

Attitudes, Behaviour, and Engagement Toward Water Consumption and Conservation in a Higher Education Setting

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ABSTRACT

There is a need to develop more nuanced and playfully informed understandings of people's attitudes and behaviour toward water consumption and conservation in particular settings, particularly if we are to design initiatives designed to engage and then change behaviour. The Southeast of England, in the United Kingdom, is an example of a water stressed region where better understandings have a potentially key role to play in helping to tackle the issue of water scarcity through attempts to reduce the personal consumption of water. Therefore, this paper presents the findings of a small-scale research project that sought to playfully engage participants in an exploration of their attitudes and behaviour toward water use in a university setting. In particular, an interactive questionnaire was designed whereby participants were encouraged to give their answers by placing counters in buckets of differently coloured water. From an awareness perspective, the study found that whilst females appeared to be more aware of their water usage, participants in general appeared to be unaware of retro fit programmes design to improve water conservation. As a result of these findings, it is suggested that future education campaigns better reflect the needs of different groups, particularly in communities with highly transient populations, such as those in University towns. From an engagement perspective, the interactive nature of the data collection was noted as appearing to be successful in encouraging engagement over time. In conclusion, it is suggested that such playful approaches to data collection and awareness raising can be a useful in not only engaging but promoting a better understanding and awareness of water usage.

Keywords: Higher Education, South East England, water attitudes, water behaviour, playful engagement.

1. INTRODUCTION

Traditionally, and from the perspective of the United Kingdom, water stress has tended to be viewed as being a problem not of ours but of others. However, it is notable that the UK, in particular, the South East of England, suffer from water stress (Environment Agency, 2011; Waterwise, 2009).

Water scarcity has traditionally been tackled by increasingly extracting and storing water for human needs (Butler & Memon, 2005). However, this approach is becoming increasingly unacceptable on sustainability grounds. Therefore, and in an attempt to make our usage of water resources more sustainable, attention is increasingly focusing on better understanding people's usage of and attitudes toward water use, so as to allow us to reduce our usage of water via behaviour change and in so doing make usage more sustainable (Defra, 2008 a and b; Jenkins and Oram, 2013; Jenkins and Pericli, 2014).

Attitudes and behaviour toward water usage can vary from person to person, from community to community, from business to business, and from one point in time to another (see Dietz *et al.*, 1998; Dunlap *et al.*, 2000; Honnold, 1981; Howell & Laska, 1992; Jenkins and Oram, 2013; Jenkins and Pericli, 2014). Therefore, it is imperative that research seeks to not only understand water usage and attitudes in a diverse range of settings, but that it also seeks to capture a changing attitudes overtime and as result of external events that may trigger a shift in understanding and thus resultant attitudes toward water usage.

A multitude of approaches exist to change peoples' usage, attitudes and behaviours toward water usage, with education and retro fit schemes being widely viewed as being key. (CCWater, 2013, Waterwise, 2013, 2016). In particular, education is viewed as being key to changing behaviour, particularly amongst younger age groups due to the belief that pro-environmental behaviours can be embedded more effectively in such groups (House of Lords, 2006; Wymer *et al.*, 2014;). Damerell *et al.* (2013) argue that environmental education is critical in implementing conservation into children at an early age, and by doing this they can change the behaviour of their parents encouraging greater water conservation in the home. While this is supposedly the case for children in primary education, Sammel and McMartin (2014) found that college students knew where their water came from. However, they had a limited idea with regards to water conservation, with many believing that taking shorter showers and turning taps off were not effective strategies to adopt to achieve increased water conservation. However, Bremner and Jordan (2012) found that while there are many educational programmes conducted in schools in the UK, there is very little evidence on whether these programmes are having any effect on children's attitude and behaviour towards water usage as the long-term impact cannot yet be recorded.

Progressing on from schools, Finlay and Massey (2012) suggest that universities are important transformation centres with regard to being drivers for social change. They can act as key places within which to address global issue and facilitate change (Moore, 2005; Clarke and Kouri, 2009). Therefore, and as result of this contention, this study contends that work done by and in universities can play an important role in fostering a positive shift in attitudes and behaviours towards water usage and it's conservation. However, research by Wymer *et al.* (2014), found that messages highlighting how much water is being used in each flat through meter readings, as well as public messages, played an insignificant role in motivating students in taking action to conserve water.

