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Examining Consumption of Bottled Water versus Tap Water on a Sustainable College Campus

Ludmilla Francisca Wikkeling-Scott [1*], Amira Mohamed Karim [1]

[1] *Zayed University, UNITED ARAB EMIRATES*

* CORRESPONDENCE: ✉ ludmilla.scott@zu.ac.ae

ABSTRACT

Background: Global water consumption has been on the rise and the UAE has one of the highest rates of bottled water consumption in the world. The consumption of bottled water is a major concern because of its burden on the environment and threat to sustainability. College experience is often the last place for formal education, and an opportunity to educate young populations about the importance of sustainability and pro-environment behaviors. The aim of this study is to examine attitude towards sustainability and pro-environment behaviors, related to consumption of bottled water versus tap water from water stations, among college students at a sustainable campus.

Material and methods: A cross-sectional design was used to describe results among a random sample of 500 male and female students, using the Theory of Planned Behavior, years and type of education exposure related to environmental studies, and perceptions that determine intention to change.

Results: Results showed that exposure to environmental studies was significantly related to students' perceived ability to change. For all five factors (access, taste, cost, convenience, and family influence), the proportion of students' perceived ability to change, was larger among those exposed to environmental studies than those in non-environmental studies.

Conclusions: The benefits of sustainability and pro-environmental attitudes may be better understood when environmental awareness is included in the education exposure. For future research, influences such as social norms, role models and mentors, daily experiences and observations, may provide better insight into students' pro-environmental attitude and actions to reduce plastic bottle pollution and improve sustainability.

Keywords: bottled water, tap water, theory of planned behavior, students

INTRODUCTION

Global water consumption has been on the rise, with an estimated global consumption of 329.33 billion liters of bottled water in 2015 (Qian, 2018). The consumption of bottled water, fresh water sold in individual containers, has grown even faster, with more than 200 billion liters of bottled water sold since 2007, mainly in North America and Europe (Gleick & Cooley, 2009). Consumers in the US purchase over 33 billion liters of bottled water or an average of 110 liters per person (Martinez, 2007). The Middle Eastern region has also seen an increasing demand for bottled water. One country which has surpassed global records, is the United Arab Emirates (UAE), where hot climates are experienced for a majority of the time, water consumption has increased exponentially since the formation of the nation in 1971. This oil-rich nation has one of the highest

rates of bottled water consumption in the world with each resident drinking an average of 250 liters of bottled water a year (Saleem, 2008; Walia, Fanas, Akbar, Eddin, & Adnan, 2017).

Consumers purchase bottled water for a several reasons, ranging from convenience to worry over availability of potable water from municipalities. In recent years, issues of public concern associated with environmental consequences of producing and disposing of plastic and the greenhouse gas emissions that result, are also on the rise.

The concept of bottled water first emerged in Western Europe and later expanded into US and other global markets, with major bottled water markets in several Asian countries (Qian, 2018). The consumption of bottled water is a major concern because of its high energy requirement in terms of production and distribution.

Cost of Producing, Processing and Transporting Bottled Water

The production of bottled water requires considerations for packaging, transport, chilling, use and recycling, all complicated by factors such as location and type of water source, distance from bottler to consumer, type of material and packaging used, method of transportation and more (Gleick & Cooley, 2009).

The processing of bottled water requires additional energy. Bottled water comes from two sources in general: municipal water systems (tap water) and surface and ground water systems. In the UAE, which has the highest per capita consumption of bottled water (265 liters per year), the two sources are wells (ground water) and desalinated water. Desalinated water comes with a high price tag and requires gas for production. In 2002, production of water was 181 billion gallons, at a cost of 3,426 billion Dirhams, according the UAE Ministry of Water and Electricity (Chaudhury, 2005). Municipal water can be bottled with or without additional treatment at the bottling plant. If municipal water is bottled without additional treatment this requires labeling that clearly states, 'municipal water', whereas municipal water that has received additional processing can be labeled as 'purified'. Under the US Safe Drinking Act, regulation requires that purified water is treated by the municipality and the bottler, to meet national standards.

