Water Literacy and Citizenship: Education for Sustainable Domestic Water Use in the East Midlands

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Thesis submitted to the University of Nottingham for the degree of Doctor of Philosophy

July 2014

Abstract

In Britain, projected population rise and climate change threaten future water availability. UK water companies run education programmes to encourage more efficient usage, but these tend to focus on primary schools and adults, missing the opportunity to engage secondary school pupils as the next generation of homeowners and bill payers. Educational interventions also traditionally follow the theory of rational choice, envisaging learners as able to change their attitudes and behaviours in accordance with newly acquired information. Sociological research on social practices and ordinary consumption, however, sees water as playing an inconspicuous role in daily domestic activities. Technological infrastructure and prevalent social norms mould behaviour and limit the ability of water users to alter their consumption. This interdisciplinary thesis attempts to break the impasse between works from educational and sociological perspectives, using the theoretical lens of water citizenship. A review of current water education provision in the East Midlands region was undertaken, and a school-based study involving questionnaires, focus groups and exploratory lessons around water. The young people involved in the study tended to show ambivalence towards water conservation, despite general pro-environmental motivations. While some teenagers perceived they were 'doing their bit' for the environment, this tended to be limited to accepting and invoking 'water saving tips', and many teenagers eschewed water conservation altogether. These findings indicate that innovative educational programmes are needed to raise the standard of water literacy in the UK. This thesis argues firstly for making water use more 'visible' in daily activities, by deconstructing the routines and habits that use water, and by recognising the influences that social norms exert on water use. Secondly, it argues that educational initiatives for water literacy could develop young people's sense of citizenship and responsibility towards water resources by connecting personal actions to impacts at local, national and global scales.

Acknowledgements

First and foremost I am very grateful to the teachers and pupils at all the schools I worked in across the East Midlands, without whose cooperation the research would have not been possible. They remain anonymous here (and referred to by pseudonyms in the body of the thesis) for ethical reasons. Secondly, I thank my supervisors, Mary Biddulph, Sujatha Raman and Colin Thorne for their support and guidance from day one. Crossing disciplines has not been an easy task but it has been helped immensely by expertise from different subjects. I would also like to thank the ESRC for funding the CASE studentship (under grant ES/I008276/1), and the collaborative partners, Papplewick Pumping Station Trust and Severn Trent Water PLC. In particular I thank Ashley Smart, Geoffrey Bond and the Trustees of Papplewick Pumping Station Trust, for their enthusiasm and support throughout the process, and Edwina Woodland, Hanna Sandstrom and Doug Clarke at Severn Trent Water, for guidance and providing excellent opportunities for data collection.

I am grateful to those who met me during my Universitas21 visit to Australia, in particular my hosts Kelly Fielding at UQ, Bryce Kelly at UNSW, and John Langford at University of Melbourne, plus the many more who gave me their time. I also thank the University of Nottingham Graduate School for helping to fund this visit.

Thanks additionally go to the staff in the School of Geography for the helpful suggestions made at departmental presentations (and, on a number of occasions, whilst making a coffee in the staff room). In this vein I am extremely grateful to the Geography postgraduates for making the School such a supportive and enjoyable place to work, in particular my officemates Jonathan, Jake, Lizzie, James, Alex and Jen, as well as Flo, Heather, Lucy and Stacey.

Finally to my family and to Aaron, for all your support - thank you.

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Acronyms

AMP – Asset Management Plan

AQA - A UK qualification awarding body

AS – Alfon School (Year 7 group engaged)

BERA- British Educational Research Association

BC – Braveley School (Year 9 group engaged)

CAT – Centre for Alternative Technology

CASE (studentship) – Collaborative Award in Science and Engineering

CC – Chalksmere College (Year 12 group engaged)

CCEA – Council for the Curriculum, Examinations and Assessments (Northern Irish awarding body)

CRB – Criminal Records Bureau

DCSF – Department for Children, Schools and Families (2007-2010)

DEA – Development Education Association

DSM – Demand Side Management

DTI – Department of Trade and Industry

EA – Environment Agency

EB – English Baccalaureate

ESD – Education for Sustainable Development

ESRC – Economic and Social Research Council

FAO – Food and Agriculture Organization (UN)

GA – Geographical Association

GCE – General Certificate of Education

GCSE – General Certificate of Secondary Education

IB – International Baccalaureate

KS2 – Key Stage 2 (Years 3 to 6: ages 7 to 11)

KS3 - Key Stage 3 (Years 7 to 9: ages 11-14)

KS4 - Key Stage 4 (Years 10 to 11: ages 14 to 16)

KS5 – Key Stage 5 (Years 12 to 13: ages 16 to 18)

KW – Kruskal Wallis one-way analysis of variance

NQT – Newly Qualified Teacher

OCR – A UK qualification awarding body

OECD PISA– Organisation for Economic Co-operation and Development Programme for International Student Assessment

PBC – Perceived behavioural control

PGCE – Post Graduate Certificate in Education

PPST – Papplewick Pumping Station Trust

STW – Severn Trent Water

TPB – Theory of Planned Behaviour

QCA – Qualifications and Curriculum Authority (now Qualifications and Curriculum Development Agency (QCDA))

WET – Water Education Trust

WJEC – Welsh Joint Education Committee (a UK examination board)

Chapter 1: Introduction and Overview

1.1 Context for the research

There is a growing global need to address the issue of water scarcity, as the world's population continues to rise and regions already vulnerable to water shortages risk becoming more so due to climate change. In the UK, we use approximately 150 litres of water directly *per capita* each day to wash, cook, drink and clean: not a large figure but one that is unlikely to be sustainable given projections of population increase. While *per capita* water consumption is projected by Defra to fall from 154 to 144 litres per day between 2010 and 2030, population increase will more than counteract this effect (Defra, 2011b). Indeed, in their 2009 *Regional Water Management Plan*, the Environment Agency predicts more than a 10% rise in population by 2017 for the East Midlands. In the Midlands as a whole, population growth could result in 1025 extra megalitres required every day by 2050 (Environment Agency, 2009c).

Future water scarcity is starting to be addressed in the UK, but people are not used to treating water as a limited resource. It is sold as a service and many parts of the country are still unmetered, so households do not pay according to the amount of water they use. Historically, supply has been governed by demand, but the transition to demand side management (DSM) has led to the water industry attempting to alter consumer demand (Medd and Shove, 2005b). One response to managing this transition is through environmental education. This has been the traditional strategy of water companies, as well as occasional public campaigns from the UK government, but

these tend to focus on homeowners and young children, to the exclusion of adolescents. Traditional environmental education also assumes that we actively consume water, acting under rational choice and making logical decisions (Warde, 2010). Under these circumstances, financial incentives and information provision should be effective in changing our behaviour. On the other hand, recent research into the sociology of water use argues that water is not something that is actively used and thought about: it is tied up in a multitude of consumptive activities in the home which may be undertaken for reasons of hygiene, health, relaxation or rejuvenation. These practices are strongly influenced by social norms, such as the daily act of showering, and habits, both of which gradually develop over time. It is for these reasons that research has shown that changing patterns of water consumption is too difficult a problem for simple traditional methods like information provision or market regulation to solve (Southerton et al., 2004b, Medd and Shove, 2005c, Southerton et al., 2004a). To be effective, education provision needs to be sensitive to these factors.

As mentioned above, young people (here defined as ages 11 to 18) have been largely overlooked in research on water behaviours and practices. Yet work on children's and young people's geographies has established that they experience specific barriers to action, including a feeling of powerless over water and environmental issues (Connell et al., 1999), with many of their actions being either determined or mediated by their parents or guardians (Gram-Hanssen, 2007, Valentine et al., 1998). While they are not responsible for the majority of water-consuming actions in the household, past studies have shown teenagers to be some of the biggest water consumers in the home especially with respect to showering (ech$_2$o, 2010). In addition, they will be responsible for making decisions about water use much sooner than primary school aged children, who form the focus of the majority of water company educational interventions.

Taking these factors into consideration, this thesis focuses on how education for water literacy could increase the uptake of sustainable water values amongst young people in the 11-18 age group in the UK.

1.2 Rationale for the research

This section outlines the key concepts and previous research which enables the research gap to be defined.

1.2.1 Previous conceptions of water and environmental education

Environmental education works to make learners more aware of environmental issues and foster the ability for them to address these problems (Cole, 2007). It has a natural place in geography and citizenship lessons, but is not limited to the school curriculum, being provided by a range of non-formal education providers, and indeed not restricted to children. However, Hogg and Shah (2010) found agency and social responsibility to act on climate change was higher amongst those who had learned about it at school.

Von Vugt (1999) argues that initiatives in water education have been seen to be underdeveloped and relatively ineffective so far. Sofoulis (2005: 457), in a paper on water consumption, criticises education programmes as "…another user-blaming tactic where experts tell users what broad environmental values they should hold, but avoid dealing with both the material barriers to change posed by the current designs of technologies and systems, and the cultural barriers of customs and habits". Water education is offered by all water suppliers in the UK, but their efforts tend to focus on primary school-aged children, and also traditionally centre around small actions that children can take to change their behaviour (such as turning off the tap whilst brushing their teeth), rather than encouraging thought about wider issues around

water scarcity, and why action is necessary and should be taken. Therefore a need can be identified for a more innovative kind of water education programme that demonstrates the connections between water uses in the home and wider environmental, economic and social issues, and which tackles the physical and psychological barriers inhibiting sustainable water consumption.

The link between environmental knowledge, values, attitudes and behaviours has been argued for over the last 30 years (e.g. Ajzen and Fishbein, 1980, Kaiser et al., 1999, Harland et al., 1999) with the classic assumption being that people consume environmental resources actively and in accordance with their beliefs and opinions. This supports the rational actor model or rational choice theory, which assumes people to be *homo economicus*, acting logically according to the information they receive and financial incentives they are offered (Warde, 2010). However, other authors, such as Duerden and Witt (2010), do not find a strong connection between values, attitudes and behaviours, and a multitude of papers consider the so-called 'value-action gap' (e.g. Brook Lyndhurst, 2007). Indeed, Shove (2010) queries why we expect there to be a link between values and behaviours at all. Particularly in the case of water, a number of academics have highlighted how using water is rarely a matter of choice: rather it is implicit to other essential activities such as washing (for cleanliness and personal hygiene), and cooking (Medd and Shove, 2006b, Sofoulis, 2005, Doron et al., 2011).

As young people are generally not affected by financial drivers, as they themselves are not responsible for paying water or energy bills, other potential drivers to action must be considered. Shove and other researchers have focused on the social practices model, which integrates social structures rather than leaving them as outside influences (Spaargaren, 2004, Southerton et al., 2004a). Practices come together to fit into everyday rituals and household routines, many of which involve water in less than conscious ways. Indeed, the ways in which water is consumed (typically in private spaces in the home:

toilets, baths and showers) makes it less likely that practices are discussed in public. This means people get locked into routines that they believe to be normal.

These two opposing models (rational actor and social practices) regard water use very differently, with the body of work on social practices envisaging that people do not act according to individual priorities or active rational choices. This challenges traditional forms of water education, which imagine water users, young and old, as having the power to change their behaviours to become more sustainable.

To overcome this difficulty, there is evidence that unsustainable social norms can be tackled through 'nudging' or gentle, indirect persuasion, as taken on by Ofwat (2011) and the UK Coalition Government (Service, 2011). Nudging initiatives can have a negative effect, however, inadvertently communicating the idea that high water use is normal (Sharp, 2006). Social marketing has also been used in relevant studies, tailoring behavioural change messages to different audiences with diverse motivations and barriers. However, Corner and Randall (2011) warn that social marketing would not be a beneficial tactic in situations where people's values completely oppose the aims of the programme.

Another drawback is the assumption that positive spillover will take place, where taking up one environmental action increases the possibility that others will be adopted too. Unfortunately there is little evidence that this actually happens, and negative spillover may be more common (where an individual is less likely to take up other pro-environmental behaviours because they perceive they are already 'doing their bit') (Crompton and Thøgersen, 2009). While nudging has been demonstrated to be effective (e.g. Schultz et al., 2007), it works by accepting the invisibility of natural resource consumption rather than making its role in actions more visible.

1.2.2 Water literacy and water citizenship

Increasing water citizenship through educational initiatives for water literacy has been identified as a possible way to address the challenges identified in the previous section. This involves using environmental resources to encourage engagement with and deliberation of issues, in order to build capacity for sustainable water management.

Environmental literacy has been seen as the core goal of environmental education (Carleton-Hug and Hug, 2010). The term is thought to have been coined by Roth (1968, cited in Scholz, 2011). It was taken up at the first Intergovernmental Conference on Environmental Education, convened by UNESCO in Tbilisi, Georgia in 1977 and more recently, the US National Environmental Literacy Project from the North American Association for Environmental Education (NAAEE) (McBeth and Volk, 2009). Water literacy, however, features much less commonly as a term in the academic literature, though it is mentioned by Amarasinghe and Sharma (2008) and Kumar (2002) on initiatives based in India, and also upcoming work from the Australian Cooperative Research Centre for Water Sensitive Cities (2013). Furthermore, it is a goal of the Alliance for Water Education and the Water Literacy Foundation. A body of work also exists on the energy literacy of American high school and middle school students (DeWaters and Powers, 2011, 2007).

Moreover, with respect to environmental issues, warnings have been made against treating people as consumers rather than seeing them as citizens. This links to the importance of building citizenship beyond purely promoting awareness (Gibson et al., 2011). Water citizenship considers the young person acting for the greater good; locally, nationally and globally. This belief stems from work on environmental and sustainability citizenship (e.g. Dobson, 2011, Goodwin et al., 2010, Bell, 1998) as well as citizenship education (e.g. Machon and Walkington, 2000).

Water literacy and water citizenship offer a potential route through the impasse between rational action and social practices outlined earlier, building knowledge around water issues to develop sustainable values, whilst tackling the barriers to acting to reduce water demand and consumption. I suggest that a water literate citizen is someone who is informed and knowledgeable about water use and issues, and is applying this knowledge to their values and their actions, whether that is achieved actively or subconsciously.

Lack of evaluation following environmental education initiatives has been criticised by Carleton-Hug and Hug (2010). While some previous studies have examined the effectiveness of water and environmental education interventions, mixed results have been obtained in terms of changes in attitudes and plans to act. For example, Goodwin et al. (2010) noted that positive changes in attitudes and reported behaviours occurred after environmental education, but this also happened in a control group that did not receive an intervention. Self-reported behavioural changes may not accurately reflect reality, and education may also have delayed impacts on behaviour later in life. Moreover, there is a dearth of research exploring the design and development of education materials, and the pedagogical and content elements which make them successful (or unsuccessful). The primary providers of water education are schools, water companies and charities, each of which has unique priorities and goals that also need to be considered.

