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Abstract

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Keywords

Water Quality, Public Awareness, Experience

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Abstract

Water is an essential resource for human activities and the global ecosystem. However, issues related to water quality have been reported internationally for quite some time with little to no action taken by the public to alter practices to ensure a future sustainable water supply. International extension educators have taken a role in educating about water quality but issues continue to exist. In order to understand current public perceptions of water quality issues and the influence of extension programming, an online survey was conducted in Florida, a part of the U.S. where water is readily accessible but water quality issues are pervasive, leading to a disconnect between what the public thinks about water and the realities of the water scarcity situation. Individuals' experiences with water quality issues, participation in extension programs, perceptions on water quality, and the importance of clean water were collected and the relationships were examined. The findings indicated respondents who had experienced water quality issues perceived water quality was getting worse and that clean water was important. However, the respondents who had participated in extension programs perceived water quality was getting better, but their perceptions of the importance of clean water were inconsistent based upon their extension programming engagement. Recommendations provide insight into how international extension educators can enhance public awareness of water quality issues globally through programming designed to drive behavior changes that will result in enhanced water quality around the world.

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Introduction

Water is essential to maintaining the global ecosystem and supporting human life and activities. A growing global population is increasing water demands, raising the number of activities that require water, and even leading to global climate change (Friedman, 2011; Vörösmarty, Green, Salisbury, & Lammers, 2000). Water is needed for agricultural production, industry, recreation, public use, and transportation. All of these activities are increasing pressure on this precious commodity and creating water issues (Levy & Sidel, 2011; Oki & Kanae, 2006).

Water related issues have been reported internationally including water pollution and contamination, water scarcity, degradation of water quality, waterlogging, and increased water salinity levels due to increasing populations and associated demand, climate change, and mismanagement of land use (Friedman, 2011). In certain areas of developing countries, safe drinking water was even limited due to mishandling of household water consumption leading to illness (Hartstone, Knight, & Riley, 2006).

Water issues have been discussed on a global level for quite some time. In 1992, conversations around the development of a global coalition to solve the world's water problems began at The International Conference on Water and the Environment held in Dublin, Ireland where contemporary water issues and recommendations for actions in order to mitigate existing problems and sustain global water resources were discussed (International Conference on Water and the Environment, 1992). Since then, global conversations around water have continued, including the United Nations working diligently to make the public more aware of water issues. Around the world, international extension educators have played an important role in enhancing public awareness of water issues and educating various groups about the need to conserve water (Swanson & Rajalahti, 2010; Young & Dhanda, 2013) and the use of water regulations to control water use and protect water quality has increased.

Water is regulated by national environmental protection agencies in many countries (The World Bank, 2014). In the U.S., water regulations designed to address quality and quantity issues, started as early as 1948 when the U.S. government started regulating water quality control by passing the Water Pollution Control Act. The U.S. government took further action by enacting the Clean Water Act in 1972 (Environmental Protection Agency, 2012). Drinking water quality was then protected by the Safe Drinking Water Act passed in 1974 (Environmental Protection Agency, 2012). In terms of agriculture, water quality has been managed in the U.S. by regulations and management of fertilizer use, sediment, waste, and pathogens through the cooperation of eligible farmers and ranchers with their local agencies (U.S. Department of Agriculture, 2014). While the U.S. government and policy makers have noticed the increased need for water quality management, public awareness is falling behind and further education is needed to change the public's behavior around water quality issues (Stave, 2003; Young & Dhanda, 2013).

Increased awareness of environmental issues are known to impact public perceptions, attitudes, and behaviors. Tunstall (2000) found public awareness of environmental issues was an important step in influencing subsequent decision-making in a study related to coastal and estuary protection. However, Rahman (2003) found that while awareness can be formed by visible environmental issues, it is more difficult to form awareness around invisible threats. For example, it is difficult for the

public to understand they may run out of water when it is available every time they go to their sink. Despite this challenge, studies have shown public awareness can be enhanced by educational initiatives, including extension educational programs (Escalada & Heong, 1993; Radhakrishna, Leite, & Hill, 2003; Rahman, 2003; Singletary & Daniels, 2004; Swanson & Rajalahti, 2010). Therefore, the opportunity for international extension educators to increase public awareness of water quality issues globally exists, but there may be a need to focus on making threats more visible in an effort for people to feel water issues are personally relevant. Participation in water-focused international extension programs can lead to positive perceptions, such as improved competency in practices individuals can apply leading to improved environmental sustainability (Heaton, Barnhill, & Hill, 2012; Kanté, Edwards, & Blackwell, 2013). By more fully understanding public perception of water quality issues and how engagement with extension programming influences public perceptions, and consequent behavior, recommendations for future programming can be offered.