Numerous government energy and transportation ministries, including the US Department of Energy, the US Department of Transportation, the European Union, and Natural Resources Canada, have compiled and analyzed data on the energy costs of different modes of freight transportation. Air cargo is by far the most energy intensive mode of transportation; truck transportation is more energy intensive than transportation by rail or bulk ocean shipping (Gleick & Cooley, 2009). Additional energy is required to cool bottled water prior to sale or consumption, and while the details of this process are not relevant to this study, the main point here is that the process of bottling water from start to finish, requires a high amount of energy that places a large foot print on global warming issues related to the output of greenhouse gases. This should be a consideration when efforts are under way globally, to improve environmental sustainability.

Pollution due to plastic bottle consumption is a major issue for the UAE. Statistics show that residents use 450 plastic water bottles on average in a single year, thus making the country one of the highest bottled water consumer in the world (Zakaria, 2018). Many plastic bottles end up in landfills, local lakes and oceans. A major argument to support drinking tap water instead of bottled water is the concern for the harmful chemical bisphenol A (BPA) found in plastic bottles. Consumers who favor bottled water, often refer to the importance of mineral content and added health benefits. Several studies showed a significant relationship between perception of risk to tap water use, taste, and preference for bottled water (Doria, 2006; Viscusi, Huber, & Bell, 2015). However, the environmental harm carries more weight among environmental organizations (Hill, 2017).

Consumers Sustainable Behavior and Drinking Water

Despite the significant social and environmental benefits to drinking tap water, it remains a challenge to convince the public to adopt this type of sustainable behaviors (Saylor, Prokopy, & Amberg, 2011). Education systems are a great opportunity to increase young persons' understanding of the environment and sustainability and sustainable campus initiatives slowly gain traction around the world (Faghihi, Hessami, & Ford, 2015; Rose, 2008; Sharp, 2002, 2009). Educational systems are recognized for their pro-environment student communities who can influence behaviors to empower one another and support sustainability activities (Chaplin & Wyton, 2014). Studies examining knowledge, attitudes and behaviors towards sustainability among this population may provide answers to consumer behavior of drinking water choices and preferences.

AIM OF THE STUDY

This study aims to examine student attitude towards sustainability and pro-environment behaviors, related to consumption of bottled water versus tap water from water stations, on a sustainable campus, while considering years of exposure to environment-related education and intention to change.

This study hypothesizes that:

H1: Education exposure is significantly associated with student's use of bottled water versus tap water.

H2: There is a significant relationship between student's perceived behavior control and intent to change from bottled water to tap water.

METHODOLOGY

Ethical Clearance

Ethical clearance for this study was obtained from the (affiliate institution) for data collection on the male and female campuses in Abu Dhabi, which is the wealthiest and largest Emirate of the UAE, with a population of approximately 3.15 million residents, occupying 87% of the geographical land mass. Most recent statistics indicate that 68% of the Emirati population in Abu Dhabi is younger than 30 years of age with a median age of 19 (Department of Health, 2016).

This cross-sectional study utilized random sampling for data collection. Measures for research included demographic characteristics such as age, gender, number of years enrolled and area of study (environmental or non-environmental). Student's water-drinking habits and preference for bottled water versus tap water were considered to describe pro-environment attitudes and behavior, the importance of sustainability, and intention to change.

Participants

A random sample of participants was recruited while they gathered in common areas of the university between 10:00 am and 3:00 pm in the afternoon, when most students are on campus, with an emphasis on the midday break between 11:00 am and 12:30 pm. Female students were oversampled due to the lack of interest experienced by male students. All students were enrolled in one of 8 undergraduate programs, to include natural and health sciences (which was labeled "environmental studies" for the purpose of this research) other programs (labeled "non-environmental studies"). Previous studies on the campus showed students' hesitance in providing their real age, wherefore the variable age was collected as a categorical variable rather than numerical.