A secondary school or college provides an environment where generations of future household decision-makers are brought together to learn, and it therefore acts as the ideal forum for increasing young people's understanding of the issue of water sustainability, and passing key messages on to households (Barratt-Hacking et al., 2007). Schools also have an important place within their local communities, influencing the socio-economic characteristics of people who move to and live in their catchment areas, developing strategies to solve local issues, and acting as community hubs (Miller, 1995, Harkavy, 1998).

1.2.3 Justification for focus on domestic water use

In this thesis, water literacy is taken to refer to a consumer's knowledge concerning the source, supply, delivery and treatment of domestic water used directly by themselves and the household of which they are a part: this includes the (on average) 150 litres used to hydrate our bodies, clean ourselves and our houses, and prepare food. While this takes into account water used for all domestic activities, it can be argued that this is a narrow interpretation of water literacy. This is the case because, for example, a consumer's water footprint includes the water used to produce groceries and other purchased goods, and averages at 3400 litres of water each day (Waterwise, 2007, Defra, 2008b).

I acknowledge that focusing on direct water use does not take into account the more than twenty times greater amount of *virtual water* consumed by an average individual. In fact, 90% of our water usage is accounted for in the production, transport and preparation of our food (Allan, 2011). Furthermore, only 5% of water extracted from resources globally is actually "consumed" by being removed from the hydrological cycle (Cosgrove and Rijsberman, 2000).

The decision to focus this thesis on direct water use was reached for two reasons. First, the research is conducted with young people in the 11-18 years age range, in particular looking at the actions they would have both the ability and the opportunity to change. Educating young people about virtual water is seen as very important, and indeed this forms a major part of the educational initiatives developed in the thesis for school pupils, as detailed in Chapter 7. I reflect in the Conclusion chapter that concepts such as virtual water are an engaging and interesting way to get young people thinking about their water use and water security more widely. However, teenagers do not yet have a great deal of control over the food and products that they purchase. Of course they do have some say over what groceries are bought by and for their family, and indeed may choose to adopt a vegetarian lifestyle-

possibly in part to reduce their water footprint. Nevertheless, the changes a young person can achieve on their own will mostly relate to their direct water use.

The second reason for focusing on direct water use was due to the way in which the project was initially conceived. As a collaboratively-sponsored doctorate, the CASE partners had some involvement in the design of the project proposal. Severn Trent Water are responsible for the supply of fresh water and treatment of waste water in the case study region, and so a concentration on the direct use of water in the home fits well with the Ofwat requirement for water companies to reduce domestic water consumption by one litre per property per day by 2015 (Ofwat, 2008). Furthermore, the priorities of the Environment Agency in relation to the Midlands region centre on greater water efficiency in the home and greater provision of metering, while reduction of direct water use in the domestic setting is also a focus of the 2011 White Paper *Water for Life* (Defra, 2011b, Environment Agency, 2009c).

In sum, this thesis focuses on the personal water use of teenagers and finding ways to build connections between this and water availability and consumption at a range of scales, through educational initiatives. While engaging young people in conversations about their water footprints could also be a very good way of developing water citizenship, it is something teenagers in the study region have only limited ability to achieve. Consequently, finding ways to encourage the reduction of *indirect* water use was not one of the aims of this project.

1.2.4 Key previous research on water use

Water has only recently been recognised as a pressing environmental issue in the UK, but we can look to Australia for more examples of relevant research. Fielding and Head (2012) discuss findings from the

Australian *Youth and the Environment* Survey, which showed that the 12-24 year olds surveyed felt that the availability of water was the most important environmental issue facing Australia in general and Queensland in particular. In the UK, the Geographical Association in association with Ipsos MORI conducted the *World Issues Survey* to establish the beliefs of UK Key Stage 3 pupils. Just 6% of pupils selected “the future of water, oil and gas” as a main issue affecting their area at the moment (Ipsos MORI, 2009).

Owen et al. (2009) produced a breakthrough report for Defra on UK adult public understanding of sustainable water use in the home using focus groups, a diary study, questionnaires and follow-up telephone interviews once information received in the focus groups had been processed by the participants. They reported low awareness and motivation to act, with only basic, small water efficiency actions tending to be known about. They found many people to view water use as a right, and conservation efforts tending to be linked to lifestyle factors rather than pro-environmental motivations. The researchers recommend developing understanding of water issues along with informing people about the benefits of their individual actions. However, there remains a lack of existing research on the water attitudes of young people in the UK.

A host of small-scale studies have been carried out on environmental education interventions, particularly in primary schools (e.g. Goodwin et al., 2010, Vaughan et al., 2003, Leeming et al., 1993) with each describing the positive impacts of education on learning; and, in some cases, behavioural change as well. Duvall and Zint (2007) critique seven studies on children’s environmental education, arguing amongst other things that few of them considered how teachers executed the programmes (a factor which is explored in this thesis). It is also notable that social practice theory and ordinary consumption were not mentioned in these articles.

It is in this context that I can delineate the research gap which my research seeks to fill. Although progress has been made recently, there is a clear need for research that brings together work on education to inspire sustainable behavioural change, with the growing field of investigation into the role that knowledge of social practices and norms can play in shaping water usage. The Ipsos MORI/GA survey showed a lack of concern by young people for water issues which needs to be addressed and the adolescent age group has been largely ignored in studies of social practices and environmental behaviours, in particular with an emphasis on water use and with a UK focus. Educational initiatives that increase water literacy and inspire young people to act with a sense of water citizenship are a potential way of achieving this.

The common thread that runs through this thesis is the idea of making water use visible across spatial scales, by exploring the potential for restructured school lessons to develop young people's conceptual understanding about personal water use and the connections between this and water consumption and availability at local, national and global scales. It is also important to consider how - in accord with the body of work on social practices - habits, routines and lifestyles may subconsciously involve water. While social practices and education researchers approach natural resource use from very different angles, the potential exists to use insights gained from a range of literatures to make water use more visible and recognisable.

1.3 Research Outline

Bearing the context and rationale described above in mind, this thesis focuses on the capacity of education initiatives to foster water literacy amongst young people, and the potential this has to nurture more sustainable behaviours, immediately and/or later in life, through developing and engendering a sense of water citizenship. Research into the pedagogical strategies and themes used in published water education resources provided guidance on the development of water

lessons for pupil cohorts at three secondary schools in the East Midlands of England that lies at the heart of my research. In this thesis I utilise the outcomes of my empirical work to explore the extent to which water use can be made more visible, so encouraging a sense of ability to act and water citizenship.

1.3.1 Research Aim and Questions

The aim of this thesis is *to explore the impact of initiatives for water literacy on the water citizenship of young people, specifically secondary school students*.

The specific research questions each relate to one of the analytical and discussion chapters:

1. How, and how well, do education materials currently encountered by young people in the East Midlands work with respect to making water use visible? (Chapter 4)

2. What is the current state of water literacy amongst young people in the East Midlands? (Chapter 5)

3. What are the social influences on water values, attitudes and behaviours, and how do these affect the development of both water literacy and water citizenship? (Chapter 6)

4. What are the wider insights that can be gained concerning the role of water literacy initiatives in increasing young people's water citizenship? (Chapter 7)

Present provision of water education (Chapter 4) was analysed through the collection and content analysis of secondary examination specifications (from the examination board Edexcel) and water education resources which are made available by informal providers such as Severn Trent Water and national and international charities. This was supplemented by a survey to secondary school teachers in the East Midlands region. These methods were chosen as they were perceived to be the most effective ways to gain an accurate picture of the water education currently on offer to secondary school students in the region.

In order to understand the current state of water literacy amongst young people in the East Midlands, and the social influences acting upon this, questionnaire and focus group data was obtained for three age groups (11-12, 13-14 and 17-18 years) at two secondary schools and one sixth form college (collectively referred to in this thesis as “the three schools”). This data was used to inform the design of lessons for water literacy, which were observed and followed by a second questionnaire and focus group to the same cohorts of students. The follow-up data allowed for exploration of changes in pupil values after water lessons, and a discussion of the barriers to water literacy and citizenship in young people.

1.3.2 Case study region: East Midlands, UK

Using the East Midlands as a case study area links to the priorities of the ESRC CASE studentship partners, Severn Trent Water (STW) and The Papplewick Pumping Station Trust (PPST). The former is the clean water and waste water service provider to the Midlands region, supplying more than 4.2 million households (Severn Trent Plc, 2013). The latter is the charity attached to a Victorian Pumping Station close to Nottingham, with the Station considered one of the finest examples of its kind. PPST also has an education arm, the Water Education Trust (WET), which aims to utilise the history of the Station to promote water

sustainability amongst the local community, whilst also upholding the strategy of Local Agenda 21 (Water Education Trust, 2005).

Indeed, maintaining a focus on one region of the UK will enable the development of an education programme tailored to its locality. Local and regional relevance is recommended by a number of studies on environmental education and initiatives (e.g. Scannell and Gifford, 2013, Seyfang and Smith, 2007) and the report of the Walker Review to the UK government (2009) suggests a campaign of key national messages on water efficiency targeted at a community level.

In the Midlands region, 41% of water abstracted is for public water supply, (Environment Agency, 2009c, Environment Agency, 2009d), so a focus on domestic consumption is well justified. Even by 2014-15, metering provision in the Severn Trent Water region is projected to be only 42% (Ofwat, 2009) and so there is a clear need for additional, soft measures to promote water efficiency and conservation.

Furthermore, with agricultural needs making up less than 1% of water abstracted in the region (Environment Agency, 2009c), the populace are clearly reliant on food produced elsewhere. Taking into account the water used to manufacture our consumer goods, the average UK water footprint totals 3400 litres per person per day (Waterwise, 2007, Defra, 2008b). This means people living in the UK arguably bear some responsibility for water abstracted and consumed elsewhere in order to manufacture goods and grow food crops, and there is a need for these connections to be made clearer. There may be a role for water policy to play in encouraging more thoughtful and more efficient domestic water consumption in the East Midlands.

1.3.3 Policy background

Since privatisation, each water supplier has had to submit a five year Asset Management Plan (AMP) to the regulator Ofwat, which is tasked with ensuring that water suppliers do not abuse the monopolies they

hold over their regions. We are currently in Year 4 of AMP 5 (April 2013-March 2014). Year 1 was the first time that regulatory targets for water efficiency were put in place: specifically, a one litre reduction per customer per day in water consumption. This amounts to 3.27 megalitres per day for Severn Trent Water (STW). There is also an obligation to educate and inform customers in order to build an evidence base (Pers. Comm. D. Clarke and M. Foster, 2010). Policy since 1996 dictates that every water company promotes water conservation to its customers (Ofwat, 2008). For these reasons, there is a need for academic research that explores the best ways of educating people about water and encouraging reductions in water demand. There is recognition that understanding of water use and behaviour is limited and that Ofwat requires better evidence on the effectiveness of water efficiency projects (National Audit Office, 2007).

The Water White Paper was released in December 2011, providing a policy framework following recommendations from the Cave and Walker Reviews and the government-appointed review of Ofwat (Defra, 2010b). *Water for Life* emphasises the need for a campaign to communicate to the public which strengthens links between personal water use and the local environment.

Additional supporting policy lies in the Eco-Schools programme, built around the previous *Sustainable Schools* strategy from the Department for Children, Schools and Families (DCSF). This was a national framework to help every school become 'sustainable' by 2020 (DCSF, 2008). Eco-Schools is an international awards programme which utilises a number of the same routes to sustainability (Eco-Schools, n.d.-d).

Support for water education also exists in the National Curriculum. The now disapplied programme of study for Key Stage 3 geography (2007-2013) states that "geography inspires pupils to become global citizens by exploring their own place in the world, their values and their responsibilities to other people, to the environment and to the

sustainability of the planet." It also explicitly mentions sustainability and climate change (QCA, 2007a). The new National Curriculum, which comes into force in September 2014, is more focused on knowledge and conceptual understanding. For geography at Key Stage 3 this includes the objective to "understand how human and physical processes interact to influence and change landscapes, environments and the climate", and also study of the "use of natural resources" (Department for Education, 2013a: 101). At the time of writing, draft curricula for Key Stages 4 and 5 had not been released. It is important to note, however, that schools with academy status do not have to follow the National Curriculum and so have greater flexibility over course content.

It can be concluded in this section that there is policy support for water education, and places for it to be taught within the National Curriculum. However, water education has been critiqued for presuming that acquired knowledge can be applied to rational water-using behaviours in the home, when consumption is affected by socially-shaped habits, routines and practices. This research strives to find a way forward between the rational actor and the social practices models in developing the water literate citizen through innovative educational interventions.

1.4 Overview of chapters

Chapter 2 introduces and reviews the literature relevant to my doctoral research, with a particular emphasis on contrasting theories pertaining to values, attitudes and behaviours, with those embedded in the sociology of ordinary consumption. I then address water literacy, introducing a model of water citizenship and responsibility that builds on the existing body of literature as a potential way forward.

Chapter 3 describes and justifies the research methods selected for the research, covering the ethical procedures adhered to and examining challenges encountered during the educational research.

Chapter 4 analyses current provision of water education for 11-18 year olds in the East Midlands. The remainder of the chapter examines the pedagogies and themes used to represent water in educational materials produced by non-formal education providers, including charities and Severn Trent Water.

Chapter 5 establishes and discusses the current state of young people's water literacy in the region. The chapter draws out tensions between the nature of water as unlimited but limited, visible yet invisible, and used both actively and inactively.

Chapter 6 builds on knowledge and understanding of the primary influences on young people's water attitudes and behaviours gained in Chapters 2 and 5, and the potential challenges to water literacy and water citizenship identified in Chapter 5, to synthesise the reasons for these attitudes, behaviours and challenges. This chapter investigates the interactions young people have with social and subconscious influences on their water consumption.

Chapter 7 outlines the design and teaching of one or more enhanced water lessons in each of the three schools, and examines pupils' understanding and outlook afterwards using results from follow-up questionnaires and focus groups. The chapter also discusses the challenges of working in schools and how the educational experiences differed between institutions.

Chapter 8 presents the main findings and conclusions emerging from the research and considers their wider implications. These are framed in terms of the research questions posed in Section 1.3.1. Finally, the thesis recommends a way forward and future research agenda for better defining the contribution that education could make to water literacy and conservation.

Chapter 2: Literature Review

This chapter investigates the literature and theory relevant to the thesis aim and research questions. It begins with an exploration of literature on understanding water use, including three models that can be applied to this: the rational actor and social practices model described in the Introduction chapter, as well as a model of citizenship and responsibility. The second section considers UK water management, including hard and soft measures for managing demand and current policy. Section 3 briefly considers sustainable communities, while Section 4 reflects on water education, including a history of the environmental education and education for sustainable development (ESD) fields which has been used to produce a definition of water literacy.

This thesis broadly fits into and contributes to the research field of children's geographies, which looks at how children interact with place and space in their everyday lives, often in very different ways to how adults do this. The way they live is often heavily mediated by adults (Valentine et al., 1998). More recently, the fields of young people's geographies and geographies of youth have emerged in response to the issues associated with the wide age range covered by children's geographies and the blurred boundary between childhood and adulthood. Valentine (2003) takes this idea further by emphasising that from age 16, young people may be in a variety of settings including formal education, vocational training and employment. Their maturity and level of independence from parents can vary greatly depending on their circumstances, and these are important considerations to bear in mind when reading this chapter.