However, previous research by Jennet *et al.* (2016) highlights that approaches that seek to change attitudes and behaviours to promote pro-environmental behaviours, using methods such as leaflets, websites or social media to communicate information to the public and impact are ineffective because they don't promote engagement (see also Froehlich *et al.*, 2010; Owens & Driffill, 2008). Work done by Jannett *et al.* (2016) on 'promoting environmental awareness through playful interactions', using squeezey green balls to help encourage engagement with the issues of climate change, suggests that interactivity is key in encouraging more candidates to partake in a questionnaire and to actively think about their behaviour.

Therefore, it is notable that whilst this study set out to explore student understandings and attitudes towards water use it sought to do so in playful way that promoted increased engagement and discussion (see Section 2 for more information). Using interaction as an element to attract students and staff to answer questions may help in promoting water efficient behaviour and the adoption of pro-

environmental behaviours, with binding communication being argued to create more positive attitude towards conservation (Jannett *et al.*, 2016).

2. METHODOLOGY

From an overarching perspective, the research undertaken for this study adopted a qualitative approach that was designed to be interactive and focused on principally exploring the understanding and attitudes of students towards water use and its conservation at the University of Hertfordshire, United Kingdom. Data was collected via the development of an interactive questionnaire approach inspired by the work of Jannett *et al.* (2016), which focused on promoting environmental awareness through play interactions using squeezezy green ball. Therefore, the questionnaire was administered by setting up clear buckets with blue coloured water ranging from light blue to dark blue (see Figure 1). The buckets were used to answer the questions in a multiple-choice format. Different coloured counters were used to differentiate between the genders first (before they were given a fact) and second answers (after they were given a fact). In this instance, female participants were told to use red counters for their first answer and yellow counters for their second answer, whereas males were told to use a blue counter for their first answer and green counters for their second answer. One question per day was asked with a view to enhancing engagement with study to keep it as simple and as quick as possible to engage with.

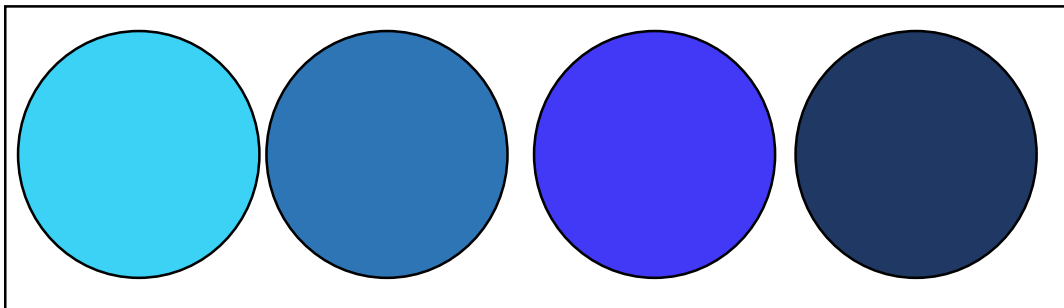


Fig 1. An illustration of the buckets containing coloured water

Figure 2 shows the actual set-up of buckets. Forum on day one and plate 2.2 shows the set up on all the other days. The buckets were also labelled in case some participants had visual difficulties and in so doing allow all to participate in the study.