Study Instrument

A self-administered survey was distributed using a hard copy sample of the survey, which included demographic measures of age, gender, number of years enrolled in college, number of years of education exposure and environmental studies exposure bottled water versus tap water use, attitude towards sustainability and intention to change from bottled water to tap water from stations installed on the campus where this study took place.

Sustainable Campus

College experience is often the last place for formal education, and an opportunity to educate young populations about the importance of sustainability and pro-environment behaviors. This study considers the sustainable campus, where students are exposed to a range of courses addressing environmental sustainability, and activities aimed to encourage pro-environment behaviors. Students are encouraged to initiate pro-environment clubs, and to encourage change to improve sustainability among their peers. The assumption is that the formal education setting and resources to increase awareness will lead to increased awareness and positive attitude, and at some point, achieve adoption of sustainability change (Hsu, 2004). To the best of our knowledge, no studies exist to describe the influence of such institution-based efforts on student change towards sustainability and pro-environment behavior in the UAE.

Theory of Planned Behavior

Behavior change, in research, can be explained through theoretical frameworks, such as the theory of planned behavior (TPB) (Ajzen, 1991). This theory may be used to describe behaviors that are environment-friendly, and considers a person's actions towards protecting the environment. Such environment friendly behaviors would include knowledge of action strategies, locus of control, attitudes, verbal commitment, and individual responsibility (Hines, Hungerford, & Tomera, 1987).

Additional support for examining environmental-friendly behavior comes from the value-belief-norm (VBN) theory of environmentalism, which links value theory, norm-activation theory and the New Environmental Paradigm perspective through a causal chain of variables (personal values, beliefs about the environment, personal norms, etc.) leading to behavior (Stern, 2000) . Another model, which emphasizes "pro-environmental consciousness," developed by Kollmuss and Agyeman, uses a diagram of factors that incorporate knowledge, attitudes, and emotional involvement, embedded in broader personal values rather than directly impacting behavior (Kollmuss & Agyeman, 2002).

Attitude

Research refers to attitude as personal evaluations of specific objects, qualities or behaviors, with a direct relationship expected between favorable attitudes and favorable behaviors (Abrahamse, Steg, Vlek, & Rothengatter, 2007; Arbuthnott, 2009; Bonnett, 2002).

In sustainability, however, this expectation is not always met, since people may have different attitudes towards specific sustainability behaviors and sustainability in general (Lertpratchya, Besley, Zwickle, Takahashi, & Whitley, 2017). In some instances, a person may have a positive attitude sustainability in general, and favor recycling, but do not agree that food choices need should be based on their impact on the environment. As students progress through their educational experience, their attitude and preference for pro-environment behaviors may be influenced by sustainability-related exposures on campus and vice versa.

Subjective norm

The subjective norm refers to the perceived pressure one may experience to engage or not engage in a behavior falls into two domains: descriptive belief and injunctive belief (Ajzen, 1991, 2002). Descriptive norm refers to whether a person does or does not engage in a behavior, while injunctive belief refers to whether other people think persons should engage in a behavior (Cialdini, Reno, & Kallgren, 1990). The two beliefs do not always correlate, for instance a person's belief that a behavior is not socially acceptable but also belief that people do engage in the behavior, as may be seen in tobacco or alcohol use. The subjective norm can be expected to correlate to time spent in an academic setting (Harland, Staats, & Wilke, 1999).