2.1 Understanding water use

2.1.1 Valuing water

Values can be defined as the principles and conditions which implicitly inform a person's choices in life (Jurin and Fortner, 2002). Individuals can hold a multiplicity of competing values and beliefs according to their different social roles (Pahl-Wostl et al., 2008). Equally, values change over time according to events and experiences in a person's life (Hards, 2011). The concept of environmental values has philosophical and economic origins, and consequently past environmental consumption studies have tended to focus on quantifiable values, as these can directly inform technological decision-making. Likewise numerical results are easier to manage, and more objective and defendable (Burmil et al., 1999, Gibbs, 2006). A seminal paper by Costanza et al. valued the world's ecosystem services and nature capital at US$33 trillion per year (Costanza et al., 1998). However, this kind of work does not recognise the underlying values held by individuals and as such, there has more recently been a movement towards more qualitative work on valuing the environment.

In comparison to this developed field, significantly less work has been done on public values towards water. In a similar vein to the work described above, several attempts have been made to put an economic value on water supply (e.g. ITT, 2010), but not a great deal of research exists on social, environmental and symbolic values of water (Medd and Shove, 2006a). While values are a useful starting point for changing behaviour, a difficulty is that people may not hold conscious values towards water in countries where it is traditionally viewed as plentiful. Owen and colleagues found a lack of understanding of water security issues and little motivation to consume less of the resource, even when excessive use is acknowledged (Owen et al., 2009). However, Ofwat has recognised the need to start encouraging people to value water more greatly if we are to reduce future demand (Ofwat, 2010). An

important consideration to make is the transformation in values held towards water over time. It can be seen that the value of water as a utility increased when everyday washing gradually became a social norm (Medd and Shove, 2005a), and water-consuming technologies like dishwashers and power showers became commonplace in homes across the country. In this way, people became involved in water-using practices without making a conscious decision to consume more of the resource. While social norms can encourage the formation of values, values in turn can result in the creation of social norms; for example, valuing the sustainability of water resources could mean it becomes more 'normal' to conserve water at home. Norms and practices will be discussed in greater detail later in this chapter.

2.1.2 Nature of water

While lessons can be learned from other areas of environmental management, water is a unique resource which is valued for different reasons in varying locations. There is a body of research on the distinction between clean or 'good' and dirty or 'bad' water, and how the former is celebrated and appreciated for its purifying and cleansing qualities, while the latter is perceived as something that is harmful and must be removed as quickly as possible. Kaika (2005: 54) describes this as a "hydrophilia" of water in the private space of the home, and a "hydrophobia" of water in the public domain. Natural bodies of water are appreciated for aesthetic reasons, but the water that runs through pipes to our homes could be seen as a completely different resource: what Bakker describes as the "hydrosocial cycle" (Medd and Marvin, 2008, Bakker, 2003a: 49). Hinchliffe (1997) develops these ideas further in terms of energy use, likening the home to a haven from nature and the outside, and a means of distancing from external issues. In other words, we can hold different values inside and outside the home, and indeed at work or on holiday.

Water is also difficult to value due to its invisibility: it is piped out of sight and plays a close to invisible role in many household activities. Those actions in which it is visible, such as showering, often take place behind a closed bathroom door. O'Toole et al. (2009) found a poor connection between the results of a family diary study on water use and those obtained from a telephone survey to one member of the household, demonstrating the potential not only for differences between family members' water usage, but also the difficulty for one person to fully know how much water is being used in their household.

Particularly since privatisation of the water industry, water has been sold as a service alongside gas and electricity. Generally however, thought is only given to water when the service is interrupted or the bill arrives (Doron et al., 2011), and therefore some kind of external structural change is required for water use to shift into active consideration. This is the reasoning behind assertions that infrastructure needs to be addressed if attitudes towards water are to be changed (Medd and Shove, 2006b). In contrast to viewing water as a service, it can also be perceived as a human right. This mind-set is encouraged by the fact that water must legally be provided to all households (Sharp, 2006). These issues make valuing water a complex subject.

2.1.3 Attitudes and behaviour towards water

Building on this work on values, we can turn to considering attitudes: if demand is to be reduced, it may well be beneficial to recognise public attitudes towards water and develop strategies sensitive towards these. However, this is still an emerging area of research in comparison to the environmental attitude field more generally. Attitudes towards water were the focus of a study by Gilg and Barr (2006), who surveyed 1265 households in Devon on their water usage. Using cluster analysis they divided the surveyed population into committed environmentalists, mainstream environmentalists, occasional environmentalists and non-

environmentalists, stemming from three identified factors: purchase decisions, habits, and recycling/post-consumer waste. They did not find a clear relationship between social values and environmentalism, but attribute this to the fact that participants who had some environmental inclination could tell which questionnaire responses would be most socially acceptable (Barr and Gilg, 2006, Gilg and Barr, 2006). Water attitudes were also explored in deliberative research for the Consumer Council for Water in 2006. It was found that participants' attitudes towards water were very much influenced by their opinions on the privatisation of the industry and their perception of how much water was being wasted by suppliers (Opinion Leader, 2006). It would be very unlikely that these kinds of attitudes would have been found if the study had been extended to children, however. Both a geographical and a historical element to attitudes were identified: the UK experiences regular rainfall, and having never been without water (apart from in terms of short hosepipe bans or brief interruptions in supply), individuals find it difficult to see this as a tangible future occurrence (ibid.).

In a similar way, Owen et al. (2009) found a strong opinion that water was a right that people were entitled to, and a lack of understanding of how it could be limited. This Defra study of adults' water attitudes and use in the home is referred to a number of times in the thesis as its findings relate to those of the present PhD study, particularly in the absence of a similar report on young people in the UK. Previous studies of young people's attitudes towards the environment and water include the Australian *Youth and the Environment* survey (Fielding and Head, 2012). Amongst both the 12-17 and 18-24 year olds surveyed, availability of water was nominated as the most important environmental issue facing both Queensland and Australia more widely. On the other hand, as described earlier, in the GA/ Ipsos MORI *World Issues Survey* to UK Key Stage 3 pupils, "the future of water, oil and gas" was only viewed as a main issue affecting their area at the moment by 6% of respondents, and a main issue affecting the world by

13% of respondents (Ipsos MORI, 2009). This suggests that British young people's values and attitudes towards water have not been strongly developed, and teenagers perhaps do not comprehend a connection between water use at home and global water security.

A wealth of studies has explored the link between environmental values, attitudes and behaviour, and many of these utilise the Theory of Planned Behaviour (TPB) (e.g. Duerden and Witt, 2010, Kaiser et al., 1999). This is a developed version of Fishbein and Ajzen's Theory of Reasoned Action (TRA), which suggests that people use their knowledge to act rationally (Ajzen and Fishbein, 1980). Harland et al. (1999) suggest that the TPB can be utilised to determine motives for pro-environmental behaviour because predictions can be made by looking at intentions: these incorporate a person's attitude, their perceived ability and their social constraints. Kaiser et al. (1999) see attitude as a very good tool to predict environmental behaviour, when taking into account situations where people do not have full control over their actions.

However, there is a large body of work that questions this relationship. Duerden and Witt (2010) summarised literature in the field to find only a weak link from knowledge and attitudes to behaviour. They conclude by calling for a greater understanding of how knowledge and attitude initiate behaviour. Other critiques come from the area of social practices research. For these reasons, it is useful to consider underlying models of water usage behaviour.

2.1.4 Underlying models of water usage behaviour

We can consider two models or theories in relation to water usage behaviour, building upon the introduction given in the previous chapter. The first is the rational actor model or rational choice theory, which sees people as making logical decisions in relation to water. Second is the

social practices model or social normative theory, under which people are envisaged as tied into routines, habits and cultures of water use, and not making active choices about it. Warde (2010) describes these two models as *homo economicus* and *homo sociologicus* respectively, and sets out the main strategies traditionally used to change behaviour according to these (Table 2.1). It can be seen from this that Warde suggests informing people by education or utilising monetary incentives would only be effective under rational action. While stressing that these models still have their uses, Warde argues that we should be recognising the space between them as a place for new opportunities (Warde, 2010). It is here that I will suggest it would be useful to consider citizenship as a background to thinking about how water values inform behaviour.

Table 2.1 Traditional strategies of changing behaviour (after Warde, 2010)

	Authoritative regulation	**Personal education**
Homo economicus (rational action)	Financial incentives	Information
Homo sociologicus (normative action)	Prohibition	Conversion

Rational actor model

Rational choice theory argues that people will make decisions about their actions after calculating the associated costs and benefits, and determining which path will have the most favourable outcome (Scott, 2000). This relates to work on the Theory of Planned Behaviour considered earlier in this chapter. The main criticism of the rational actor model is that it operates well for individual decisions but not for collective ones (Renn et al., 2000): people tend to make decisions

about collective resources that take into account the actions and decisions of others, whether these are known or not. This is the underlying concept behind Game Theory and the Tragedy of the Commons (Turocy and von Stengel, 2003, Hardin, 1968). Situations where water is unmetered and individuals do not have altruistic motives to conserve the resource are when the rational actor model is least likely to be at play. On the other hand, where there are economic incentives to reduce water usage or an individual holds values which make them reduce their consumption, they are more likely to be operating under the theory of rational choice. This is supported by the fact that metered households use on average 20 litres less water per day than unmetered households (Environment Agency, 2009d). Because of this identified need for financial incentives, it could be seen as unlikely that young people will engage in water consumption according to rational choice, but improving their understanding of the reasons for reducing consumption may make rational action more likely.

Further evidence that rational choice theory is unlikely to be applicable to water use in practice can be seen through work on the value-action gap (e.g. Kollmuss and Agyeman, 2002, Blake, 1999), where a disparity can be noted between expressed values and actual behaviours. Brook Lyndhurst note the existence of this in their 2007 report for Defra on sustainable energy consumption in the home (Brook Lyndhurst, 2007). They suggest that this disparity is especially noticeable in the case of energy consumption because of the intrinsic role it plays in contemporary life.

Elizabeth Shove, however, suggests that the value-action gap should not perplex academics: it involves us assuming values lead to actions, which she argues should not necessarily be the case (Shove, 2010). Influences outside an individual's control mean behaviour cannot easily reflect values, and there are higher structures which shape how products are consumed by an individual. The 2006 report *I Will If You Will* commissioned by Defra and the Department of Trade and Industry (DTI) explains the gap between environmental values and behaviour

through patterns of unsustainable consumption which are difficult to break out of (Sustainable Consumption Roundtable, 2006). Southerton et al. (2004a) describe concepts of path-dependency, lock-in and scripts in the formation of habits, which involve the grouping of consumptive activities into social practices. By considering the practices rather than the individual activities, we can start to unpick the significance of particular modes of consumption and the reasons for them (Southerton et al., 2004b).

A gap between sustainable values and less sustainable actions can lead to cognitive dissonance, where a conflict between attitude and behaviour tends to make an individual feel uncomfortable, leading to a number of possible shifts taking place.

The individual could take on new greener behaviours which follow their attitude once they are alerted to the gap being present, for example through information provision (Science for Environment Policy, 2012). Alternatively, the individual may adjust their attitudes towards their behaviours. If a person is persuaded to engage in an environmental action, they might subsequently shift their attitude based on how they now behave. This is likely to result in them continuing to engage in the future (persistence) (Gardner and Stern, 1996, Crompton and Thøgersen, 2009). The person may even adjust their attitudes more generally as a result of engaging in a specific environmental action; in other words, seeing themselves as an environmentally friendly person. This could encourage them to take on further actions which reflect this attitude (positive spillover) if the person feels that other behaviours are inconsistent with their new environmental activity (Crompton and Thøgersen, 2009).

However, the change resulting from cognitive dissonance could also be a shift towards less environmental or ‘green’ attitudes due to unsustainable behaviours. This would usually be where other barriers to action are recognised, for instance the restrictions of infrastructure, or

not being bothered to act. Alternatively, negative spillover may occur, where the individual feels they are already 'doing their bit' for the environment and do not need to make a concerted effort to take action in other parts of their life. The new environmental activity may even get dropped because it is perceived that its effect is 'cancelled out' by other unsustainable behaviours (Crompton and Thøgersen, 2009).

Which of these processes takes place is likely to be influenced by whether the individual has pro-environmental values (Crompton and Thøgersen, 2009). Thøgerson and Ölander (2003) suggest positive spillover is unlikely unless the individual has strong personal pro-environmental norms.

This body of work will be utilised in the thesis to explore young people's chosen pro-environmental behaviours. I also return to this discussion later in this section under the theme of citizenship and responsibility.

Social practices model

Spaargaren suggests replacing the attitude-behaviour model with a social practices model, as this would bring social structures into the forefront of the analysis of consumptive activities, rather than leaving them as outside influences (Spaargaren, 2004, Southerton et al., 2004a). Hards (2011) provides a comprehensive history of social practice theory. Sociological and behavioural economic research has shown that people are not entirely *Homo economicus*: rather, they act according to a wide set of prevailing and changing social norms and shared understandings. A practice-based focus considers why there is a gap between attitudes and behaviours, and why behaviours might not reflect values.

Shove (2009) breaks down social practices into three elements: materials (objects and tools); skills (or know-how); and meanings (or images) (Figure 2.1).

