ways: seekers prefer to critically think about information they have actively sought out; engagers gain information from their environment. Communicators can use information about the audience, such as critical thinking styles, to tailor communication methods to each audience (Monaghan et al, 2013), further impacting potential behavior change.

The literature indicated information seekers prefer to gain information by seeking the sources themselves (Lamm & Irani, 2011). To acquire information, the public has relied on traditional forms of mass media (such as magazines, newspapers, advertisements, and radio) and Internet references to educate themselves on a particular topic (Brodie, Kjellson, Hoff, & Parker, 1999). Individuals use these types of media to search and seek new information on the topic of their choice (Cotton & Gupta, 2004). To satisfy the needs of the informational seeker, communicators should place information about water conservation in traditional forms of mass media as well as on the Internet. As the informational seekers find this information, they will begin to process the information and then think critically based on what they have found and how it fits into their previous notions about the topic (Lamm & Irani, 2011). The information seekers will judge the quality of the information they find and evaluate it before developing a behavioral change. Communicators should focus on developing quality information about water conservation and placing it in easily accessible communications channels for the informational seeker.

While the informational seeker prefers to seek their own information, a different communications approach should be taken with the engagers, who prefer to learn through their environment. Communicators should focus on communicating to the engager through the environment in word-of-mouth situations using traditional means such as opinion leaders and also through the use of social media. According to Blackshaw and Nazzaro (2004), social media has become the online form of word-of-mouth and has become an instrumental force in influencing an individual's behavior. The development of social media as a communications tool has become a realm where communicators can engage individuals in a conversation (Mangold & Faulds, 2009). In fact, communicators can use social media networks, consumer email, and forums to impact individual information gathering, opinions, and attitudes (Mangold & Faulds, 2009). Since individuals' possessing the engagement critical thinking style prefer to gather information from their environments (Lamm & Irani, 2011), communicators should use opinion leaders and social media as platforms to send water conservation information to individuals with the engager style.

Although barriers still will exist when using communications to influence a positive change in the level of water conservation behaviors, communicators should continue to apply different communications strategies to cater to different audiences. Further research should be conducted to solidify the link between critical thinking style and behavior. The study could be performed with a particular audience, such as high water users, to determine if the link still exists between critical thinking style and water conservation behaviors. As another example, a study could be conducted to determine if the link exists between critical thinking styles and other conservation behaviors. Since the recommendations for this study suggested using different message strategies for the seeker and the engager to communicate, a future study could test potential message strategies with both seekers and engagers to evaluate if the messages cause a behavioral change.

This study was specific to residents in the State of Florida and generalization beyond this population should be done with caution. Future studies should be conducted to determine the relationship between critical thinking styles and level of engagement in water conservation behaviors in other states or in a national scale to allow for a greater generalization of the results.

References

Adler, R. W. (2007). Freshwater. In J. C. Dernbach (Ed.)., *Stumbling Toward Sustainability* (197-225). Washington D.C.: Environmental Law Institute.

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

Bartlett, A. A. (1999). Colorado's population problem. *Population Press, 5*(6): 8-9

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.nielsen-online.com/downloads/us/buzz/nbzm_wp_CGM101.pdf

Brodie, M., Kjellson, N., Hoff, T., & Parker, M. (1999). Perceptions of Latinos, African Americans, and Whites on media as a health information source. *The Howard Journal of Communication, 10,* 147-167.

Chaffee, J. (1988). *Thinking critically.* Boston, MA, Houghton Mifflin.

Corral-Vedugo, R. Bechtel, B., & Fraijo-Sing, B. (2003). Environmental beliefs and water conservation: An empirical study. *Environmental Psychology, 23*(3), 247-257.

Cotton, S. R., & Gupta, S. S. (2004). Characteristics of online and offline health information seekers and factors that discriminate between them. *Social Science and Medicine, 59*(9), 1795-1806.

Davis, J. A. (1971). *Elementary survey analysis*. Englewood Cliffs, NJ: Prentice-Hall.

Delorme, D. E., Hagen, S. C., & Stout, I. J. (2010). Consumers' perspectives on water issues: Directions for educational campaigns. *The Journal of Environmental Education, 34*(2), 28-35. doi: 10.1080/00958960309603497

Dietz, T., Fitzgerald, A., & Shwom, R. (2005). Environmental values. *Annual Review of Environment and Resources,* 30: 335-372.

Facione, P. A. (1998). *Critical thinking: What it is and why it counts*. The California Academic Press: Millbrae, CA.

Flint, W. R. (2004). The sustainable development of water resources. *Journal of Contemporary Water Research and Education, 127*(1), 6. Retrieved from http://www.eeeee.net/sd_water_resources.pdf

Geller, E. S., Erickson, J. B., & Buttram, B. A. (1983). Attempts to promote residential water conservation with educational, behavior and engineering strategies. *Population and Environment, 6*(2), 96-112. Retrieved from http://link.springer.com/article/10.1007/BF01362290#page-1

Glaser, E. (1941). *An experiment in the development of critical thinking.* New York: J. J. Little and Ives.

Halpern, D. F. (1996). *Thought and knowledge: An introduction to critical thinking.* Mahwah, NJ: Lawrence Erlbaum Associates, Publishers.

Hart, S. L. (2008). Beyond greening: Strategies for a sustainable world. In M. V. Russo (Ed.), *Environmental management: Reading and cases (*2nd ed.). Los Angeles: Sage.

Hassel, T., & Cary, J. (2007). *Promoting behavioral change in household water consumption: Literature*

DOI: 10.4148/1051-0834.1092

Review. Retrieved from Smart Water Website: http://www.vu.edu.au/sites/default/files/Promoting%20behavioural%20Change%20in%20Household%20Water%20Consumption.pdf

Irani, T. (2006). Teaching the critical thinking skill of explanation. *Agricultural Education Magazine, 78*(6), 21-22.