Theoretical Framework

The theoretical framework for this study was the theory of cognitive dissonance (Festinger, 1957). The theory of cognitive dissonance addresses inconsistencies between an individual's experience and cognition. Herein, cognition is defined as "any knowledge, opinion, or belief about the environment, about oneself, or about one's behavior" (Festinger, 1957, p. 3). In the context of conflict between one's experience and cognition, an unpleasant feeling can influence behavior through the need to reduce the inconsistency and increase the consistency of what has been experienced with what is known. Stone, Singletary, and Richmond (1999) described the suggestions of this theory by stating, "dissonance is psychologically uncomfortable enough to motivate people to achieve consonance, and in a state of dissonance, people will avoid information and situations that might increase the dissonance" (p. 183). According to the theory, a motivation of change from a dissonance situation to a consonance situation would be generated under the unfavorable context with inconsistence (Festinger, 1957).

Research on public perceptions of water related issues has been connected to the theory of cognitive dissonance for quite some time. Dickerson, Thibodeau, Aronson, and Miller (1992) conducted a psychological experiment on water conservation behavior and provided the recommendation to use "cognitive dissonance as means of changing behavior in applied settings, especially those in which people already support the desired goal, but their behavior is not consistent with those beliefs" (p. 841). In another study investigating beach users' perceptions and behaviors as indicators for beach welfare measures, cognitive dissonance was used to find that beach users with children tended to present more care for water quality and were more willing to engage in water conservation activities due to their relatively higher level of frequency of beach use when compared to beach users without children (Hilger & Hanemann, 2008). In addition, Arcury and Christianson (1990) found people in a certain location, who had experienced environmental issues, and people facing critical environmental events, used their shared experiences to generate a social paradigm towards their concern about the environment. These findings were supported by Fielding, Spinks, Russell, McCrea, Stewart, and Gardner's (2013) results when they found individuals' experiences with severe drought led to the formation of a norm around water

conservation in their community.

Escalada and Heong (1993) also found that awareness of issues and perceptions of importance can be formed or altered by participating in educational programs. Participants of international extension programs have been found to obtain knowledge, awareness, and even skills according to the program topics, and their willingness of involvement in problem solving has also been found to increase (Singletary & Daniels, 2004; Vommi, LaVergne, & Gartin, 2013). Therefore, it is expected dissonance will be minimized through extension education programs that increase participants' knowledge and awareness of water quality issues, leading to changes in attitudes and behaviors towards the issue (Shaw, Hazel, Bardon, & Jayaratne, 2012).

Purpose and Objectives

The purpose of this study was to identify how water quality experiences and participation in extension programs related to perceptions of water quality issues in order to provide guidance for international extension educators to facilitate extension programming. The objectives sought to describe the (a) respondents' place of residence, experiences with water quality issues, and participation in extension programs; (b) respondents' perceptions of water quality and the importance of clean water; and (c) the relationships between respondents' place of residence, experiences with water quality issues, participation in extension programs, and perceptions on the importance of clean water.

Methods

This study was descriptive and correlational using a web-based survey design to collect place of residence, associated level of importance of clean water, previous experiences with water quality issues, perceptions of water quality, and level of participation in extension programs from Florida residents. Florida residents were chosen because of the geographical location and characteristics of the state, issues with water quality in the Florida water supply, and the stressed importance of clean water. Rapid population growth in Florida over the past several decades has negatively impacted the quality of water available for consumption, recreation, natural resource sustainability, and agricultural enterprise (Odera, Lamm, Dukes, Irani, & Carter, 2013). While the need to ensure a clean water supply has recently become more apparent to Florida residents, behaviors associated with ensuring a future quality water supply have not been rapidly adopted (Syme, Nancarrow, & Seligman, 2000). Therefore, the two sections of the survey instrument germane to the findings of this study were respondents' place of residence within the state, personal experiences with water quality issues, their previous participation in extension programs, perceptions on the importance of clean water, and associated level of importance of clean water.