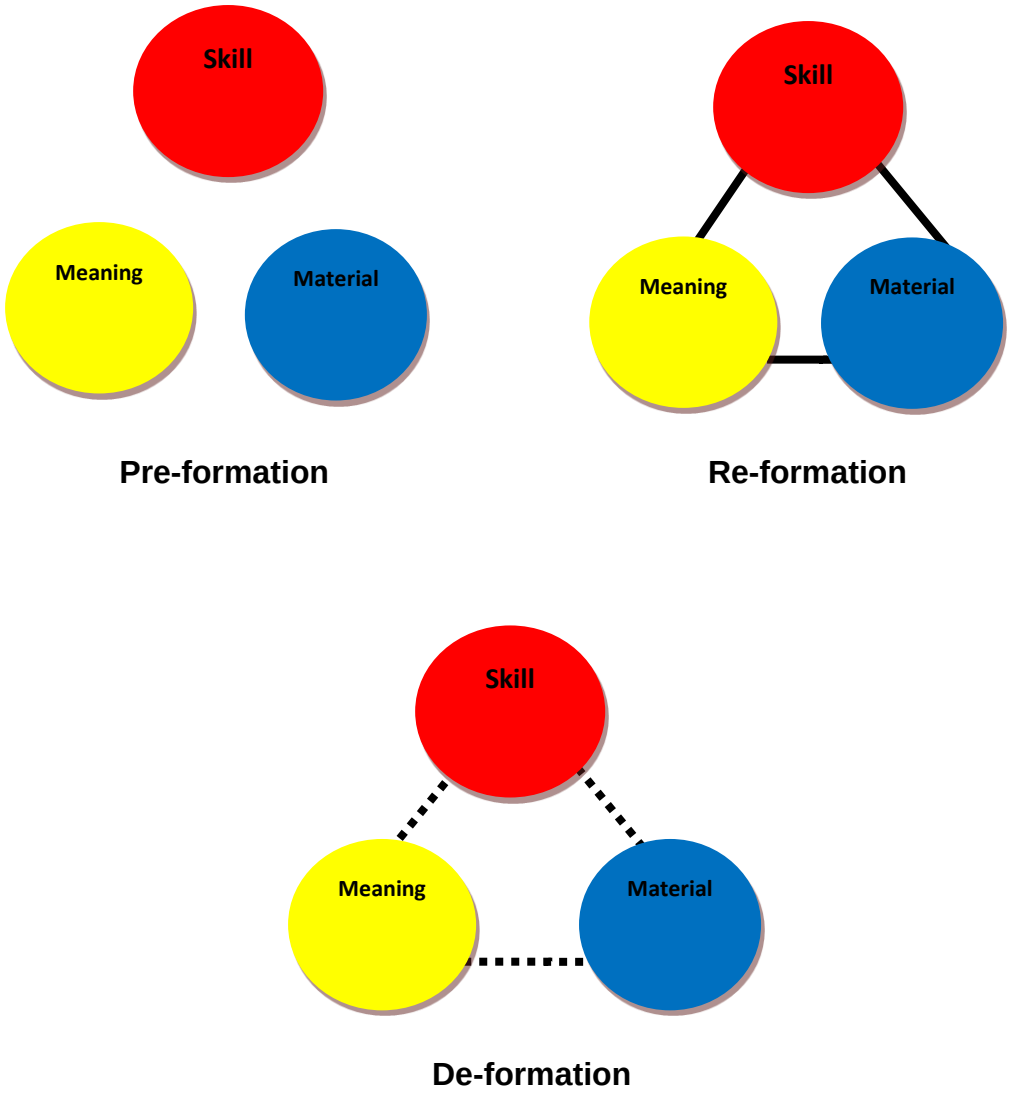


Figure 2.1 Making and breaking links between the elements of social practices (After Shove, 2009)

For instance, in terms of showering, shower equipment and running water are required (materials); knowledge of how to make the equipment function is needed (skills); and concepts of cleanliness and convenience play a part (meanings). Shove (2011) argues that changes in social practices over time are the result of the reorganisation of this model and its elements, for example, the gradual movement from

bathing as a public activity to a private one. She also highlights the importance of rituals and routines in showering, and how these slot into everyday life. Routinisation brings together unconscious actions into a conscious daily life pattern (Giddens, 1984). This pattern means that changing the composition of one practice will have knock-on effects on others. Equally, it can enable an understanding of why practices which command large amounts of water are chosen over more sustainable ones (Shove, 2011). As many water-consuming habits are linked to hygiene, they form part of early childhood training. Therefore there is a need to de-routinise these habits in order to encourage the adoption of more sustainable ones (Sofoulis, 2005).

There are a number of practice-focused water researchers, including Shove, Southerton, and Gram-Hanssen, with this becoming a dominant viewpoint in the UK and Australia. This body of work is a key focus of Chapter 6. In her 2007 paper, Gram-Hanssen focuses on teenage water and energy consumption in relation to cleanliness practices. She relates teenagers' desire to not smell of sweat as motivating regular clothes changes and showering. She also emphasises the influence of parents and peers on consumption behaviour (Gram-Hanssen, 2007). As part of the *Traces of Water* workshops in 2005, Medd and Shove (2005b) explored the embedding of water consumption into daily routines, arguing that water usage is tied up in a multitude of activities in the home (Medd and Shove, 2005c). Certainly, water is an integral part of practices relating to cleanliness, health and relaxation, where its actual volume and use is barely given a thought. For instance, a bath may be viewed as a way to unwind and soothe sore muscles. These practices are shaped and sustained by people, gradually becoming what is accepted as normal. At the same time, people will transform social practices over time by carrying them out in novel ways, and technological changes could lead to the adoption of new social norms in water use (Hards, 2011, Medd and Shove, 2005c, Medd and Shove, 2006a, Shove, 2011). An individual may be exposed to different types

of norm that conflict, for example a child could be influenced by their school friends, their siblings and their parents.

In another way, Shove et al. (2012: 73) write that “Daily showering, viewed as a totality, is being reconfigured by subtle but cumulative differences in the elements of which it is formed, including plumbing technologies and products, and in how these are integrated by its many carriers, all of whom take their routine to be *the* normal thing to do.” It is therefore important to consider the role of infrastructure and hard measures of water demand management, which will be considered in the next section of this chapter.

Water citizenship

Citizenship, on the other hand, moves individuals away from acting according to rational choice or social norms (Bevir and Trentmann, 2007). Citizens must engage with economic, social, political and environmental sources of knowledge and use these to deliberate and reflect on their outlook (Lambert, 2002). Environmental citizenship can be defined as acting for the common rather than the individual good, in a way that protects or preserves the environment (Dobson, 2007). In this vein, water citizenship is unlikely to be displayed by anyone who views themselves as a water ‘customer’ as this would suggest a focus on self-interest rather than societal needs.

Dobson (2007) stresses that environmental citizens have both international and intergenerational responsibilities, and thus must consider the implications of the decisions they make. This suggests water citizenship should be acted out over geographical and time scales (and the role for these elements in water education is a key argument of this thesis). Indeed, Bell (1998) stresses that a sense of responsibility can be developed by actively thinking about possible, probable and preferable futures, and understanding the consequences of their actions on the likelihoods of particular scenarios happening. Dobson suggests that environmental citizenship unites the curricular

themes of citizenship and environmental education, and therefore the school is the ideal forum to promote environmental citizenship (Dobson, 2007, Dobson, 2003). Therefore, there is likely to be potential for cultivating water citizenship in this environment.

In order to be water citizens, it could be argued that individuals need to become active consumers of water. Both Lee and Hirschman outline the active consumer as an individual who finds new ways of using a product or resource, which are suited to his or her specific requirements (Lee, 2006, Hirschman, 1980). While water is used for a multitude of different personal uses in the home, these tend to be scripted by technological instruments and plumbing: for instance, the amount of water used in a dishwasher cycle is pre-established, not selected by the user. Trentmann (2006) likens the active consumer to the citizen consumer. It follows from this that in order to be both a citizen and a consumer, a water user should be active in their consumption of the resource. This requires acknowledgement of water consumption and the practices it is currently inconspicuously a part of. However, the active water consumer is restricted by the infrastructure of the home and the daily routines into which water consumption falls. An example of where water consumption has been made more active is O'Toole et al. (2009), whose study involved putting a card and pen on the bathroom door to aid completion of a diary study.

Another difficulty in fitting water into the theory behind active consumption lies in the way in which it is priced: in many cases, still a fixed yearly cost, and even where a property is metered, not priced according to its full value. For those who are not metered, the price paid is not affected by volume used, so active choices to save water are likely to only be made if the user feels a strong moral or environmental pull to conserve water. On the other hand, it is important to appreciate that individuals who are acting sustainably without actively acknowledging it can still be viewed as water citizens. Seyfang (2006)

in particular does not dichotomise ecological citizenship and sustainable consumption, instead seeing the former as a strong motivator for the latter.

For young people, water citizenship could be a highly viable option, and so we need to now consider how it could operate on a range of scales. Scannell and Gifford (2013) queried British Columbians about their engagement with climate change and attachment to their surroundings after reading about local or global climate issues. The study found that the more attached to a local place an individual was, and if the reading was locally focused, the researchers perceived that the individual was more likely to be 'engaged' with climate change. Scannell and Gifford suggest that an everyday element is absent in climate change communication as well as the potential implications for health, unlike the connection that is made between the hole in the ozone layer and skin cancers. They suggest that this psychological distance increases the distance between awareness and engagement (ibid.) - or perhaps values and actions. This raises an issue with feeling attachment and responsibility towards water resources internationally and globally.

This chapter will not go into the theoretical discussions around citizenship more broadly as I have elected to focus on environmental and sustainability citizenship, and citizenship education in secondary school geography lessons. However it is essential to discuss scales of responsibility in order to consider how water citizenship is enacted over space and time.

There is a large and well-known body of work on place and space in human geography, for example by Thrift (2009), Massey (1991) and others. A history of theoretical debates about scale can be found in Marston et al. (2005). Herod (2009) also summarises recent debates on scale, presenting metaphors of scale as a ladder (local at the bottom and global at the top), scale as concentric circles (local in the middle and global round the outside, and scale as Russian Matryoshka

(nesting) dolls. Another metaphor included in his discussion is scale as a network of, for instance, tree roots, where divisions between scales are unclear. This deals with the issues caused by fixed conceptions of scale boundaries (Marston et al., 2005). Nested scales, however, are central to many of the arguments made about scale. I would suggest that this is the best way of encouraging water citizenship amongst young people, as it demonstrates how the personal experience sits in the global context. Desforges et al. (2005) summarise work by geographers on space, scale and citizenship. In particular, they note the spatial and time scales over which citizenship can be enacted, while also paying attention to a model of the sustainable citizen as acting out the responsibilities of citizenship at different scales (for example, linking actions at home to global issues) (Desforges et al., 2005).

Indeed, citizenship and scale are inextricably linked, as people hold multiple identities and 'belong' to different spaces. According to Lambert (2002: 102), "A sophisticated sense of scale can help students understand their role as global citizens who exercise daily (individual) local choices that can have global (universal) effect". Continuing to bring this conversation back to education, Brooks and Morgan (2006: 6) try to bridge the gap between academic understandings of 'place' and what is being taught in school geography. They look at places that are not the "curriculum 'usual suspects'", and advocate the 'place study' enquiry. Connecting the distant with the local, and the future with the present, may work to engender a sense of citizenship and responsibility amongst young people. This works with Dobson's (2007) definition of environmental citizenship as acting for the common rather than the individual good, in a way that protects or preserves the environment.

It is also pertinent to consider citizenship education, and citizenship in geography education. Marsden (2001) provides a summary of the history of citizenship education, from the moral basis of citizenship in Christianity, to national and imperial citizenship and then, more broadly, world citizenship education. He describes the emergence of eco-citizenship since Earth Day in 1970, and distinguishes between

education about, in/through and for citizenship. Education *for* citizenship - in a similar way to education for the environment - is seen is as the way to encourage action, but historically evidence associates it with a set of instructions, and so there is potential for indoctrination (Marsden, 2001).

Machon and Walkington (2000) discuss overlaps between citizenship and geography, including the idea of 'a sense of place', sustainability and reflection. They emphasise that geography's spatial focus could help students think about their actions across local and global scales. The place for citizenship in geography education was set out by the 1998 QCA final report of the Advisory Group on Citizenship, entitled *Education for citizenship and the teaching of democracy in schools* (also known as the Crick Report). This provided three elements of education for citizenship: social and moral responsibility, community involvement, and political literacy. The report also emphasises the opportunity to teach citizenship education in geography (as well as history and English) (Butt, 2001). Butt (2001) considers some of the providers of global citizenship resources (such as Oxfam) which directly link to school geography education, thereby demonstrating a clear role for geography in the teaching of citizenship education.

However, citizenship is not a straightforward fit into geography teaching. Lambert and Machon (2001) describe the tension involved in teaching of the elements of citizenship within the hierarchical structure of a school. It is also, of course, important to acknowledge that teachers will bring their own values to teaching, and learners to learning. Morgan (2001b) argues that teachers play a role in 'constructing' the world and actively produce knowledge as 'cultural workers', with students encountering different narratives from the various teachers they engage with (ibid.).

Responsibility

Responsibility is a concept central to the thesis, and Barnett et al. (2011) write about the connection between responsibility and behaviour change. They criticise a policy focus on changing either attitudes or behaviours, also suggesting that we should not focus on consumption because it is often unconscious and habitual. Supporting sustainable practices whilst encouraging conversations about everyday and ordinary behaviour in order to make these more conscious is an alternative focus (Barnett et al., 2011). However, different levels of both responsibility and ability to act are assumed by education providers, with children being variously assumed to be able to heavily influence their household's water consumption, or only be able to engage in small actions.

Indeed, small actions are sometimes all that even adults are perceived to be capable of. *Are you doing your bit?* was a campaign run by the UK Labour Government Department of Environment, Transport and Regions from 1998-2000, which aimed to overcome barriers to action like apathy and helplessness (DETR, 2001). Hobson (2002) criticises this kind of message for assuming citizenship is a direct result of information provision, and that filling this 'gap' in knowledge will mean people immediately want to be more environmentally friendly, with sustainable consumption the assumed way to do so. Other academics have also criticised this message, for instance because it encourages simply changing the style of consumption rather than reducing it (Maiteny, 2002), or because it erroneously suggests small simple steps will have a big impact on the environment (Crompton and Thøgersen, 2009, MacKay, 2008). Information provision does have its role though: Kellstedt et al. (2008) found in their survey to American people about climate change that the more informed individuals felt a lower sense of responsibility. They note that this is self-reported informedness, so it could be the case that those who thought they were ill-informed actually knew more than those who considered themselves informed (the idea of 'known unknowns'), and so it can be argued that there is a place for

offering information even to those who feel knowledgeable about an issue already.

Kollmuss and Agyeman (2002) state that an individual's sense of responsibility depends on their locus of control, and therefore whether they feel their own personal actions would make a difference, which is likely to be even more noticeable amongst younger people. This could also reduce the take-up of small pro-environmental behaviours. On the other hand, an individual might recognise their lack of personal action in accordance with their personal values (cognitive dissonance) and blame this on a broader situation or the lack of perceived effort by governments, companies, or society more generally (Babcock, 2009). This relates to the idea raised earlier of attributing water wastage to water companies and other businesses.

Water footprints and virtual water

Another way of considering water citizenship and responsibility over spatial scales is through water footprints and virtual water. Embedded, hidden or virtual water encompasses the water used in all areas of manufacture of a good, also known as the water footprint. While direct daily consumption of water averages at 150 litres per person, in the UK each person uses an approximate average of 3400 litres of water daily when taking into account the water used in food production, clothing manufacture and services used (Waterwise, 2007, Defra, 2008b). This can be compared to 6800 litres in the USA and 1900 litres in China. While the UK footprint appears sensible (and is close to the global average of 3405 litres), 71% of this is made up of imported water (second only to Japan and Italy), compared to a global average of 16% (Waterwise, 2007). Indeed, the UK is the sixth greatest net importer of virtual water in the world (Chapagain and Orr, 2008). This means we are far from self-sufficient and are having major impacts on countries that are already under water stress, including Spain and Pakistan (ibid.) which supply us with some of our fruit and vegetables. Clearly the level

of control individuals have over their water footprint may be limited (without making major changes to their lifestyle) but an increasing consciousness and understanding of our impacts on water availability in other countries is a key element of water citizenship.