Perceived behavior control

The perceived behavior control relates to individuals' perception of the extent to which performance of the behavior is easy or difficult, and is closely related to Bandura's concept of self-efficacy. In a sustainability context, a person believes the ability to contribute to the protection of the environment with perceived control over the behaviors involved. Education exposure in the sustainable college environment could potentially lead to an increase of students who belief they can change towards pro-environment behavior. It will be expected that students with educational exposure to environmental studies perceive they are able to engage in pro-environment behavior more than their counterparts in non-environmental studies.
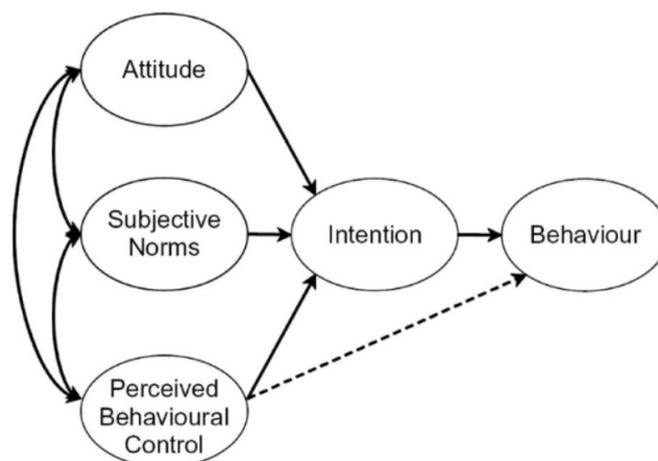
Figure 1. Theory of planned behavior (TPB) framework (Ajzen, 1991)

Data Analysis

The university where this study was conducted focuses on the use of tap water stations, which could improve sustainability by reducing the number of plastic bottles that end up in the environment. We applied concepts from the TPB, such as attitude (…how important is sustainability to you?"), subjective norm ("While on campus, do you normally drink water from tap water stations"), perceived behavior control ("I will be able to use tap water stations instead of plastic bottled water if …", intention ("…I intent to use tap water stations instead of plastic bottled water if…"). Behavior was measured using a single-item measure ("do you drink water from tap water stations on campus?") Surveys are not always seen as a favorable pass-time for students already challenged to manage their time, so the survey questions were kept at a minimum to manage the length of time for student participation in the study.

Descriptive analysis was conducted to provide an overview of demographic and pro-environment characteristics of the student sample. Pearson's Chi Square provided significance of association and regression analysis was used to identify which perceived behavior control factors predicted change from tap water to bottled water.

RESULTS

A total of 500 surveys were completed by undergraduate Emirati students with overwhelming participation by female students (94.60%) compared to their male counterparts (5.40%). One out of every 4 students were younger than 21 (75.40%). One third of students had completed at least 4 years of college (31.40%), and 22.40% of students were enrolled in the natural and health sciences one of the 8 colleges at the university where this study was conducted (where students are exposed to environmental sciences and sustainability and health sciences).

Attitude: Importance of Sustainability

This study was conducted at a higher education facility, and assumes that protecting the environment is in general very important to young generations. Students were asked to rank their attitude towards sustainability using a Likert-type single item (**Table 1**). In general, one third of students reported that sustainability was "very important" to them (31.20%) and a similar proportion reported "important" (36.20%) while 27.40% reported sustainability was "somewhat important" and only 5.20% reported it was "not important." These differences were not significant when considering education exposure (p=0.426).

Table 1. Importance of sustainability among students at sustainable college campus

How important is sustainability to you?	N	%	Non-Environmental Education Exposure		Environmental Education Exposure		p
			N	%	N	%	
Not Important	26	5.20	7	26.92	19	73.08	0.426
Somewhat Important	137	27.40	26	18.98	111	81.02	
Important	181	36.20	38	20.99	143	79.01	
Very Important	156	31.20	41	26.28	115	73.72	

N=500; significant at p<0.05

Table 2. Association of education exposure and students' tap water consumption on sustainable college campus

Education Exposure		N	%	Drink from tap water stations on campus				p
				No	%	Yes	%	
How many years have you been in college?	1 year	134	26.80	117	87.31	17	12.69	0.676
	2 years	120	24.00	108	90.00	12	10.00	
	3 years	89	17.80	81	91.01	8	8.99	
	4 or more years	157	31.40	136	86.62	21	13.38	
Exposure to Environmental studies	Not Exposed	112	22.40	99	88.39	13	11.61	0.998
	Exposed	388	77.60	343	88.40	45	11.60	

N=500; significant at p<0.05

Current Behavior

The UAE has one of the highest numbers of bottled water use in the world, which is supported by the data from this study showing that only 11.60% of students drink from tap water stations, while 82.80% of students drink bottled water on campus.