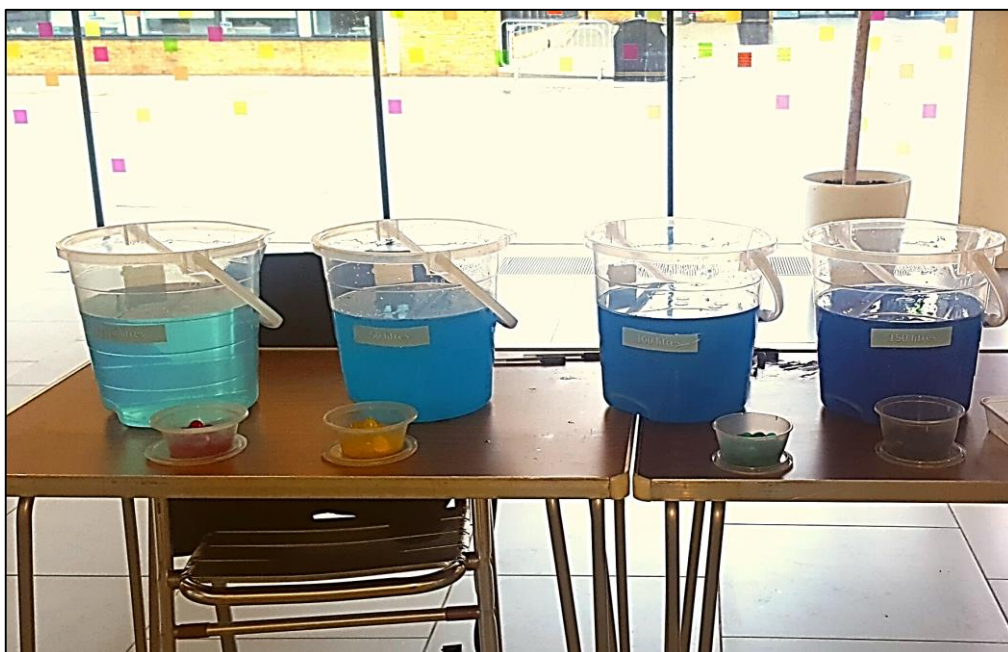


Fig 2. Photo showing how the buckets were set up on the first day of the questionnaire.

The questionnaire consisted of asking a question, and then providing an attitude changing fact before asking the question again. The reason why the participant did or did not change their answer was also asked. This was done in order to see whether the attitude and behaviour of the participant had changed once given a fact. The participants were asked their gender (male or female), age, and occupation (staff or student) and then were asked a question about their water usage and behaviour. Table 2 shows the questions that were asked as part of the questionnaire on each day as well as the influencing fact.

Table 2. Questions asked as part of the questionnaire and the influencing facts relating to them.

Day	Question	Influencing fact	Image associated with the fact
1	How much water on average do you think a person uses in the UK per day? a)10 litres b)50 litres c)100 litres Follow up question - Does this encourage you to do more to save water? (Yes or No)	On average, every person in the UK uses 200 filled water bottles– like the one displayed (150 litres) of water per day and this number has been increasing annually by 1% since the 1930's and this number can be cut by a third if water saving devices were used. (Waterwise, 2016).	A pile of many used and disposed plastic bottles.
2	Do you think that the UK has a secured amount of water for the future and therefore can be used in abundance? a) Yes b)Not sure c) No Question is repeated after fact is given	The UK has less water available per person than most other European countries. London is drier than Istanbul. The water we use has a significant carbon footprint contributing to climate change (Waterwise, 2009).	Image of Big Ben overlooking the River Thames and an image of the Blue Mosque in Istanbul.
3	Do you consider it important to save water? a)Yes b)Not sure c) No Question is repeated after fact is given	With continuing population growth, household water demand has been increasing, and therefore there is a need to abstract more water in some areas which is not currently sustainable (Defra ^b , 2008).	A crowded street with no space to walk.
4	Would you consider cutting 1 minute from your shower per day? a)Yes b)Not sure c) No Question is repeated after fact is given	Cutting your shower by a minute a day can save a family of 4 up to £52 per annum (Thames water, 2016).	A showerhead with water coming out.
5	Did you know that Thames water and Affinity water provide free water saving devices? a)Yes b) No		
	Would you consider putting water saving devices in your home? a)Yes b)Not sure c) No Question is repeated after fact is given	Retrofitting devices can help save an average of £125 off your water bill per year. Retrofit shower heads can help save £91 per annum Retrofit taps can help save £16 per annum Toilet cisterns can help save £18 per annum (Thames water, 2016).	All the water saving devices which are available from Thames and Affinity water.

4. RESULTS AND DISCUSSION

A total of 414 responses were collected over the duration of a week. Overall, it was found that females were more aware of average water usage. However, it was found that many participants were unaware of retrofit programmes designed to conserve water but willing to consider them in their home after becoming aware of such programmes, suggesting that education and subsequent awareness are crucial to facilitating behavioural change. The interactive nature of study was observed to be beneficial in promoting engagement and thus potentially encouraging behaviour change. To aid discussion of the results, the following discussion has been split into three sub-sections. The first section focuses on water usage awareness and potential behaviour change, with this then being followed by a discussion of the impact the provision of facts and interactivity has on prompting behaviour change. The final section focuses on participants' awareness of retrofit schemes.