While this discussion has made clear that we should not overestimate the level of control individuals have over their water consumption, it is important not to underestimate it. A limitation of the social practices model is its supposed opposition to considering individual preference. Indeed, if the social practices model is assumed to entirely explain water usage behaviour, this would suggest that water literacy may be unable to enhance efforts towards sustainable water management. It is most likely that some combination of rational choice, social practices and citizenship is working to determine water demand, with each person being affected by the factors at different levels according to their personal values. However, altogether, the theories can be used to more clearly understand behaviour towards water and help make it more sustainable.

2.1.5 Changing behaviour towards water

Much recent UK policy work has been directed towards pro-environmental behavioural change. Notably, Defra has commissioned a large number of studies on pro-environmental behaviours and customer segmentation since 2006. In their 2008 framework, they set out a plan for developing an evidence base on public comprehension and actions towards the environment, and subsequently set 12 behaviour goals targeted at designated demographic groups, including more responsible water usage (Defra, 2008a).

Defra (2008a) place their headline behaviour goals onto axes that contrast participants' willingness to act with their ability to do so (Figure 2.2). This suggests that the population are generally very able to use water in a more sustainable manner, and are fairly willing to do so as

well in comparison to other goals like lowering car and aeroplane usage. This is likely to be due to the ease of making small adjustments to behaviour in relation to water.

This idea of catalyst behaviours suggests that positive spillover will take place from one pro-environmental behaviour to another. However, as discussed earlier in this section, this has not been proven to take place in practice (Crompton and Thøgersen, 2009, Corner and Randall, 2011). A number of studies also segment populations according to their environmental or water attitudes, such as the Gilg and Barr (2006) study considered earlier in this section.

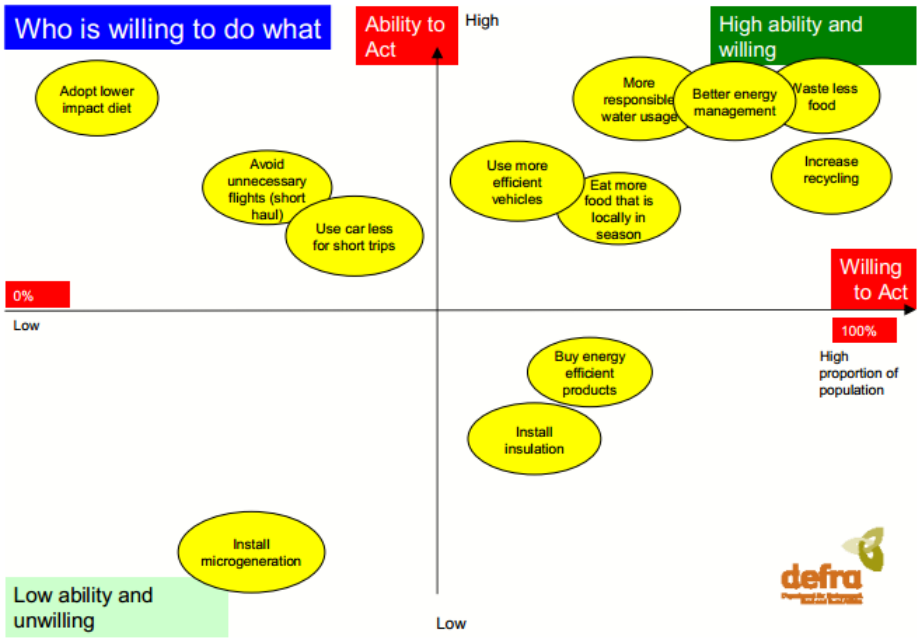


Figure 2.2 Graph to show behaviour goals arranged by the proportion of the population willing to act and able to act (Defra, 2008a)

In order to motivate people who do not have pro-environmental attitudes to use less water, it is necessary to not only remove convenience barriers, but to actually make saving water a more convenient choice. Owen et al. (2009) found that lifestyle factors such

as a change in living situations spurred people to act in a more water efficient manner, rather than an individual actively trying to use less water for environmental reasons alone. Indeed, Shove calls for reconfiguration of social practices into new modes of work, play and life (Shove, 2011).

A rapidly expanding area of research in changing behaviour to be more sustainable is behavioural economics. This literature builds on the rational actor and social practices models, along with citizenship, combining elements of the three. These can be seen in Table 2.2, which displays seven key principles of behavioural economics outlined in a briefing by the New Economics Foundation (nef) for policy makers (Dawnay and Shah, 2005).

Table 2.2 Principles of behavioural economics (after Dawnay and Shah, 2005)

Principle 1	Other people's behaviour matters
Principle 2	Habits are important
Principle 3	People are motivated to 'do the right thing'
Principle 4	People's self-expectations influence how they behave
Principle 5	People are loss-averse
Principle 6	People are bad at computation
Principle 7	People need to feel involved and effective to make a change

Principles 1-3 and 7 can be seen as particularly pertinent to water usage behaviour: individual water use is influenced by what is considered 'normal' and hygienic; water-consuming activities in the

home are greatly shaped by habit; people are more likely to minimise wastage of water if they recognise the environmental impacts; and individuals are more likely to alter their behaviour if they see others doing the same. The 2008 book *Nudge: improving decisions about health, wealth and happiness* by Thaler and Sunstein paved a way for the movement of these theories into both the public arena and government policy (Thaler and Sunstein, 2008). Indeed, in March 2010 *MINDSPACE* was published by the Institute for Government, outlining low-cost ways of encouraging citizenship and healthy lifestyles through behavioural influences (Dolan et al., 2010). This was closely followed by the announcement of the Coalition Government's "Big Society" agenda and the formation of the Behavioural Insights team, advised by Thaler and colloquially known as the "Nudge Unit". This was in response to an endeavour by the Coalition Government to structure policy in different ways, and recognition of the behavioural element of many urgent policy issues (Service, 2011).

It is recognised that people will generally follow the path of least resistance in deciding their daily activities, and therefore they can be gently "nudged" into more socially desirable behaviour. Where an action is found to be influenced by social norms, telling individuals what "most people" are doing could lead to the activity being more readily taken up. Those who have the ability to nudge are described as choice architects. By subtly encouraging people to take actions that make their lives better, nudgers become libertarian paternalists (Thaler and Sunstein, 2008). However, discussion of the concept of nudging has been received with some resistance. Rowson (2011), director of the *RSA Social Brain* project, argues instead for "steering" people towards active decision-making. He stresses that current adaptive challenges require reflexivity and thus behaviour change cannot be unconscious. This argument is also made by Spaargaren who asks whether, by making social practices more environmentally friendly, we give consumers more authority, or rather increase their dependence on systems outside their control (Spaargaren, 2004). Where social norms are found to be at

play, it can be useful to get “key influencers” on board: people who have sway over their peers’ opinions (Rowson, 2011, Dawnay and Shah, 2005). This links in to Taylor’s work on the characteristics of sustainable urban water champions in Australia, who have the potential to guide those in their social networks to act more sustainably towards water (Taylor, 2007).

Evidence from Defra’s Centre of Expertise on Influencing Behaviours argues that people want to see action from peers and action from government and companies before being encouraged to act themselves (Defra, n.d.). This is also the central argument behind *I will if you will*, the concluding report of the Sustainable Consumption Roundtable (2006).

It is important to consider personal norms as well as social norms, and a report by Science for Environment Policy (2012) suggests that an individual who behaves according to his or her personal norms will be less likely to pay attention to potential social influences on their actions. The report also outlines some judgement heuristics or mental shortcuts to rational behaviour, including a preference for familiarity and an aversion to loss. These are used as the basis of nudges. The report suggests that market norms, which utilise financial incentives for action, may lead to a reduction in the completion of a given activity by people who were originally motivated to do it for the greater good (Science for Environment Policy, 2012).

Behavioural economics have also been taken forward in recent Ofwat policy. The 2011 report *Push, pull, nudge: how can we help customers save water, energy and money?* sets out the regulator’s plans in terms of reducing water demand. It states that “Push is about setting standards for water-using devices….. Pull is about rewarding customers for using water wisely. The most obvious way to do that is to charge customers for what they use, so that they pay less if they use less….. Nudge is about understanding consumer behaviour and using it to promote change” (Ofwat, 2011: 5). From this statement it can be seen

that Ofwat's approach clearly sees users as being influenced by both the social practices and rational actor models. Ofwat recognises that standard water metering does not act as a nudge, because the meters do not make it easy to link consumption to behaviour: feedback that the user can learn from is also required. An example of where nudging can be applied to water demand management is smart metering, but at present there is a lack of data to quantify the benefits of these in the UK (Ofwat, 2011). Currently Ofwat sets a 30% threshold on the contribution that "soft" measures of demand management (education, information provision and nudging) can make to a water company's efficiency target. However, they intend to remove this limit, giving the water companies more scope to decide the most effective methods for themselves (Ofwat, 2011).

A study by Essex and Suffolk Water looked at the effectiveness of informing customers about their water consumption over a period of time in reducing demand. Participants were recruited from a housing development and had their water use monitored for a year. This was communicated to each household, along with anonymous comparisons to their neighbours' water consumption. Customers were found to be keen to take part and very interested in the comparative data, and the overall result was a 7% reduction in daily water use (Rogers, 2006). There has been much more extensive work in this field relating to energy, particularly by Schultz and Cialdini at the US energy efficiency software provider OPower. Schultz et al. (2007) demonstrate that when average energy consumption is communicated to a neighbourhood, high consumers tend to reduce their usage, but low consumers increase their usage (a boomerang effect). However, if a message of social approval of their low consumption is added, the boomerang effect appears to be eradicated (Schultz et al., 2007). This demonstrates a need for a clear understanding of the motivations of water users and the social norms at play.

Until this point, the literature review has focused on individual behaviour. There is a need to situate this within the wider context of water management, and how this can be made sustainable.

2.2 Water management

2.2.1 Sustainable water resource management

Sustainable water resource management can be defined as a situation where the amount of water abstracted in a local area is the same as or less than the amount which is becoming available by recharge in that time (Wilderer, 2007). Under increasing pressure for resources, this status could be reached through internal supply management: by fixing leaks or recycling water, or by enhancing reservoir recharge rate. Remaining options include freshwater importing or conversion of other types of water, such as wastewater, saltwater and humidity in the atmosphere (ibid.). But in order to be truly globally sustainable, the UK should only be using what water is naturally available to the country. This requires reduction of industrial and domestic demand for water. In order to instigate change, the whole dynamic of the water supply-demand system will need to be altered. Historically, supply has been governed by demand, but the transition to demand side management (DSM) has seen the water industry attempting to alter consumer demand (Medd and Shove, 2005b). It is important to recognise that customers do not shape demand entirely through their individual actions: technology and the influence of society play an important role. However, a move towards DSM brings in higher levels of uncertainty which supply side management is not used to dealing with (ibid.). This is characteristic of a more inclusive and participatory method of decision-making.

2.2.2 Water sourcing and supply

In order to begin thinking about effectively managing water resources, it is useful to consider the water system as a whole, starting with precipitation. Looking at England, rainfall volumes are at their highest in the northwest, and lowest in the southeast, working at an approximate gradient across the country. Both water demand and groundwater storage capacity can be seen as running roughly opposite to the gradient in rainfall, with the latter working to buffer the differentiation between supply and demand (Johnson and Handmer, 2002). The average volume of rainfall each year in the East Midlands is 700 millimetres, while the average for England and Wales is 900 mm (Environment Agency, 2010). By 2050 there is forecast to be a 13-14% increase in winter rainfall, and a 15-16% decrease in summer (Environment Agency, 2009d). Approximately 40% of rainfall reaches aquifers, rivers and lakes, while the remaining 60% is absorbed into the soil substrate. The latter is referred to as “green” water (as opposed to the former “blue” water) and cannot be managed. 85% of world crop growth is enabled by green water, while the remaining 15% is enabled through irrigation of blue water (Waterwise, 2007, Engineering The Future, 2010).

In the Midlands, 78% of water supply is sourced from surface water and 22% from groundwater (Environment Agency, 2010). The Derwent Valley, Charnwood, Staunton Harold and Foremark Reservoirs are the primary surface water supplies for the East Midlands. In times of drought, water is abstracted from the River Trent at Shardlow, Derbyshire, which can also be boosted by groundwater from below Birmingham (Environment Agency, 2009a). Approximately 40% of the East Midlands region is underlain by aquifers that can be used for water abstraction, and a quarter of the water supply is taken from the Sherwood Sandstone aquifer (Hudson, 2002, Environment Agency, 2010, Natural England, n.d.). However it is at risk of over-abstraction and consequently permission is no longer granted for new abstraction developments (Environment Agency, 2009a). Bakker (2003) highlights

the difficulty in mobilising water due to its density, and therefore the cost of producing and managing infrastructure to transport it. With one cubic metre of water equating to a mass of one tonne, the energy requirements for abstraction and transport are high. This is part of the reason why water companies tend to have a monopoly over a particular region (Bakker, 2003a, Engineering The Future, 2010).

Abstracted water is cleaned at a water treatment works, supplied to homes via pipes, then treated again at a sewage treatment works before being released back into the environment. In the Midlands region, 41% of water abstracted is for public water supply, while 49% goes to power stations to be used for cooling. A much smaller proportion (6%) is used by industry, and interestingly less than 1% is used for agricultural purposes (Environment Agency, 2009c, Environment Agency, 2009d), which makes Midlands dwellers reliant on other parts of the country and world for much of their food supply. The 150 litres used in total per person per day in the UK (approximately) is cleaned to drinking water standard, despite only 3% of this being used for drinking (USWITCH, 2013).

2.2.3 Water security

Currently we use 40-50% of all freshwater run-off globally. By 2020 it is expected that water use will have increased by 40%, with food production alone requiring 17% more water (Palaniappan and Gleick, 2008, Waterwise, 2007). This means that water security is set to become a major global issue: 2007 estimates saw approximately 40% of the world's population as living in areas of water scarcity, and 80% living in regions threatened by water scarcity (Waterwise, 2007, Vorosmarty et al., 2010).

Population growth is a chief pressure on water resources globally. In England the population is forecast to reach 62 million by 2030: an increase of 15% from 2009 (Cave, 2009). But even focusing on the

East Midlands, in the 2009 *Regional Water Management Plan*, the Environment Agency predicted more than a 10% rise in population by 2017. In the Midlands as a whole, population growth could result in 1025 extra megalitres required every day by 2050 (Environment Agency, 2009c), threatening regional water security.

2.2.4 Water governance

Difficulty in governing water arises from tallying the global hydrological cycle with the local and gradual effects of water scarcity, and also legal and regulatory boundaries. Water management in developed countries has traditionally been seen as a duty of the national government (Watson et al., 2009). However international discussions in Kyoto at the 2003 World Water Forum found that many water and environment ministers supported private sector involvement in supplying water, particularly in countries where governments are viewed as too corrupt to take responsibility. As a result of privatisation, water users become customers who expect a certain level of service with no disruption to supply (Taylor et al., 2009). More efficient allocation of resources should occur which in turn should limit avoidable environmental degradation, and conservation of the resource should be able to be promoted via pricing. But it could be said that as private companies aim to make a profit, water will not be managed as sustainably by the private sector as the public sector would.