Sustainable college campuses promote recycling, reusing and reducing of things that pose a danger to the environment, such as plastic, and commonly provide filtered tap water stations for water consumption.

We hypothesized that education exposure would be significantly related to student's use of bottled water versus tap water stations as research shows that pro-environmental attitudes do not always follow behaviors (Durr, Bilecki, & Li, 2017). Pearson's Chi Square was used to describe the association between demographic characteristics and the use of tap water stations versus bottled water (**Table 2**). The majority of students do not drink tap water, regardless of the number of years of education exposure on a sustainable campus, and differences among students of 1, 2, 3, or 4 or more years of education exposure, were not significant (p=0.676). The same was observed for differences by exposure to environmental studies (p=0.998).

In general, 51.60% of students purchase bottled water "frequently", 22.20% "sometimes", 24.20% "rarely" and only 2% "never purchased bottled water." The frequency of bottled water consumption on campus differed significantly when considering exposure to environmental studies (p=0.05), but no significance was found when considering years of education exposure (p=0.749). The relation between frequency of bottled water consumption and education exposure (0.659), or environmental education exposure (p=0.834) was not significant. Frequency of bottled water consumption is shown in **Figure 2**.
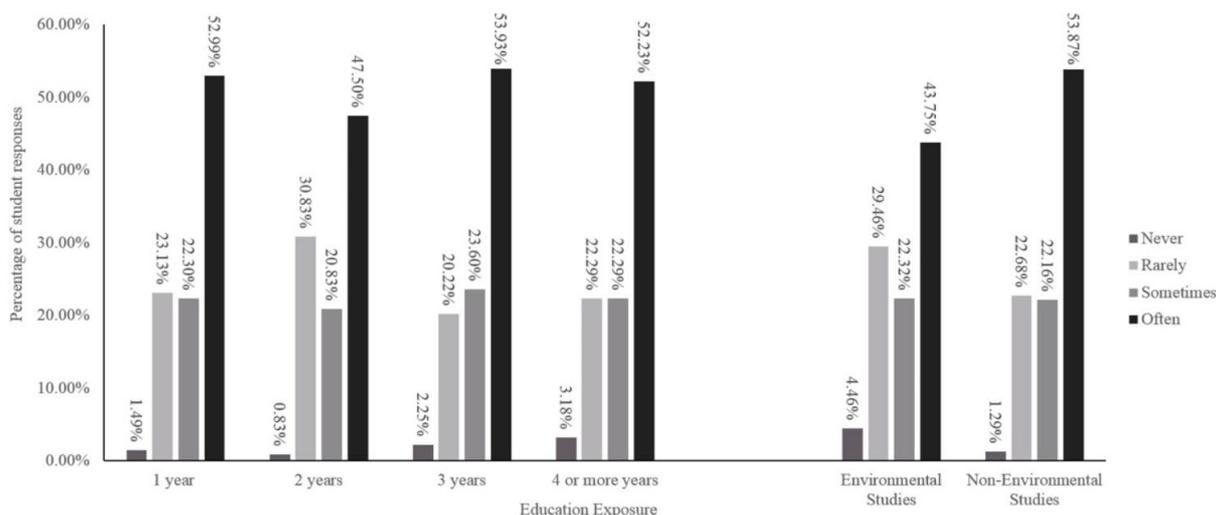
Figure 2. Frequency of drinking bottled water on campus

Table 3. Association of education exposure and perceived behavior control towards consumption of bottled water versus tap water

	Total N=500		Non-Environmental Education Exposure		Environmental Education Exposure		
I will be able to use tap water stations instead of plastic bottled water if:	N	%	N	%	N	%	*p*
Access: The university increases the number of tap water stations on campus	89	17.80	27	30.34	62	69.66	0.048
Taste: If they improved the taste of tap water	112	22.40	18	16.07	94	83.93	0.068
Convenience: If it is easier to carry around refillable container available on campus	112	22.40	32	30.48	73	69.52	0.026
Cost: The price of bottled water increased	39	7.80	8	20.51	31	79.49	0.768
Family influence: My family changed to tap water use at home	155	31.00	27	17.42	128	77.60	0.073