Jorgenson, B., Graymore, M., & O'Toole, K. (2009). Household water use behavior: An integrated model. *Journal of Environmental Management, 91*(1), 227-236. Retrieved from http://www.sciencedirect.com/science/article/pii/S0301479709002850

Kalton, G. & Flores-Cervantes, I. (2003). Weighting methods. *Journal of Official Statistics, 19(*2), 81-97.

Keefe, J. W. (1979). Learning style: An overview. In NASSP's student learning styles, Diagnosing and prescribing programs (pp. 1-17). Reston, VA: National Association of Secondary School Principals.

Kirton, M. J. (2003). *Adaption-innovation: In the context of diversity and change*. New York, NY: Routledge.

Konikow, L.F. (2013). Groundwater depletion in the United States (1900–2008*). U.S. Geological Survey* (Scientific Investigations Report 2013–5079). Retrieved from http://pubs.usgs.gov/sir/2013/5079.

Kotrlik, J. W., Williams, H. A., & Jabor, M. K. (2011). Reporting and interpreting effect size in quantitative agricultural education research. *Journal of Agricultural Education, 52*(1), 132-142. doi:10.5032/jae.2011.01132+

Lamm, A. J. (2013). *Public opinions of water in Florida.* PIE2012/13-06B1. Gainesville, FL: University of Florida/IFAS Center for Public Issues Education.

Lamm, A. J., Irani, T. A., Rhoades, E. B., Roberts, T. G., Brendenmuhl, J., & Snyder, L. J. U. (2011). Utilizing natural cognitive tendencies to enhance agricultural education programs. *Journal of Agricultural Education*, *52*(2), 12+. Retrieved from http://go.galegroup.com/ps/i.do?id=GALE%7CA276808952&v=2.1&u=gain40375&it=r&p=AONE&sw=w&asid=43bd72c71a221406704798e43c7ed1cc

Lamm, A. J., & Irani, T. (2011). *UFCTI manual.* Gainesville, FL: University of Florida.

Mangold, G. W., & Faulds, D. J. (2009). Social media: The new hybrid element of the promotional mix. *Business Horizons, 52*(4), 357-365. Retrieved from http://www.sciencedirect.com/science/article/pii/S0007681309000329

Michelsen, A. M., McGuckin, J. T., & Stumpf, D. (1999). Nonprice water conservation programs as a demand management tool. *Journal of the American Water Resources Association, 35*(3), 593-602. Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/j.1752-1688.1999.tb03615.x/abstract

Monaghan, P., Ott, E., Wilber, W., Gouldthorpe, J., & Racevskis, L. (2013). Defining audience segments for extension programming using reported water conservation practices. *Journal of Extension, 51*(6), 6FEA8. Retrieved from http://www.joe.org/joe/2013december/a8.php

Olmstead, S. M., & Stavins, R. N. (2009). Comparing price and non-price approaches to urban water conservation. *Water Resources Research, 45*(4), W04301.

Patterson, L. (2012). *2012 RBC Canadian water attitudes study*. RBC Blue Water Project. Retrieved from http://www.rbc.com/community-sustainability/environment/rbc-blue-water/index.html

Paul, R., & Elder, L. (2006). *The miniature guide to critical thinking: Concepts and tools.* Retrieved

from http://books.google.com/books?id=lrdOjmb22HkC&printsec=copyright#v=onepage&q&f=false

Reba, M. L., Daniels, M., Chen, Y., Sharpley, A., Bouldin, J., Teague, T. G., ... & Henry, C. G. (2013). A statewide network for monitoring agricultural water quality and water quantity in Arkansas. *Journal of Soil and Water Conservation*, *68*(2), 45A-49A.

Stanford, M. J. (1996). What do customers want? *American Water Works Association. Journal, 88*(3), 26. Retrieved from http://search.proquest.com/docview/221537767?accountid=10920

Steinberg, W. J. (2011). *Statistics Alive!* (2nd ed.). Thousand Oaks, CA: SAGE

Syme, G. J., Nancarrow, B. E., & Seligman, C. (2000). The evaluation of information campaigns to promote voluntary household water conservation. *Evaluation Review, 24*(6), 539-578. doi: 10.1177/0193841X0002400601

Theodori, G. L., & Fox, W. E. (2009*). Attitudes and behaviors on water conservation in Texas.* TWDB Contract No. 0704830767. Texas: Texas Water Development Board.

United States Census Bureau. (2013). *State facts for students.* Retrieved from http://www.census.gov/schools/facts/united_states.html

United States Department of Agriculture Economic Research Service. (2013). *Rural-Urban Continuum Codes.* Retrieved from http://www.ers.usda.gov/data-products/rural-urban-continuum-codes.aspx#.UuPFaGQo4fE

Water sense. (2013). *Environmental Protection Agency.* Retrieved from http://www.epa.gov/WaterSense/about_us/index.html

Watkins, K. (2009). Human development report 2006: Beyond scarcity: Power, poverty, and the global water crisis. *United Nations Development Programme.* Retrieved from http://dspace.cigilibrary.org/jspui/handle/123456789/20135

Willis, R. M., Stewart, R. A., Panuwatwanich, K., Williams, P. R., & Hollingsworth, A. L. (2011). Quantifying the influence of environmental and water conservation attitudes on household end use water consumption. *Journal of Environmental Management*, *92*(8), 1996-2009.

United Nations Environment Programme in 2007. (2007). Global environment outlook: GEO4: Environment for development. *United Nations Environment Programme.*. Retrieved from http://www.unep.org/geo/GEO4/report/GEO-4_Report_Full_en.pdf

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