The England and Wales water industry was privatised in 1989 and since then, new environmental and drinking water standards have been met (Page and Bakker, 2005, Ballance, 2010). But the debt of the water industry (zero in 1989) has risen to approximately £33 billion and bills have increased by 45% in real terms in the last 20 years (Ballance, 2010). A further issue with privatisation is that water supply lends itself to being monopolised, due to each water company encountering lower costs in their own region (Bakker, 2003b). There are 26 companies in the UK that supply water or water and sewerage services, with 21

monopolies dominating the industry (Cave, 2009). Water resource zones for the Midlands region are displayed in Figure 2.3.

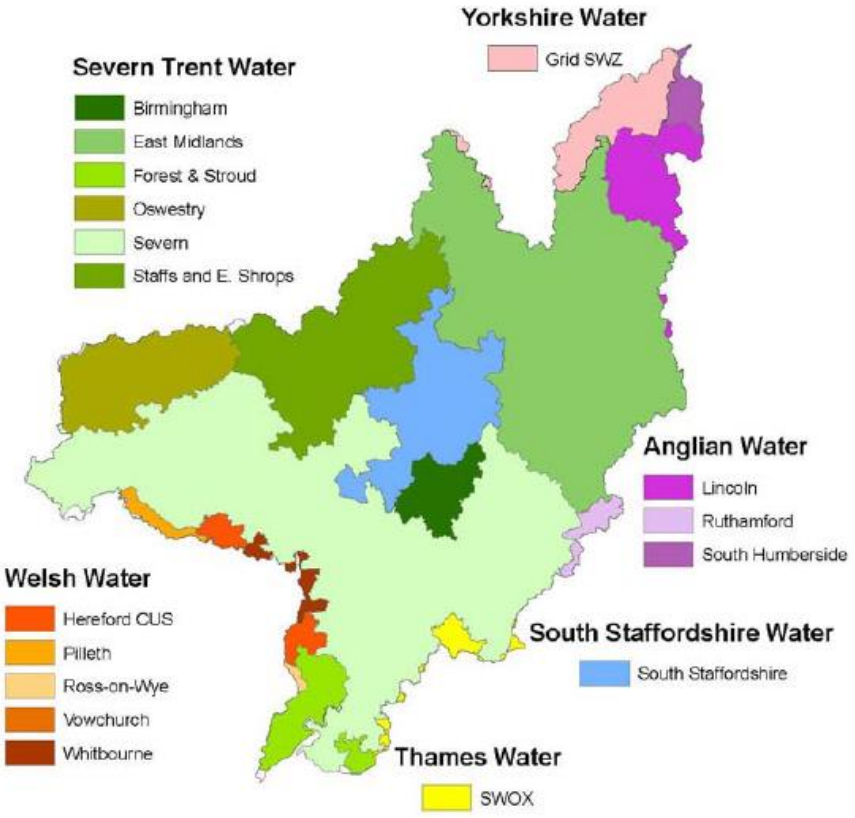


Figure 2.3 Distribution of water companies over the Midlands region (Environment Agency, 2009d)

Ofwat acts as the economic regulator for each of these companies (reporting to Parliament), while the Environment Agency and the Drinking Water Inspectorate oversee water quality (reporting to Defra), the Consumer Council for Water acts as the representative for the consumer, and Water UK represents the water industry. The relationship between water companies and customers has changed over time: Trentmann and Taylor (2005b) describe how in the 1890s, at least 154 gallons of water was being pumped to every household each day, despite perceived shortages. Wastage of water by consumers was then highlighted as a problem but customers were accused of this

rather than water companies recognising their own role in the problem. Now the water companies put funding towards Waterwise, an independent NGO promoting water efficiency in the UK.

2.2.5 Domestic water use

Domestic water consumption accounts for over half of water use in the UK (Water UK, 2008), compared to an average of 8% of water use globally (World Business Council for Sustainable Development, 2005). This demonstrates the need for a focus on reducing domestic water consumption in the UK as well across other sectors. Delving deeper into the household environment, a report by *The Guardian* in July 2013 stated that the shower is now the biggest single use of water in the British home, accounting for a quarter of total consumption (Smithers, 2013). Indeed, a study by ech$_2$o Consultants (ech$_2$o, 2010) found that average shower time was 13 minutes, with adult males taking the shortest showers (mode response was the category “5 minutes or less”), and teenage girls the longest (mode response was the category “11-20 minutes”). Altogether, over 40% of household water consumption occurs through flushing the toilet or showering (Waterwise, 2013). However, knowledge of the breakdown of water consumption (or even the volume) is poor, and little research has taken place into how such behaviours might change in the future.

2.2.6 Forecasts of future demand

The Environment Agency and Defra set out four scenarios for water resource usage in the UK in 2030. The first is sustainable behaviour, characterised by local governance, greater citizen awareness and public ownership. The second is innovation, where technological fixes are found for environmental problems and the role of EU legislation strengthens. Thirdly is local resilience, where water and energy

resource use drops due to ‘Peak Oil’ being reached earlier than envisaged, and fourthly is uncontrolled demand, where environmental issues receive less attention and disparities in wealth increase (Environment Agency, 2009b). Forecasts for water demand under each of these scenarios can be seen in Figure 2.4. Similarly, the UK Government *Foresight* programme produced four scenarios: world markets, provincial enterprise, global sustainability and local stewardship (Westcott, 2004). Westcott makes forecasts for household, industrial and agricultural water use under each of these scenarios. However he is keen to point out that water demand may not carry on growing, but is dependent on actions taken by governments and how society responds to a changing environment. Also working on modelling future water demand, Downing et al. (2003) predict that drought could have widely ranging social impacts: it could lead to populations shifting towards water saving measures, but conversely could cause an increasing feeling of entitlement and right to water, actually leading to an increase in demand (Downing et al., 2003).

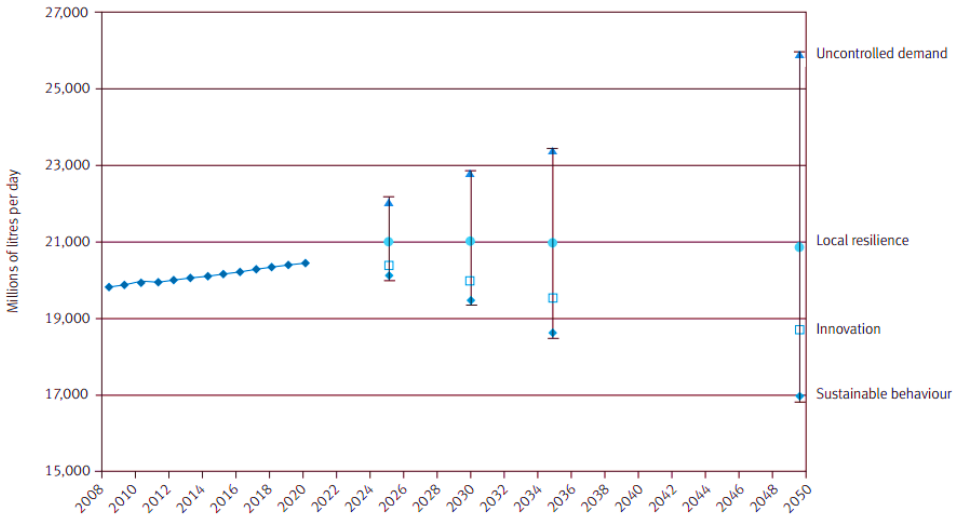


Figure 2.4 Water demand forecasts under four future scenarios (Environment Agency, 2009b)

2.2.7 Supply management

In order to meet the UK demand for water in the short-term, increased supply is needed. However, many of the methods of supply management are controversial. Desalination has the greatest potential to sustain water supply within the UK. However, the two methods (multi-stage flash process and reverse osmosis) are respectively energy intensive and expensive (Cook, 1998). Less contentious methods include water transfer: for example, in the UK water is carried via the Rivers Severn and Wye from parts of Wales with low demand and high rainfall to be held in reservoirs serving Birmingham and North West England (ibid.).

While enabling local water demand to be met, importing water may not be a globally sustainable option. Waterwise (2007) recommends maximisation of use of green water to grow crops, by growing particular crops in accordance with the water availability of the region and seasonality. However, under current levels of consumption self-sufficiency is not realistic for the whole country, and growing large volumes of our own food in the UK would also have implications for other countries with economies which rely on exporting produce to the UK. Water recycling and reuse appears to be a clear option for increasing the water supply available, particularly where water quality is not important. Greywater recycling involves reuse of water used for showers, baths and washing, in flushing toilets, as well as possibly in washing machines (though research shows this to be less popular with the general public) (Waterwise, 2010). Rainwater recycling is the collection, storage and supply of rainwater for domestic practices which do not require water to be potable, and in some cases treating to drinking water standard (Waterwise, 2010). However Defra (2008b) raises the issue of the cost of putting in place and maintaining new systems of water recycling, and also how to ensure drinking water is not contaminated.

2.2.8 Demand management: hard measures

The main hard measure used to reduce water demand is metering. 2009 figures of metering provision for the Midlands region are displayed in Figure 2.5. This shows the East Midlands to have relatively low metering provision compared to other Midlands counties.

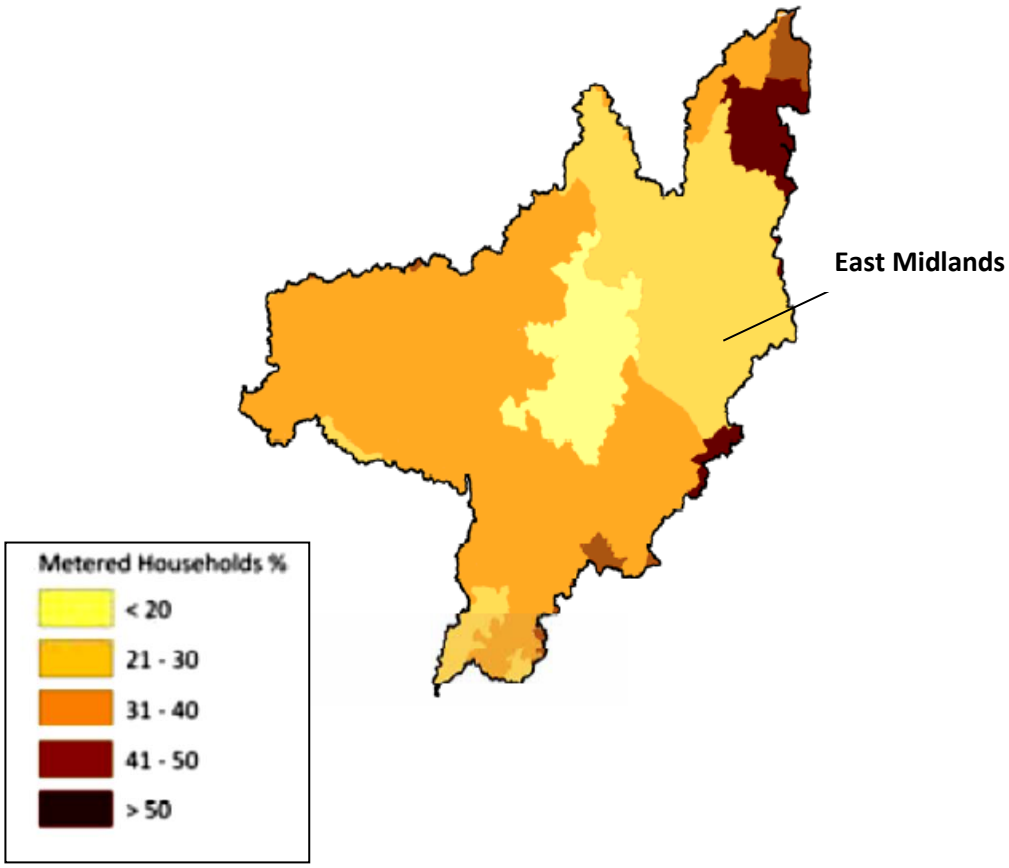


Figure 2.5 Percentage of households metered in the Midlands region (Environment Agency, 2009d)

In 2009-10 37% of England and Wales households were metered: a figure that is projected to rise to 50% by 2014-15. Water companies in the South East are expected to have 90% of their households metered

by this time, while for the Severn Trent Water region this figure is 42%. This should have a noticeable effect on water demand: in the Midlands region as a whole, metered households use on average 20 litres less per day than unmetered households (Environment Agency, 2009d). It is suggested that charging for water via meters communicates the idea to the consumer that water is a limited resource that requires conservation. In households where water is not metered, price does not relate to demand, nor does it take into account the environmental cost of abstraction and disposal (Bakker, 2003b, Von Vugt, 1999).

While the *Waterwise White Paper* recommends that every household should be metered by 2020 (Russell, 2010), universal metering is a contested option, due to the social implications of charging for water by volume (Sharp, 2006). But the Walker Review to the UK government (*The independent review of charging for household water and sewerage services*) does recommend that the country transitions to a metered system (Walker, 2009). One issue with optional metering is that customers are only likely to opt to be metered if they will save money by doing so. There are also large costs associated with the fitting and reading of meters which could be passed on to customers. Consequently a certain amount of hostility exists towards compulsory metering, with only 40% of homeowners favouring this option (Smith, 2010, Defra, 2008b).

However, Von Vugt (1999) suggests that installing meters may instil confidence in citizens that their neighbours are also 'doing their bit' to save water, as metered households are more willing to reduce their usage in times of drought than unmetered households. This is likely to be due to the individual benefit of lower bills for metered households, contrasting with no clear individual benefit for unmetered households (Von Vugt, 1999). But as water bills are not generally a significant household cost in comparison to other utilities, there still may not be a great impetus to reduce them. Equally, users must be in control and aware of their consumption if metering is to reduce this (Sharp, 2006).

While metering is often not a popular option for larger households who would stand to have higher bills, water saving fittings and appliances are generally well accepted, with 60% of homeowners supportive of having dual flush toilets and water-efficient showers (Waterwise, 2010). This shows how sustainable infrastructure is generally supported if comfort is not compromised. Reduced depth baths are not as popular, perhaps due to habit, and notions of what is comfortable. Indeed, it is important to consider what people expect from water supply if they are to accept new hard measures. Tap aerators are a good example of this: by softening water flow and creating the illusion of high flow volumes, they are much more likely to be accepted than flow restrictors (Waterwise, 2010).