To determine place of residence, respondents were asked their postal code. They were then identified as either directly on the coastline or inland and marked as one or the other classification with a binomial variable. Since the location of the study was in a state surrounded by water on three sides, living on a coastline was expected to directly impact the respondents' experiences with water issues and therefore was included as a germane part of this study.

Respondents were then asked to indicate whether or not they had experienced five water quality issues within the past year. Respondents were assigned a point for each issue they indicated they had experienced. The points were summed to create an overall experience with water

quality issues index that could range from zero to five.

Respondents were also asked to indicate whether they had participated in five specific statewide extension programs addressing water quality issues in certain part of the programs. Respondents were assigned a point for each program they indicated having participated. The points were summed to create an overall participation in Extension programs index score that could range from zero to five.

Respondents' perceptions on water quality were collected using a researcher-developed scale where respondents were asked to indicate how they perceived the water quality has changed in seven different water bodies on a scale of -1 = *Better*, 0 = *No Change*, 1 = *Worse*. Respondents were allowed to indicate they were unsure and were not assigned a value if they responded in this manner. The overall index score for perceptions of water quality was calculated by averaging the responses to the seven water bodies. The range of the overall index score could range from a negative one to a positive one. Reliability for the overall water quality perception index was calculated *a priori* with the result in a Cronbach's α of .94.

Respondents' associated level of importance of clean water was captured through a researcher-developed scale requesting respondents indicate the level of importance they associated with a list of nine items on a five point Likert-type scale with 1 = *Not at All Important*, 2 = *Slightly Important*, 3 = *Fairly Important*, 4 = *Highly Important*, 5 = *Extremely Important.* The responses to the nine items were averaged to create an overall importance of clean water index score ranging from one to five. Reliability was calculated *a priori* for the overall clean water index resulting in a Cronbach's α of .85.

A panel of experts with a background in water quality issues, public opinion research, and survey design validated the survey. 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 UF/IFAS Center for Landscape Conservation and Ecology, and a professor with a focus on survey design.

A purposive sampling was obtained by using non-probability sampling with opt-in procedures. The researchers collaborated with a public opinion research company to recruit a sample of Florida residents who were 18 years and older. Post-stratification weighting methods were used (Kalton & Flores-Cervantes, 2003) to overcome the limitations of non-probability sampling. Limitations may include non-participation biases, selection, and exclusion (Baker et al., 2013). Post-stratification weighting procedures ensured respondents' demographic characteristics were balanced so the sample was representative of the population. In this case, specific demographic variables including gender, race, ethnicity, age, and community size were weighted according to the 2010 census statistics.

Five hundred and sixteen individuals were invited to participate in the study. Responses that were complete and useable were collected from 469 individuals resulting in a 90.9% participation rate. Descriptive and correlational statistics using SPSS ® 21.0 were run to achieve the objectives of the study.

Complete demographics of the respondents can be viewed in Table 1. Gender was equally distributed with 240 (51.1%) of the respondents indicating they were female and 229 (48.9%) male. The largest group of respondents was Caucasian/White (Non–Hispanic) (77.1%, *n* = 362), followed by African American (17%, *n* = 80). Ethnicity was broken out

separately with 22.5% (n = 106) of the respondents indicating they were Hispanic. Lastly, 26.3% of the respondents were less than 39 years of age, 27.7% between 40 and 59, and 23.4% reported being 60 years of age or older.

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

Results

Place of Residence, Experience with Water Quality Issues and Participation in Extension Programs

The results from the survey indicated 11.5% of the respondents lived directly on the coastline, while 88.5% lived inland. The issue experienced most often by the respondents was poor home drinking water, and the issue experienced the least was algae blooms at closed springs, rivers, or lakes (see Table 2). When asked about participation in extension programs (see Table 3), the Florida Friendly Landscaping™ Program was the extension program with the highest participation rate, and the Master Beekeeper Program and the Entomology and Nematology Online Resources had the lowest participation rates.