Significant at p<0.05

Data indicated that frequency of drinking bottled water on campus was consistent across age groups and education exposure, with approximately half of students reporting that they "often" purchase bottled water on campus (**Figure 2**). Among students exposed to environmental studies, frequency "often" consuming bottled water on campus was lower (43.75%) than those who were not exposed (53.87%). The frequency for "often" consuming bottled water on campus by number of years of education exposure was 52.99% (1 year), 47.50% (2 years), 53.93% (3 years), and 52.23% (4 or more years).

Perceived Behavior Control

The five factors for perceived ability to change from bottled water to tap water were: convenience, availability, taste, price, or family decision to change (**Table 3**). Family influence was the main reason that students perceived they could change from bottled water to tap water stations (31.00%), followed by improvement in the taste of tap water (22.40%) and convenience of carrying around refillable bottles available on campus (21.00%). Access (17.80%) and cost (7.80%) were of lesser priority. Exposure to environmental studies was significantly related to students' perceived ability to change from bottled water to tap water stations to support sustainability (p=0.017) and for all five factors (access, taste, cost, convenience, and family influence), the proportion of students perceived ability to change, was larger among those who were exposed to environmental studies than their colleagues in non-environmental studies.

Intent to Change

This study further hypothesized that exposure to environmental studies would significantly relate to student's intent to change from bottled water to tap water to support sustainability.

Regression analysis was conducted with the intention to change from bottled water to tap water to support sustainability, as the dependent variable, and the five different areas of perceived behavior control as the independent variables. The independent variables were chosen as they are potential influential variables of intention. A multiple regression procedure was performed to predict change from bottled water to tap water, $F(4, 495) = 2.55$, $p = 0.0387$, $R^2 = 0.0202$. Three of the five variables, convenience (p=0.003), family influence (p=0.013) and cost (0.044), significantly predicted intent to change.

DISCUSSION AND CONCLUSION

This research suggests that students at this sustainable campus, consume bottled water and tap water from the water stations accessible on the campus grounds, and that sustainability is important although the proportions of students for each level of importance are not statistically significant.

The study provided a comparative analysis of students by years of exposure to education, exposure to environmental education and by age. This study supports previous findings that higher education and a more informed population, did not show significantly differences in bottled water versus tap water consumption. Frequency of consumption of bottled water was consistent across age groups and when comparing groups by education exposure. A previous study conducted in three regions in Asia, namely Singapore, Hong Kong and Macau, found that students who have filtered tap water readily available, still drink bottled water more frequently than tap water. This raises concern of the overconsumption of bottled water, which costs more energy and poses a great burden on the environment.

Secondly, to understand why students prefer bottled water over tap water, several factors were identified, such as convenience, cost, access, taste and family influence, since traditionally most students reside with their families while attending college. The findings from this study support previous research that suggests convenience is of highest priority, as is cost and family influence.

The small sample of male students did not allow for a comparison by gender as other studies had done, but in general exposure to environmental studies did significantly influence students' preference for tap water over bottled water.

The information about preferences towards plastic water bottles versus tap water consumption available in peer-reviewed literature is still relatively low, although interest in the topic has increased in the UAE. Most research on plastic bottled water consumption focus on the chemical and economic aspects. Studies on the social aspects of water bottle use, are descriptive in nature. While studies describe consumer behavior, limited information exists about young adults, particularly students on college campuses, which are a major focus for sustainability programs (Doria, 2006).

This research suggests students, on average are more concerned about sustainability when they are exposed to environmental studies. The benefits of sustainability and pro-environmental attitudes may thus be better understood when environmental awareness is included in the education exposure. The pro-environmental attitude does not necessarily lead to pro-environmental behavior. Studying for longer periods within a curriculum had no significant effect on the attitude and behavior of students. Hence, if students with greater awareness about the environment are to be recognized for their excellence in sustainability and protecting the environment from pollution, environmental education should be integrated across all curricula. It is worth noting that the positive attitude towards sustainability across student groups, may be due to the sustainable campus program visibly active on campus.