An important recent development in terms of water efficiency fittings was implementation of the *Code for Sustainable Homes*, which sets the environmental requirements for any new houses. The *Code for Sustainable Homes* specifies six levels which correspond to rising reductions in domestic water usage (along with energy, waste, pollution and several other indicators). For example, more efficient appliances should allow a home to achieve levels 1 and 2, where 120 litres is used by each person each day. This should not increase the cost of the home. On the other hand, to reach the top levels of 5 and 6 (where 80 litres of water is consumed per person per day), a water recycling system will probably have to be installed (Waterwise, 2010)**.**

2.2.9 Demand management: soft measures

On the other hand, in order to make people active water users, there is a need for softer measures of water demand management. Education is one of the major soft measures being used, which will be considered in detail later. Even from an engineering perspective, the importance of changing behaviour to reduce demand is recognised: the *Engineering The Future* alliance, for instance, sees efforts to reduce individual

consumption as vital to managing water scarcity (Engineering The Future, 2010).

However, there is significant criticism of education as a method of reducing water demand. Von Vugt (1999) summarises research into the effectiveness of public education campaigns to find little effect on reducing water usage, and no effect where there is a state of normal water availability (Von Vugt, 1999). Sharp (2006) criticises some of the common strategies used by water companies to promote water efficiency: alarmist messages about the fragility of the environment and phrases outlining how high normal water use is may make the reader feel that their effort is pointless. There is also widespread mistrust in water companies' motives (Sharp, 2006). At a 2009 meeting of Research Councils UK on water security, the efficacy of education to reduce water demand was challenged, with its role being seen mainly as a 'stepping stone' towards changing behaviour.

It has been suggested that public water education should be a long-term effort of reinforcing messages and sustaining interest in the issue, over time making it socially unacceptable to waste water (RCUK, 2009, Tucker, 2010). The Walker Review also suggests a campaign of key national messages targeted at a community level (Walker, 2009). However, Taylor et al. (2009) warn that the lasting nature of water scarcity may produce different behaviour to the ephemeral characteristics of drought, which is characteristically treated as a temporary interference with normal life. Under water stress the definition of what is normal water use is likely to change over time (Trentmann and Taylor, 2005a). Therefore clearly there is a case for further research into how water education initiatives can be made more effective.

2.2.10 Water policy

Climate change and population growth will impact parts of the UK in different ways, potentially exacerbating current extremes of shortage and surplus. The Environment Agency, Severn Trent Water, and the *Independent review of competition and innovation in water markets* to the UK Government all argue for the sharing of water resources between companies. However, industry regulation currently promotes self-sufficiency of the regions, and abstraction differs little in cost across the country, so trade is not encouraged (Cave, 2009, Environment Agency, 2009b, Ballance, 2010). Ballance (2010) states that there need to be more incentives for sharing and greater transparency about costs.

Policy since 1996 dictates that every water company promotes water conservation to their customers (Ofwat, 2008). Promoting this message via the water companies theoretically allows for a regional focus to be adopted, therefore taking local issues such as drought into account. In fact, the Environment Agency raises the idea of a water efficiency commitment for businesses in areas of water shortage (Environment Agency, 2009b). In 2009 the EA released *Water for people and the environment: water resources strategy for England and Wales*, with two priorities in the Midlands strategy being greater water efficiency in the home and more households with meters (Environment Agency, 2009c). Therefore it is clear some strategies are regionally focused. The UK Government's current water resource strategy is outlined in *Future Water* (Defra, 2008b), advising a twin track approach to managing resources by increasing supply and reducing demand. This strategy emerged from the *Flood and Water Management Act 2010* (Defra, 2010a).

Further policy recommendations have been directed towards water pricing. The *Engineering The Future* alliance (2010) argues that in order for water efficiency to be encouraged, water needs to be priced according to its value. This viewpoint is supported by CIWEM (2010), who make the recommendation that water prices take into account

environmental externalities, even though this will entail a cost increase which is passed on to customers. CIWEM also believe that pricing should reflect availability in terms of physical scarcity and demand (ibid.). However there is a wide debate behind charging for water at all. Putting aside the ethical and moral arguments, there is still a great deal of controversy over viewing water as a commodity. It can be argued that due to its scarcity, water should be apportioned by the market and sold at a price which takes into account production, distribution and environmental impacts. On the other hand, commoditising what is essentially a common good can be viewed as immoral, particularly as it is essential to life, and some people are less able to pay than others (Page, 2005).

In December 2011 the White Paper *Water For Life* was released, providing a policy framework following recommendations on competition and pricing from the Cave and Walker Reviews (part of the *Flood and Water Management Act 2010*) and the Government-appointed review of Ofwat (Defra, 2010b). *Water for Life* emphasises the need for a campaign to communicate the link between personal water use and the health of local rivers to the public. It also suggests that the key to changing attitudes is working out the priorities of individuals. While Defra project per capita water consumption to fall from 154 to 144 litres per day between 2010 and 2030, population increase will more than counteract this effect (Defra, 2011b). According to the White Paper, “Building connections that matter to individuals is powerful- whether a connection to their water bill and opportunities to save money or to their local river. We need strong and consistent messages that speak to individuals” (Defra, 2011b: 84). However, the resulting draft Water Bill was criticised by the Managing Director of Waterwise for neglecting to address water efficiency and metering (Tompkins, 2012).

It can be summarised from this section that the Water White Paper stresses the need for local drivers towards more sustainable personal behaviour, whilst regional Environment Agency strategies exist for

resource management. The chapter now turns to the significance of the community and the household as loci of change, and attempts to enable change from both a top-down and a bottom-up approach.

2.3 Influence of sustainable communities and households

2.3.1 Sustainable development policy

Arguably the most influential piece of sustainable development policy in terms of community and grassroots action is Local Agenda 21. Stemming from the 1992 Rio Summit, Local Agenda 21 asks for concentration of sustainability initiatives at the local level because of the belief that the source of both problems and answers can be found here (United Nations Sustainable Development, 1992). The message "think global, act local" is reflected in the dominance of international and local sustainability drivers, as opposed to national ones (Buckingham and Theobald, 2003). Still, sustainable development has been a major government policy focus since the first UK strategy for sustainable development in 1995, but more recently efforts have focused on making sustainability become part of everyday life, rather than promoting it as an alternative lifestyle. This is reflected in *Mainstreaming Sustainable Development*, released by Defra in February 2011 (Defra, 2011a).

Sustainability has clear ties to citizenship, as local individual action can be a major force for community transitions to more sustainable lifestyles. Government efforts to encourage this can be seen in the 1995 *Going for Green* campaign, and more recently, outputs of *Skills for Sustainable Communities* (the Egan Review) (Parker and Selman, 1999, Egan, 2004). Sustainable development has also informed a number of past and current education policies, including *National*

Framework for Sustainable Schools, the *Sustainable Schools* programme, and *Building Schools for the Future*.

Recent work has focused on utilising the assets of local communities to address problems: for example, the RSA project *Connected Communities* aims to explore citizen engagement in solving present-day challenges at the community level (Rowson et al., 2010). Community-focused work is also underway in relation to energy literacy. Consumption was monitored in a neighbourhood of Kingston-upon-Thames, London over a three-year period for the *CHARM* project, and households informed about their energy use and that of their neighbours. The researchers found perceptions of what is normal heavily influenced both the sustainable and unsustainable actions being undertaken, with problems lying with behaviours seen as both 'not green' and 'normal', or green and niche (Rettie et al., 2012).

While these top-down initiatives have seen some success, there has been a rise in the popularity of bottom-up sustainability initiatives in the last decade which must also be considered. Seyfang and Smith (2007) argue the potential for grassroots initiatives to meet sustainability objectives more effectively than top-down efforts, as the former make use of locally specific lay knowledge and are likely to construct projects which are more suited to their locality. The concepts of community and citizen science see individuals volunteering their expertise, for instance to monitor an environmental issue in a local context (Barnett et al., 2005). When considering these topics, it is useful to look briefly at the literature on organic public sociology, where researchers engage in a dialogue with community groups to help nurture positive change (Burawoy, 2005). However, Burawoy suggests "the recognition of public sociology must extend to the organic kind which often remains invisible, private, and is often considered to be apart from our professional lives" (Burawoy, 2005: 8) and therefore the organic nature of this PhD research is debateable.

2.3.2 Social learning and networks

The potential for community action to enable sustainable water management more specifically has been explored through research into social learning. This involves different stakeholders collaborating as communities of practice to manage water resources through mutual sharing of knowledge and insight (Pahl-Wostl et al., 2008). A community of practice can be described as a group of individuals participating in a common, ongoing activity, potentially resulting in mutual views or values, common interpretations and a shared identity (Eckert, 2006). Social learning theory recognises the importance of role models in shaping behaviour, and how networks of individuals encourage the formation of social norms (Barnett et al., 2005). Work on social learning for sustainable water management has been done as part of an EU project, which explored the opportunities for participatory methods to help solve resource dilemmas (Ison et al., 2007). This kind of situation, where there are numerous stakeholders and an inherent uncertainty over future availability and demand, creates a role for post-normal science. Developing Kuhn's concept of 'normal science', Funtowicz and Ravetz (1993: 744) describe post-normal science as applicable when "facts are uncertain, values in dispute, stakes high and decisions urgent". When data is lacking and impacts are long-term, decisions require the engagement of an extended peer community (Funtowicz and Ravetz, 1993). This could certainly be applicable to management of local water resources.

It is also important to communicate the uncertain nature of so-called 'wicked problems' to those who are learning about them. The ideal situation would be for the co-production of knowledge, as suggested by Callon's (1999) third model of public participation (following the Public Education Model and the Public Debate Model). This recognises both the rights of lay people to be involved in the creation of knowledge which concerns them, and the value of including lay people in research which would benefit from insights into their daily lives. Elements of this model can be applied to this research (particularly the chance for

knowledge to be co-produced in focus groups, and the opportunity for some lessons to utilise a learner-centred approach) but the fact that the research takes place in a formal learning environment and with children may limit its applicability.

Children come to school with ‘virtual schoolbags’ (Thomson, 2002) or ‘funds of knowledge’ (Gonzalez et al., 1993) which vary according to their experiences outside the classroom. This will impact on how they react towards what they learn in school, and whether new knowledge translates into value and behaviour shifts. Indeed, it should not be assumed that children are empty vessels to be filled with knowledge (a deficit model). There may also be conflicting norms of use that children are trying to reconcile, as highlighted earlier. In addition, people learn from their local communities: Olli et al. (2001) emphasise the importance of the social ‘environmental network’. They found that the most important indicator of environmental behaviour was participation in environmental social networks, while Rabinovich (2009) argue that highlighting the ‘good’ environmental performance of communities could encourage positive action amongst other groups. In a similar way, Corral-Verdugo et al. (2002) found that the more an individual perceived neighbours to be wasting water, the less their personal effort would be to conserve it.

Of course, young people are part of a school community: Shallcross (2005: 29) suggests that a whole school approach to sustainability may enable schools to become “…active agents of change rather than passive transmitters of information and/or values”. Adolescents are often members of clubs and friendship groups outside of school, which may all have an influence on environmental and water behaviours, and the impact of peers and family groups in particular will be considered in Chapter 6.

2.3.3 Sustainable households

Furthermore, people are highly influenced by the behaviour of those they live with. Grønhøj (2006) found interventions into children's water and energy use (e.g. showering) by parents to be very common, but also reports of child influence on parents in terms of use of these utilities. However, Fielding et al. (2011) note that the uptake of a pro-environmental behaviour by just one individual in a household may not result in a knock-on effect on others, which would mean dilution of the individual's efforts.

Conversely, as mentioned earlier, it has been noted in previous household water use studies that often people are unaware of the water consumption of their own family members (O'Toole et al., 2009). Dauphin et al. (2011) found 16-21 year olds to behave as decision-makers in households, but others (e.g. Jenkins, 1979) have found children to have a limited influence on family decision making apart from in terms of planning activities. The influence of parents on young people's environmental behaviours is not a well-developed field but Chawla and Cushing (2007) provide a review of contributing work, including parental influence on pro-social values and participation in community activities. Goodwin et al. (2010) also see family and peer groups as greater influences over environmental attitudes than short term educational interventions. However, we should also consider parents' explicit influence on water behaviours, such as asking a child to spend less time in the shower.

This research aims to look at the implications of the above developments for water education initiatives. But in order to do this, an understanding of how the field has developed so far is essential.

2.4 Water education

2.4.1 Environmental education

It is useful to begin this section with a background to environmental education. Environmental education works to make learners more aware of environmental issues and foster the ability for them to address these problems (Cole, 2007). The area has seen rapid growth in the last 30 years but traditionally has focused on children as the decision-makers of the future, who are likely to have a greater ability and willingness to meet ecological challenges (Walshe, 2008, Orr, 1993). A distinction can be drawn between education *about*, *through* and *for* the environment, with a school normally implementing some combination of the three (Hicks, 2007c, Huckle, 1983). Education *about* the environment is the most traditional approach, focusing on imparting knowledge with a technocratic anthropocentric viewpoint. Education *through* the environment tends to be a fieldwork and experience-based approach. Lastly, education *for* the environment works towards developing values to lead to sustainable behaviour (Job, 1996). These three strands have provided the context for recent progressions in the area with more of an emphasis on action and behaviour, including education for sustainable development (ESD). In this vein, education *through* sustainable development should enable both cognitive (knowledge-based) and affective (behaviour-based) learning.

2.4.2 Education for sustainable development

The shift from environmental education to education for sustainable development (ESD) has been induced by an increasing national focus on sustainable development and social justice (Wals, 2010). ESD is defined by O'Riordan as "preparing everyone to care for the planet by respecting justice, local identity and fundamental requirements for wellbeing" (O'Riordan, 2004 :33). This message of education being

fundamental to ensuring responsible behaviour towards the environment fits with the vision of the United Nations Decade of ESD, running from 2005 to 2014. This has raised the profile of ESD further and has identified schools as instruments for action (Morgan, 2011, UNESCO, 2006). Webster (1996) views ESD as an improvement on environmental education, suggesting that it is at least a stage ahead and has the potential to bring about a new worldview, which Davies (2009) sees as important in order for the human relationship with the Earth to become less exploitative and ultimately sustainable (Webster, 1996, Davies, 2009). Perhaps it can also be enhanced by incorporating thinking about possible or preferred futures, which is an important element of an education programme if environmental citizenship and sustainable development are the goals (Hicks, 2002). Futures will be considered in more detail in Section 2.4.4.

However, the concept of ESD is not universally popular. Wals (2010) criticises ESD as less legitimate than environmental education as it tends to be borne out of policy decisions and is less likely to be grounded in specific localities (Wals, 2010). These thoughts are supported by Huckle (2005), who maintains that ESD should "be based on sustainability as a frame of mind rather than sustainability as policy" (Huckle, 2005:14). This fits with the idea of enabling people to become 'literate' in sustainability rather than aiming to change behaviour.

Indeed, environmental literacy has been seen by some as the core goal of environmental education (Carleton-Hug and Hug, 2010). Working with similar goals in mind, Hogg and Shah's 2010 report for Ipsos MORI on behalf of the Development Education Association outlines the benefits of global learning for increasing agency and social responsibility around international issues (Hogg and Shah, 2010). Having "the capacity to perceive and interpret the relative health of environmental systems and take appropriate action to maintain, restore, or improve the health of these systems", as Coppola (1999:40) defines environmental literacy, could certainly be seen as a target for ESD as well.