Table 2

Respondents' Experience with Water Quality Issues

Water Quality Issues	*f*	%
Poor quality of home drinking water	103	22.0
Poor water quality at closed beaches	94	20.1
Prohibition on eating caught fish	51	10.8
Low water levels at closed springs, rivers, or lakes	49	10.4
Algae blooms at closed springs, rivers, or lakes	39	8.3

Table 3

Respondents' Participation in Extension Programs

Extension Programs	*f*	%
Florida Friendly Landscaping™ Program	80	17.0
Online Resource Guide for Shellfish Aquaculture	39	8.3
Master Gardener Program	26	5.5
Master Beekeeper Program	12	2.5
Entomology and Nematology Online Resources	12	2.5

Perceptions on Water Quality and the Importance of Clean Water

When asked about their perceptions on water quality in various water bodies, most respondents indicated they believed there was no change in the water quality in lakes, estuaries, rivers, groundwater, springs, and oceans (see Table 4). However, the largest number of respondents felt the water quality in bays was getting worse. The overall score averaged over the seven water bodies was -.15 (*SD* = .61).

Table 4

Respondents' Perceptions of Water Quality Change Associated with Different Water Bodies

	Perceptions of Water Quality (%)					
Water Bodies	Better	No Change	Worse	Unsure	*M*	*SD*
Springs	17.9	42.7	18.9	20.6	-0.01	0.68
Rivers	15.1	35.5	31.7	17.2	-0.20	0.73
Oceans	14.6	35.0	33.9	16.5	-0.23	0.73
Bays	13.4	32.6	34.4	19.2	-0.26	0.73
Groundwater	13.1	37.2	29.1	20.4	-0.20	0.70
Lakes	11.9	36.6	32.8	17.5	-0.26	0.70
Estuaries	10.8	37.4	25.0	26.8	-0.19	0.67

Note. Scale: 1 = *Better*, 0 = *No Change*, -1 = *Worse.*

When asked about the importance of water quality on a five point Likert-type scale (1 = *Not at All Important*, 2 = *Slightly Important*, 3 = *Fairly Important*, 4 = *Highly Important*, 5 = *Extremely Important*), respondents indicated they considered clean

water to be extremely important across all the descriptive items (see Table 5). Respondents perceived clean drinking water, clean lakes, rivers, and springs, clean beaches, clean groundwater, and clean oceans as extremely important. However, hypoxia in the Gulf of Mexico was only considered fairly important. The overall perceptions of the importance of clean water index score was 4.54 (*SD* = .61).

Table 5

Respondents' Perceptions of the Importance of Clean Water Associated with the Description Items

Description Items	Perceptions of the Importance of Clean Water (%)						
	1	2	3	4	5	*M*	*SD*
Clean drinking water	0.2	1.2	4.0	11.0	82.4	4.76	0.60
Clean lakes, rivers, and springs	0.2	0.9	8.8	24.9	64.0	4.53	0.71
Clean beaches	0.8	1.8	6.0	25.1	65.4	4.54	0.76
Clean groundwater	1.4	1.1	7.8	22.5	65.8	4.52	0.81
Clean oceans	0.4	1.4	7.7	28.1	61.3	4.50	0.73
Clean bays and estuaries	0.5	1.6	7.5	28.4	60.7	4.49	0.75
Clean water for shellfishing	0.9	3.1	9.8	26.0	58.2	4.40	0.86
Saltwater intrusion	2.7	7.1	14.7	18.2	35.0	3.98	1.15
Hypoxia in the Gulf of Mexico	16.3	21.1	23.5	17.5	21.6	3.07	1.38

Note. Scale: 1 = *Not at All Important*, 2 = *Slightly Important*, 3 = *Fairly Important*, 4 = *Highly Important*, 5 = *Extremely Important*.

Relationships between Variables of Interest

The relationships between the variables of interest were described using Davis' (1971) convention with .01 ≥ *R* ≥ .09 = *Negligible*, .10 ≥ *R* ≥ .29 = *Low*, .30 ≥ *R* ≥ .49 = *Moderate*, .50 ≥ *R* ≥ .69 = *Substantial*, *R* ≥ .70 = *Very Strong*. Respondents living on the coast showed negligible relationships with both their perceptions of water quality (*r* = -.08) and with their perceptions of the importance of clean water (*r* = .01). Correlations between experiences with water quality issues and perceptions of water quality, and the importance of clean water were examined by using the listwise score averaged over the water bodies and clean water items (see Table 6). Respondents who experienced poor home drinking water had a low negative correlation with their perceptions of water quality which means they were more likely to believe water quality was getting worse (*r* = -.18). In addition, the more respondents had experienced poor home drinking water the more important clean water was an important issue to them, although the magnitude of this correlation was also low (*r* = .12).