4.1 Water usage awareness and potential behaviour change

From the data collected and the subsequent analysis, it was found that more female students (17) were accurate about their water usage compared to male students (8), as more thought that the average water use in the UK was 150 litres of water per person per day. This may be due to females using more water than men, as suggested by Tong *et al.* (2017). However, when broken down into occupation. Upon learning about how much water is actually used on average, the majority of participants, 61 out of the 76, said they were encouraged to save water. However, there was a small number of male and female students that said 'no', with these responses being confined to the younger age groups i.e. 18-24 and 25-34-year-olds (see Figure 3.4). This finding is reflective of the work done by Roberts (1996), which suggests that older individuals tend to be more environmentally conscious. However, the results of this study show that both the younger and older individuals are equally environmentally conscious and therefore the work done by Roberts (1996) may be too outdated in comparison to studies done today. Tong *et al.* (2017) found that women were happier to adopt water conservation practices compared to men. However, the results of this study show that males and females are equally happy to adopt water conservation practices; this could be a result of being more aware of reasons to conserve water.

Reasons participants gave for why the fact they were given encouraged them to save water included:

"water is important for our lives, we need to preserve it"

and

"it's a lot of water to use and waste"

This suggests that the fact given to the participants had somewhat influenced their answer, hence supporting research done by Parant *et al.* (2016) which suggests that binding communication is key in facilitating positive attitude changes.

The reason participants gave for why the fact they were given did not encourage them to save water included:

"I don't know how to save water"

and

"I don't think I use a lot of water"

The responses highlight that people are aware of the issue with water but could potentially be limited by their poor knowledge of how water can be saved. Potentially, this finding serves to underscore the importance of an education programme designed to better inform water users about their water usage and how they can change it.

4.2 Facts and interactivity

The study found that factual information, and efforts to enhance engagement, does have the potential to change a person's response and thus potentially their behaviour toward water usage and its conservation. This corresponds to the work done by Parant *et al.* (2016), which found that binding communication is significant in encouraging positive attitudes. It was hypothesised that there would be no statistically significant difference between the answer given by the participant before and after the fact was given. However, through the utilisation of χ^2 tests, it was found that for three out of the four

questions (see Table 2.1) that were tested found that there was a significant difference between the two responses given by the participants.

In particular, it was found that most participants thought that the UK does not have a secure amount of water that can be used in abundance. It was found that at first, students of both genders had split opinions, however, after being prompted with the fact that the UK had less water than most European countries was given, most participants answered 'no', reinforcing their previous opinion. The 18-24 age group mainly changed their answer after knowing the fact; all other age groups seemed to be more aware. The number of participants that said 'yes' the first time was halved after the fact was given. This suggests that the younger demographic are less aware of the issues surrounding water but are willing to change their attitudes after given, which is similar to the research findings of Roberts (1996). However, unlike his work, it was observed that many participants, mainly 18-24-year-olds would come back each day to learn a new fact about water suggesting that they are environmentally conscious but unaware of the water issue which other studies have not shown.

The reasons participants gave for why the fact changed their answer included:

"We need to conserve for future generations"
and
"If population is increasing, we should be more careful"

This suggests that the fact had a significant impact on the participant's attitude toward water usage the need for its conservation. The results also appear to indicate that binding communication, along with interactivity, is key in the promotion of pro-environmental behaviours as it engages an audience, as suggested by Jannett *et al.* (2016). Furthermore, whilst conducting this study, it was observed that students and staff would come back on consecutive days with colleagues to learn a new fact while remembering facts given on previous days. This suggests that interactivity is key in raising awareness as well as interactivity being a way of making facts given more memorable.

The reasons participants gave for why the fact did not change their answer included:

"because there is a lot of water"
and
"I think the government is lying to us to make more money"

This suggests that participants are aware that there is enough water in the world but they are unaware of its inaccessibility. A participant also thought that it was a way of government making money, suggesting a lack of institutional trust.