We should be mindful that although students may be concerned about sustainability, their behaviors may not relate to their attitudes. This can be drawn from the fact that pro-environmental behaviors are also affected by other factors, which have not been considered in this study. These factors include social norms, and moral obligations as proposed by Fishbein and Ajzen (Heyl, Moyano Díaz, & Cifuentes, 2013). This research identified only some factors related to pro-environmental behavior and sustainability, which are mostly demographic factors.

Additional research is necessary to include larger diversity of methodological approaches such as blind tests, and development of regression models, that can lead to a better understanding of factors involved in pro-

environmental behaviors such as reducing consumption of bottled water and influencers of pro-environmental behavior. For future research, influences such as social norms, role models and mentors, daily experiences and observations, may provide better insight into students' pro-environmental attitude and concern for sustainability on the one hand, and their actions which contradict those on the other hand. Such studies will be of benefit in providing information for future programs to improve pro-environmental behaviors among young adults, around reducing plastic pollution, to decrease consumption of water bottles, and improve sustainability.

Disclosure statement

No potential conflict of interest was reported by the authors.

Notes on contributors

Ludmilla Francisca Wikkeling-Scott – Zayed University, United Arab Emirates.

Amira Mohamed Karim – Zayed University, United Arab Emirates.

REFERENCES

Abrahamse, W., Steg, L., Vlek, C., & Rothengatter, T. (2007). The effect of tailored information, goal setting, and tailored feedback on household energy use, energy-related behaviors, and behavioral antecedents. *Journal of Environmental Psychology, 27*(4), 265-276. https://doi.org/10.1016/j.jenvp.2007.08.002

Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes, 50*(2), 179-211. https://doi.org/10.1016/0749-5978(91)90020-T

Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *Journal of applied social psychology, 32*(4), 665-683. https://doi.org/10.1111/j.1559-1816.2002.tb00236.x

Arbuthnott, K. D. (2009). Education for sustainable development beyond attitude change. *International Journal of Sustainability in Higher Education, 10*(2), 152-163. https://doi.org/10.1108/14676370910945954

Bonnett, M. (2002). Education for sustainability as a frame of mind. *Environmental Education Research, 8*(1), 9-20. https://doi.org/10.1080/13504620120109619

Chaplin, G., & Wyton, P. (2014). Student engagement with sustainability: Understanding the value–action gap. *International Journal of Sustainability in Higher Education, 15*(4), 404-417. https://doi.org/10.1108/IJSHE-04-2012-0029

Chaudhury, M. D. (2005, 3 May 2016). UAE water consumption one of the highest in the world. . *Khaleej Times*. Retrieved from https://www.khaleejtimes.com/article/20050722/ARTICLE/307229987/1036

Cialdini, R. B., Reno, R. R., & Kallgren, C. A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of personality and social psychology, 58*(6), 1015. https://doi.org/10.1037/0022-3514.58.6.1015

Department of Health, A. D. (2016). *Health Statistics 2015*. Retrieved from Abu Dhabi: http://www.haad.ae/statistics2015

Doria, M. F. (2006). Bottled water versus tap water: understanding consumers' preferences. *Journal of water and health, 4*(2), 271-276. https://doi.org/10.2166/wh.2006.0023

Durr, E., Bilecki, J., & Li, E. (2017). Are Beliefs in the Importance of Pro-Environmental Behaviors Correlated with Pro-Environmental Behaviors at a College Campus? *Sustainability: The Journal of Record, 10*(3), 204-210.