Table 6

Relationships between Experiences with Water Quality Issues, Perceptions of Water Quality, and the Importance of Clean Water

Poor Water Quality Experience	Perceptions of Water Quality *r*	Importance of Clean Water *r*
Poor quality of home drinking water	-0.18	0.12
Poor water quality at closed beaches	-0.10	0.07
Prohibition on eating caught fish	-0.11	0.02
Algae blooms at closed springs, rivers, or lakes	-0.05	0.07
Low water levels at closed springs, rivers, or lakes	0.04	0.02

Relationships were also examined between participation in extension programs and perceptions of the importance of clean water (see Table 7). Respondents who had attended the Master Gardener Program, Master Beekeeper Program, or Florida Friendly Landscaping™ Program, were more likely to believe water quality was getting better. However, a low negative correlation between the belief that clean water was important and participation in the Master Gardener Program was found.

Table 7

Relationships between Experiences with Extension Programs and Perceptions of Water Quality, and the Importance of Clean Water

Extension Program Experience	Perceptions of Water Quality *r*	Importance of Clean Water *r*
Master Gardener Program	0.19	-0.11
Master Beekeeper Program	0.15	-0.08
Florida Friendly Landscaping™ Program	0.14	0.04
Online Resource Guide for Shellfish Aquaculture	0.11	-0.05
Entomology and Nematology Online Resources	0.04	-0.09

Conclusion

The findings of this study described the relationships between place of residence, experiences with poor water quality and participation in extension programs, and their perceptions of water quality issues and importance of clean water. Given the population of interest used in this study was residents in the state of Florida, the results cannot be generalized beyond this population, however, the results do provide insight into the influence of experience on perceptions.

In this study, the findings did not show an association between place of residence and people's perceptions of water quality issues and importance of clean water. Meaning those living on the coastline,

and most often confronted with water quality issues, did not perceive water quality issues differently from those living inland, nor did they perceive that clean water was more important than those with less exposure. This is contrary to the findings from Brody, Zahran, Vedlitz, and Grover's (2008) study which indicated residential area was associated with people's perceptions of an environmental issue.

Overall, poor drinking water quality was the issue most respondents had experienced, and clean drinking water was considered extremely important with the highest score across all items in the survey. Respondents who had experienced poor home drinking water quality also perceived water quality was getting worse and clean water was an important issue. This finding supports de França Doria's (2010) findings that indicating people's perceptions of water quality were associated with their experiences with poor water quality. One difference was that in this study, the water quality issues listed in the survey were all visible issues but with different reachability and accessibility depending upon the activities individuals participated in related to water. This is similar to the findings from Rahman (2003) indicating that visible environmental issues can affect the level of awareness an individual has of environmental issues. Therefore, people's negative perceptions of water quality and positive perceptions of the importance of clean water can be described by their experiences with visible water quality issues.

When investigating the impact of participation in extension programming, the participation rates were not very high, indicating extension programs listed in this study are only reaching a small portion of the public in Florida. While low-level relationships were discovered, the findings indicated there is the possibility that participation in extension programs can positively influence perceptions of water quality. These findings are similar to other studies that have shown the positive effects of participation in extension programs on perceptions of environmental issues (Escalada & Heong, 1993; Singletary & Daniels, 2004; Vommi et al., 2013). However, the difference between this study, and the studies by Singletary and Daniels (2004) and by Vommi et al. (2013) was in the purposes of the extension programs studied. The listed extension programs in this research were well-recognized statewide programs that incorporated water quality discussions in the programming but are not directly focused on water quality issues. Instead, the extension programs identified in previous studies were directly associated with the environmental issues they studied, which may explain the low level relationships found in this study. For example, Vommi et al. (2013) studied the pest management practices farmers used in association with an extension program on integrated pest management. The extension programs participants attended in Singletary and Daniels' study (2004) were for the water conflict issues currently occurring in California and Nevada. Contrarily, for residents who had participated in the Master Gardener Program, the result revealed they did not consider clean water as an important issue in a low magnitude. This is contradictory to Vommi et al. (2013) that found participation in education programs develop perceptions of importance around an issue.