It was found that most participants (94%) considered it important to save water, this was then reinforced after the fact was given. It was subsequently found that most participants would consider cutting a minute from their shower per day. It was found more participants said 'yes' after the fact was given to them. It was found that all age groups were encouraged to cut a minute from their shower per day after the fact was given to them. However, some participants still answered 'no' after the fact was given to them. The reasons participants gave for why the fact did not change their answer included:

"I like showering"
and
"I'll think about it when and if I ever get a water meter"

This suggests that although there is a potential to save money, it is not substantial enough for to encourage some individuals to save money as water is seen as an inexpensive commodity.

4.3 Awareness of retrofit programmes

It was found that participants were unaware of the retrofit programmes provided by Thames and Affinity water (see Figure 3.12). This suggests that educational programmes provided by water companies have not encouraged the use of water saving devices. However, this could also suggest that not enough visits or programmes are being provided by water companies to make students more aware of water efficient technologies. However, it was found that many would consider adopting water retrofits in their

homes even before they were given the fact. After the fact was given it was found that more participants were more open to the idea of having water retrofits installed in their home. This finding signifies the importance of educating individuals about water efficiency in a setting which promotes higher levels of learning and could also make students identify water conservation as a sustainability initiative, which is something students failed to identify in a study by Cleverdon *et al.* (2017).

The reasons participants gave for why the fact they were given made them consider having water saving devices in their home included:

“To save money and water”
and
“it’s a precious resource, we need to save it”

The responses suggest that the fact given to the participants made them realise water is a scarce resource. It can also be noted that saving money is a big encouragement, especially to students when it comes to saving water. Therefore, being able to save money when saving water may lead to greater sustainable water usage by consumers.

5. CONCLUSIONS

Attitudes and behaviours are known to be alterable via technology, education and legislation. The Stern review (2007) emphasised the need to educate those currently in education to promote pro-environmental behaviours. It has been argued in this study, and by others, that universities are important transformation centres in regard to driving social change (see Finlay & Massey, 2012).

From the data collected it was found that interactivity combined with factual information had the potential to alter individual’s attitudes and behaviours, therefore, supporting the work done by Jannett *et al.* (2016). It was also found that those in higher education were unaware of retrofit programmes but were willing to consider putting them in their home after participants were given facts. It was also found that females were more aware of their water usage than males, which is supportive of research by Tong *et al.* (2017). The results from this project were significant as they found that attitudes and behaviours can be changed in a higher educational setting if the way of presenting facts and interacting with the consumers is made memorable.

With water becoming an increasingly scarce resource it is clear that being able to alter consumer attitudes and behaviours is important in educational contexts. Therefore, it can be concluded that binding communication and interactivity are essential in achieving pro-environmental behaviours and hence encouraging sustainable water usage in the home. As a result of the findings of this study, it is also suggested that future education campaigns better reflect the needs of different groups, particularly in communities with highly transient populations, such as those in University towns.

REFERENCES

- Bremner, S. & Jordan, D. (2012). *Investigating the impact of water efficiency educational programmes in schools: a scoping study and evidence base project*. London: Waterwise.
- Butler, D., & Memon, F. A. (Eds.). (2005). *Water demand management*. IWA Publishing. London.
- CCWater (2013). *Research into saving water - the experiences and perceptions of customers and their households*. Consumer Council for Water: Birmingham.
- Clarke, A. and Kouri, R. (2009), “Choosing an appropriate university or college environmental management system”, *Journal of Cleaner Production*, Vol. 17, pp. 971-84.
- Cleverdon, L., Pole, S., Weston, R., Banga, S., & Tudor, T. (2017). The Engagement of Students in Higher Education Institutions with the Concepts of Sustainability: A Case Study of the University of Northampton, in England. *Resources*, 6(1), 3.
- Damerell, P., Howe, C., & Milner-Gulland, E. J. (2013). Child-orientated environmental education influences adult knowledge and household behaviour. *Environmental Research Letters*, 8(1).
- Defra (2008a). *A framework for pro-environmental behaviour*. London, Defra.
- Defra (2008b). *Future Water The Government’s water strategy for England*. London, Defra.
- Dietz, T., Stern, P. C., & Guagnano, G. A. (1998). Social structural and social psychological bases of environmental concern. *Environment and Behavior*, 30(4), 450–471