Faghihi, V., Hessami, A. R., & Ford, D. N. (2015). Sustainable campus improvement program design using energy efficiency and conservation. *Journal of Cleaner Production, 107*, 400-409. https://doi.org/10.1016/j.jclepro.2014.12.040

Gleick, P. H., & Cooley, H. S. (2009). Energy implications of bottled water. *Environmental Research Letters, 4*(1), 014009. https://doi.org/10.1088/1748-9326/4/1/014009

Harland, P., Staats, H., & Wilke, H. A. (1999). Explaining proenvironmental intention and behavior by personal norms and the theory of planned behavior. *Journal of applied social psychology, 29*(12), 2505-2528. https://doi.org/10.1111/j.1559-1816.1999.tb00123.x

Heyl, M., Moyano Díaz, E., & Cifuentes, L. (2013). Environmental attitudes and behaviors of college students: a case study conducted at a chilean university. *Revista latinoamericana de psicología, 45*(3), 487-500. https://doi.org/10.14349/rlp.v45i3.1489

Hill, J. (2017, 29 January 2017). The many myths of the UAE's tap water. . *The National*. Retrieved from https://www.thenational.ae/uae/environment/the-many-myths-of-the-uae-s-tap-water-1.15502

Hines, J. M., Hungerford, H. R., & Tomera, A. N. (1987). Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. *The journal of environmental education, 18*(2), 1-8. https://doi.org/10.1080/00958964.1987.9943482

Hsu, S.-J. (2004). The effects of an environmental education program on responsible environmental behavior and associated environmental literacy variables in Taiwanese college students. *The journal of environmental education, 35*(2), 37-48. https://doi.org/10.3200/JOEE.35.2.37-48

Kollmuss, A., & Agyeman, J. (2002). Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research, 8*(3), 239-260. https://doi.org/10.1080/13504620220145401

Lertpratchya, A. P., Besley, J. C., Zwickle, A., Takahashi, B., & Whitley, C. T. (2017). Assessing the role of college as a sustainability communication channel. *International Journal of Sustainability in Higher Education, 18*(7), 1060-1075. https://doi.org/10.1108/IJSHE-09-2016-0172

Martinez, S. W. (2007). The US food marketing system: Recent developments. *Economic Research Report, 42*.

Qian, N. (2018). Bottled Water or Tap Water? A Comparative Study of Drinking Water Choices on University Campuses. *Water, 10*(1), 59. https://doi.org/10.3390/w10010059

Rose, G. (2008). Encouraging sustainable campus travel: self-reported impacts of a university TravelSmart initiative. *Journal of Public Transportation, 11*(1), 5. https://doi.org/10.5038/2375-0901.11.1.5

Saleem, N. (2008, 13 February 2008). Beverage companies target UAE. *The Gulf News*. Retrieved from http://gulfnews.com/business/sec-tors/general/beverage-companies-target-uae-1.84446

Saylor, A., Prokopy, L. S., & Amberg, S. (2011). What's wrong with the tap? Examining perceptions of tap water and bottled water at Purdue University. *Environmental Management, 48*(3), 588-601. https://doi.org/10.1007/s00267-011-9692-6

Sharp, L. (2002). Green campuses: the road from little victories to systemic transformation. *International Journal of Sustainability in Higher Education, 3*(2), 128-145. https://doi.org/10.1108/14676370210422357

Sharp, L. (2009). Higher education: the quest for the sustainable campus. In: Taylor & Francis.

Stern, P. C. (2000). New environmental theories: toward a coherent theory of environmentally significant behavior. *Journal of social issues, 56*(3), 407-424. https://doi.org/10.1111/0022-4537.00175

Viscusi, W. K., Huber, J., & Bell, J. (2015). The private rationality of bottled water drinking. *Contemporary Economic Policy, 33*(3), 450-467. https://doi.org/10.1111/coep.12088

Walia, T., Fanas, S. A., Akbar, M., Eddin, J., & Adnan, M. (2017). Estimation of fluoride concentration in drinking water and common beverages in United Arab Emirates (UAE). *The Saudi dental journal, 29*(3), 117-122. https://doi.org/10.1016/j.sdentj.2017.04.002

Zakaria, S. (2018, 31 March 2018). Go drastic on plastic waste in UAE. *Khaleej Times*. Retrieved from https://www.khaleejtimes.com/nation/dubai/go-drastic-on-plastic-in-uae

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