The findings from this study can be tied back to the theoretical framework of the theory of cognitive dissonance (Festinger, 1957) and the relationship between experience and cognition. In this study, the experience included respondents' experiences with poor water quality issue and extension program participation, with

the cognition including respondents' perceptions of water quality and the importance of clean water. Cognitive dissonance was found within respondents who had experienced poor quality in their home drinking water, closed beaches and prohibitions on eating caught fish and their cognitive thoughts about water quality getting worse and their associated importance with clean water. However, respondents' experiences with extension program participation did not reduce the dissonance between experiences and perceptions as expected. Respondents who participated in the Master Gardener Program, Master Beekeeper Program, or Florida Friendly Landscaping™ Program perceived water quality was getting better; and those who participated in the Master Gardener Program did not consider clean water as an important issue.

Implications

The area of the world examined in this study offers abundant water resources and its residents are active users of water, therefore the variation in attitudes and perceptions related to experiences with water could be enhanced when compared to areas where water is less abundant and should be recognized as a limitation. However, because of the chosen location, the findings can be used with caution as a foundation for the development of extension programs in other parts of the world, especially those that are similar in nature such as island countries.

This research shed light on how personal experiences with water quality issues reduces cognitive dissonance within target audiences. This finding implies that emphasizing personal relevance of water issues within extension programs could activate interest in water protection, ultimately leading to behavior change. Poor quality of home drinking water was the water quality issue experienced most often by respondents. In addition, clean drinking water was identified as the most important water issue examined. When comparing the characteristics of home drinking water to the other water quality issues provided, home drinking water can be characterized with the highest reachability and accessibility because it is something used every day around the world. In addition, home drinking water is associated with human water intake that may be related to human health. These findings imply that people are aware of issues that are more closely related to their daily life and health than issues less directly applicable.

When the relationships between water quality issues, perceptions of water quality and the importance of clean water were examined, the findings indicated perceptions of water quality can be negatively influenced by experiences with poor water quality issues. Brody et al. (2008) found negative experiences with environmental issues could influence perceptions on these issues, supporting this finding. Moreover, it also implies people who have experienced poor water quality issues may be willing to take action when it comes to learning and engaging in water quality programs and activities (Festinger, 1957).

Respondents who had participated in extension programs indicated their perceptions on water quality were positively influenced at a low level. The similarity of this finding and previous research by Singletary and Daniels (2004) and by Vommi et al. (2013) implies that participation in extension programs may influence perceptions, although the inconsistency in the results within this study and previous literature needs to be further examined.

Recommendations

The findings from this study revealed extension programs focused on water quality issues should be developed with personal relevance in mind to maximize their influence on changing behaviors. As part of this, extension educators should consider using personal experiences with water issues as a factor in program participant recruitment. For example, extension educators could examine their target audiences to identify areas where water issues may be more relevant, such as low-income areas or areas where utility companies or the local government has historically had trouble supplying clean water resources. The individuals living in these areas will feel more personal relevance and therefore be more interested in water quality-focused educational experiences. Should they participate, individuals in these areas would also be more likely to change their behavior if they receive education about the protection of water resources.

Since personal experience has been found as a behavior change motivator, program context and content should be developed and tailored to provide a sense of personal experience. For example, international extension educators developing water quality programs should consider integrating simulations into their programs that provide a real-life experience emphasizing the realities of poor water quality so participants want to change their behaviors. Note that issues and experiences can be diverse depending on the location. Therefore, extension programs should be developed in a localized manner to address relevant issues optimizing program outcomes (Monroe & McDonell, 2012). For example, an extension program about proper lawn fertilization could be conducted in an urban area where potential participants experienced poor drinking water quality caused by a polluted aquifer where an extension program about proper animal waste management would be appropriate in an agricultural community where non-point source runoff has resulted in watersheds becoming impaired.

Future research is also recommended based on the results of this study, which indicated inconsistencies in the effects of different extension programs on perceptions of water quality and the associated importance of water. Since previous research examined extension programs directly related to a specific environmental issue, additional research focusing on perceptions of water quality issues in association with participation in extension programs related to water management should be examined for a more thorough explanation. A promising approach could be targeting localized small-scale programs directly related to water protection efforts, which can provide more specific results indicating the effectiveness of extension programs.

Lastly, a similar study should be conducted in a different country with similar water issues to the one in this study to explore the possible existence of cultural differences and the impacts of extension programming on water quality perceptions under different cultural situations. A comparative study could also be conducted to determine the similarities and differences in these two locations to further explore if the findings of this research are specific to this part of the world or relevant broadly.

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