- Dunlap, R. E., Van Liere, K. D., Mertig, A. G., & Jones, R. E. (2000). Measuring endorsement of the New Ecological Paradigm: A revised NEP scale. *Journal of Social Issues*, 56(3), 425–442.
- Environment Agency. (2011). *The case for change – current and future water availability*. Bristol: Environment Agency, December.
- Finlay, J., & Massey, J. (2012). Eco-campus: applying the ecocity model to develop green university and college campuses. *International Journal of Sustainability in Higher Education*, 13(2), 150-165.
- Froehlich, J., Findlater, L., & Landay, J. (2010). The design of eco-feedback technology. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 1999-2008). ACM.
- Honnold, J. A. (1981). Predictors of public environmental concern in the 1970. In D. E. Mann (Ed.), *Environmental policy formation: The impacts of values, ideologies and standards*. Lexington, MA: Lexington Books.
- House of Lords. (2006). *Water Management*, Volume 1, House of Lords, Science and Technology Committee, 8th Report of Session 2005-06. The Stationary Office Ltd., London.
- Howell, S. E., & Laska, S. B. (1992). The changing face of the environmental coalition: A research note. *Environment and Behavior*, 24(1), 134–144
- Jenkins, J. and Pericli, A. (2014). Understanding consumer responses to water efficiency strategies. In K. Adeyeye, *Water efficiency in buildings: from theory to practice* (pp. 61-70). Oxford: Wiley-Blackwell.
- Jenkins, J. O., & Oram, S. (2013). Water use attitudes in the UK pharmaceutical industry. *Water and Environment Journal*, 27 (4), 575-580.
- Jennett, C., Iacovides, I., Cox, A. L., Vikhanova, A., Weigold, E., Mostaghimi, L., Jones, G., Jenkins, J., Gallacher, S., & Rogers, Y. (2016, October). Squeezy Green Balls: Promoting Environmental Awareness through Playful Interactions. In *Proceedings of the 2016 Annual Symposium on Computer-Human Interaction in Play* (389-400). ACM.
- Moore, J. (2005), “Barriers and pathways to creating sustainability programs: Policy, rhetoric and reality”, *Environmental Education Research*, Vol. 11, pp. 537-55
- Owens, S., & Driffill, L. (2008). How to change attitudes and behaviours in the context of energy. *Energy policy*, 36(12), 4412-4418.
- Parant, A., Pascual, A., Jugel, M., Kerroume, M., Felonneau, M. L., & Gueguen, N. (2017). Raising Students Awareness to Climate Change An Illustration With Binding Communication. *Environment and Behavior*, 49 (3), 339-353.
- Roberts, J. A. (1996). Green consumers in the 1990s: profile and implications for advertising. *Journal of business research*, 36 (3), 217-231.
- Sammel, A. J., & McMartin, D. W. (2014). Teaching and Knowing beyond the Water Cycle: What Does It Mean to Be Water Literate? *Creative Education*, 2014.
- Stern, N. H. (2007). *The economics of climate change: The stern review*. Cambridge: Cambridge University Press.
- Thames water (2016). *Saving water saves money*. Retrieved 16 February 2017 from, <http://freebies.thameswater.co.uk/>
- Tong, Y., Fan, L., & Niu, H. (2017). Water conservation awareness and practices in households receiving improved water supply: A gender-based analysis. *Journal of Cleaner Production*, 141, 947-955.
- Waterwise (2009). *Waterwise UK Manifesto -2009/2010*. London: Waterwise.
- Waterwise (2013). *Evaluating Water Efficiency Retrofit Projects: An Example An Evidence Base project*. Waterwise: London.
- Waterwise (2016). *A water efficiency strategy for the UK – Consultation*. Waterwise: London.
- Wymer, C., Adeyeye, K., Robinson, D., Hyde, K. (2014), The Cumulative Impact of Awareness Tools on Water and Energy Use in University Halls of Residence, 40th IAHS *World Congress on Housing: Sustainable Housing Construction*, Dec. 16-19, 2014, Funchal, Portugal.