2.4.3 Environmental and water literacy

In brief, the idea of environmental literacy has its origins in the work of Roth, who first used the term in 1968 (Cutter-Mackenzie and Smith, 2003), but a comprehensive summary of work on the concept is given by St. Clair (St. Clair, 2003). Ecological literacy, coined by Orr (1992, cited in Cutter-Mackenzie and Smith, 2003) is seen by some as a development of the environmental literacy concept but others use the two terms interchangeably without explanation (e.g. Weston, 1996).

By considering environmental literacy rather than simply environmental knowledge, it is suggested that a person should have the ability to apply the information they acquire, with action being the desired output (St. Clair, 2003). Indeed, affective learning can be seen as a vital goal for practitioners of environmental education (Cole, 2007). The use of the word “literacy” means that acquiring the relevant knowledge base is seen as not only as fundamental as developing reading and writing skills, but also as requiring a complete change in the individual’s way of conceptualising the world around them (St. Clair, 2003). This understanding allows for informed decisions to be made rather than the learner simply taking on the view of the educator (Cutter-Mackenzie and Smith, 2003).

Those intending to become environmentally literate must develop the ability to be critical about what they see and hear (St. Clair, 2003). It could be argued that environmental literacy building is more legitimate than environmental education or ESD, as it focuses on improving learners’ ability to think critically and make informed decisions themselves, rather than students being told how to act in a more environmentally friendly manner, which Standish (2009) argues has the potential to become ‘greenwashing’. This method also fits better with the high levels of uncertainty inherent in decision-making linked to sustainability and climate change (Wals, 2010). However,

environmental literacy as a concept has still been criticised for assuming knowledge leads to action (St. Clair, 2003).

Very little work exists on water literacy, but Amarasinghe and Sharma (2008) define the term as “education and awareness of the efficient use of scarce water supply” (Amarasinghe and Sharma, 2008: xiii). The subject has had most attention in India, in response to multiple compounding issues including a rapidly increasing young population and rising demand for irrigation (Amarasinghe and Sharma, 2008, Kumar, 2002). Work has been done with a secondary school in northern Karnataka to build water literacy into its curriculum and also to educate residents of the local area (Padre, 2007). Additionally, a social dialogue approach incorporating stakeholder workshops has been employed by researchers for the International Water Management Institute in order to build water literacy in Karnataka and Tamil Nadu (Kumar, 2002), and a year-long water literacy campaign was launched in association with World Water Day 2007 in Kerala. This had a broad range of aims, from improving drinking water quality and promoting rainwater harvesting, to publicising water law enforcement and enabling stakeholder action (IRC, 2007). As with environmental literacy, however, the ideas behind water literacy can also be noted in other places in the literature without the term being explicitly acknowledged. For instance, Blumstein and Saylan (2007) highlight a need to educate about resources and where they originate, including water.

It is appropriate to note the body of work on energy literacy from DeWaters and Powers (2011, 2007). They define an energy literate individual as:

“…one who has a sound conceptual knowledge base as well as a thorough understanding of how energy is used in everyday life, understands the impact that energy production and consumption have on all spheres of our environment and society, is sympathetic to the need for energy conservation and the need to develop alternatives to fossil fuel-based energy resources, is cognizant of the impact that

personal energy-related decisions and actions have on the global community, and – most importantly – strives to make choices and exhibit behaviors that reflect these attitudes with respect to energy resource development and energy consumption." (DeWaters and Powers, 2011: 1700).

Their study of the energy literacy of high and middle school students in New York State, USA, takes a slant towards knowledge, attitudes and behaviours towards energy, but elements of citizenship can be noted in their definition as well.

2.4.4 Futures education

Hicks (2008) argues the importance of young people comprehending how past, present and future actions are connected. He describes how geography teachers may not 'claim' the temporal dimension, while the past is seen to be the role of history teachers, so the future may get overlooked in education. 'Futures' as a theme presents itself in geography in several ways. Futures are regularly found in physical geography research in the form of predictions and projections, while in terms of water resource management, modelled scenarios of the future are commonly presented in policy documents. Two examples are Westcott (2004), who forecasts demand for water under different socio-economic and governmental scenarios, and the CCDeW scenarios of climate impact on water demand (Downing et al., 2003), both discussed in Section 2.2.6. In a slightly different way, the concept of Peak Water, developed by Peter Gleick following various works on Peak Oil, offers a way of comprehending unsustainable water futures (Palaniappan, 2008). Palaniappan and Gleick (2008: 1) define peak water as the point "at which we run up against natural limits to availability of human use of freshwater".

The concept of futures has been a topic of keen discussion in geography education since the 1980s (Hicks, 2007b), exemplified by

the publication of Gerber and Fien's (1988) book *Teaching geography for a better world*. While Standish (2009) is critical of the so-called 'ethical turn' in geography education, the future dimension continued to be of interest in the 1990s when Walford and Haggett (1995) speculated on possible futures for geography education based on both predicted changes in our world, and its place in schools. Hicks (e.g. Hicks, 1996, 2008, 2007b) has long argued for the presence of a futures dimension and also a global perspective in education, and proposes students think about possible and probable futures, in part to "identify and envision alternative futures that are more just and sustainable" and "engage in active and responsible citizenship, both in the local, national and global community, and on behalf of present and future generations" (Hicks, 2008: 120).

In an earlier paper, Hicks (1996) explored children and young people's perceptions of the future on personal to global scales. Most of the children surveyed said they didn't often think about the future of their community, and half of them never talk to their friends about this topic. On the other hand, more than half often thought about the future on a global scale, yet discussion levels were still low. Alternative futures are also explicitly mentioned in the Geographical Association manifesto *A Different View* (2009) which makes a case for geography education. Indeed, it is interesting to explore how responsibility can be encouraged over time scales into the future. Understanding your own preferable future requires values to be developed which will allow personal assessment of the desirability of a scenario (Bell, 1998). Bell's (1998) paper on futures thinking entitled *Making people responsible: the possible, the probable, and the preferable* states that social scientists can help encourage people to become future-oriented and in turn more responsible for their own behaviour. This literature on futures education will be utilised in discussions around developing young people's water citizenship and sense of responsibility and ability to act.

2.4.5 Policy and curriculum

There have been a number of past and current policy initiatives encouraging environmental education in the UK, although all the major schemes are based on school child education. Eco-Schools is a long running international programme headed by the Foundation for Environmental Education (Eco-Schools, n.d.-a). In the UK its aims were built around the *Sustainable Schools* strategy, with students playing an active role in working towards a bronze, silver or green flag award for their school (Goldup, 2011). The *National Framework for Sustainable Schools* ran from 2006 to 2010 (SSA Trust, 2009), with the aim being for all schools to become Sustainable Schools by 2010 (QCA, 2009a). The framework consisted of eight "doorways" for a school to follow in order to integrate sustainability into pupils' learning, one of which was energy and water, and a matrix was provided for teachers to assess their performance (QCA, 2009b, DCSF, n.d.). In a report for the DSCF, Barratt Hacking et al. (2010) describe the positive effects of Sustainable Schools, including pupils' increasing values towards and participation in the natural and social environments around the school, particularly when outdoor learning took place (Barratt Hacking et al., 2010). Despite the *Sustainable Schools* strategy being cut, schools are still working towards Eco-Schools goals and the *Sustainable Schools Alliance* has been launched with support from the Department for Education (SE-Ed, 2010, Sustainable Schools Alliance, 2011).

Research in this area in terms of water has been carried out by Fischer and Freund (2010). They recognise that schools are not only a forum for educating about water usage, but are also themselves locations of water consumption. This clearly makes them a place where children can be educated about living sustainably through doing so. Indeed, the paper goes on to assert that water education should not be added on to the curriculum, but absorbed into the daily workings of the school: this is described as the BINK approach (Fischer and Freund, 2010).

Reis and Roth (2007) note the struggle of environmental education curriculum designers to produce changes in attitudes and behaviours beyond the classroom, while being restricted by the curriculum structure (Reis and Roth, 2007). Changes beyond the classroom are important in terms of the role of the school within its community. Hicks (2009) emphasises that Sustainable Schools (product of the former government strategy) are in a good position to make social, economic and cultural transitions, and also to aid the implementation of these transitions in wider society. But on the other hand, schools can learn from their localities to put in place ESD programmes that make real changes to their communities.

From the late 1990s to 2007, environmental education was an extra non-compulsory topic in PSHE, citizenship and science curricula. However, in geography, sustainable development was seen as something to be considered across topics in order for pupils to gain a thorough understanding of the concept (Rawling, 2001). Since 2007, “the global dimension and sustainable development” has been one of seven cross-curriculum dimensions for teachers to draw on, in conjunction with the *Sustainable Schools* strategy (QCA, 2009a). The global dimension “explores what connects us to the rest of the world…[and] helps learners to imagine different futures and the role they can play in creating a fair and sustainable world” (QCA, 2007b: 2). This provides an obvious setting for education for water literacy, as young people will be gaining an understanding of the nature of water as a global resource which is locally consumed.

Indeed, there is also a clear place for water education in geography lessons, particularly as the new National Curriculum comes into force in September 2014. The National Curriculum in England was under review from January 2011 until February 2013 (Department for Education, 2013b). The Royal Geographical Society (with IBG) welcomed the focus on core knowledge that the new Key Stage 3 programme of study

for geography presented, and stated that teachers should have the power to decide the best way in which to teach the National Curriculum (Gardner, 2013). Currently, the exact term “climate change” does not explicitly feature on the curriculum up to Key Stage 3 in geography or science, and will not feature (along with the term “sustainability”) at Key Stage 3 from September 2014 (Hickman, 2013). However, Key Stage 3 geography pupils will need to “understand how human and physical processes interact to influence and change landscapes, environments and the climate” and study “use of natural resources” (Department for Education, 2013a: 216). At the time of writing, draft national criteria for Key Stages 4 and 5 had not been released. Didactic teaching is likely to make a return as in September 2013 the current Secretary of State for Education, Michael Gove, argued for teachers to engage with actively passing on their knowledge to pupils, particularly in subject areas where pupils are unlikely to discover knowledge on their own (Gove, 2013). A more pared down curriculum is likely to be the result in order for teachers to have greater freedom over teaching, as was recommended by the Coalition Government’s Department of Education 2010 Schools White Paper entitled *The Importance of Teaching* (Department for Education, 2010, Winter, 2013).

While geography has been the traditional setting for environmental education and ESD, there is also potential for bringing the topics into citizenship, which since 2002 has been a mandatory subject in secondary schools. The 1998 Crick Report was the major driver for this, setting out desired learning outcomes at each key stage and plans for community involvement (Crick, 1998).

There is a strong existing body of research on recommendations for environmental education and ESD programmes outside curriculum requirements. Hicks (2007a) makes the suggestion that students could be set tasks to fulfil outside the classroom in order for ESD learning to become part of their everyday lives. An example given is explaining

climate change to relatives: an idea that could be applicable to water efficiency as well. The idea of taking learning outside the classroom is echoed by other work: Orr (1993) suggests using the natural environments of school and university campuses to make experience a part of environmental education. The opportunity for learning is improved when a challenge is provided that requires a novel solution, and the learner has the experience to recognise and cope with the task in hand (Reynolds et al., 2002). In terms of sustainability, this links to positive visions of the future as opposed to alarmist, negative pictures of what might happen if action is not taken (Blincoe, 2009).

2.4.6 Community and lifelong environmental education

Where water education is implemented in schools, there may be a positive knock-on effect on adult learning within schools' local communities. Clover and Hall (2010) describe the concept of environmental adult education as "an engaged and participatory process that begins with recognizing and respecting people's knowledge and bringing these together through dialog and debate to create new ecological understandings of our world" (Clover and Hall, 2010: 163). This could link to the concept of learning communities, where like-minded people gather, in-person or virtually, to share views on sustainable living (Davies, 2009). Community-based adult learning has the potential to promote true sustainability through education due to a lack of curriculum restrictions or focus on qualifications. This means education can be based more on practical skills, like living in an environmentally friendly manner, which are much more likely to meet the aims of transition education as well. However, this does not just have to be for adults: alternative sites of education for young people are likely to develop outside the school environment in response to the Transition movement (Reed, 2010). However, the focus of this research is the secondary school environment and so this topic will not be taken further in the thesis.

2.4.7 Pedagogy

Studying pedagogy, the science, art and craft of teaching, allows us to understand how people learn and what makes an effective resource for learning. Indeed, learning can be highly social and is certainly not limited to the school environment or to children. A particularly pertinent perspective to this thesis is constructivism: the idea that people construct knowledge for themselves as they learn, building upon what they already know. This means that a teacher should provide a route from current knowledge to the new knowledge being taught, without reproducing their own understanding. It is also important to motivate learners by demonstrating why learning is important and how they may be able to apply knowledge in real life (Hein, 1991). For this reason, constructivist learning environments often utilise real-world settings (and different representations of the world) to stress the authenticity of lessons. Collaboration and reflection are key features (Chen, n.d.-a). Vygotsky's social constructivist theory places more emphasis on the social context of learning and on collaboration, with in-school and out-of-school experiences being connected (Chen, n.d.-b). Constructivist learning is an important pedagogical strategy for teaching about global issues like water availability, as it advocates starting on the personal scale with situations people will already be aware of, and moving from there.

Inspired by Freire and Habermas, Mezirow initiated the term transformative learning:

> "Transformative learning is defined as the process by which we transform problematic frames of reference (mindsets, habits of mind, meaning perspectives) – sets of assumption and expectation – to make them more inclusive, discriminating, open, reflective and emotionally able to change. Such frames are better because they are more likely to generate beliefs and opinions that will prove more true or justified to guide action." (Mezirow, 2009: 92).

The abstract habits of mind are expressed through points of view, which are more easily changed through experiences. These two elements make up Mezirow's frames of reference (Mezirow, 2009). This could be learning that encourages thinking more closely about water using habits, for example. He builds on Habermas' (1981, cited in Mezirow, 2009) concepts of instrumental and communicative learning, stating that task-oriented learning is likely to take place when transformative learning happens in instrumental learning. Critical self-reflection is more common in communicative learning (when that is transformative), as a way to synthesise learning and encourage pupils to think about the direction of their future learning (Brown, 2004). Another element of transformative learning is critically assessing personal perspectives and living in accordance with these (Mezirow, 2009). This reflects elements of the aims of water literacy and citizenship education. However, Mezirow sees transformative learning as something children and teenagers are not capable of (Rampton Halverson, 2011).

2.4.8 Key examples of water education globally

Water education is now offered by a range of providers and every England and Wales water supplier is compelled to have an education programme in place. These tend to be aimed at primary school-age children, but educational materials are also available for secondary schools, community groups and adults. In addition, alternative, more experiential provision has also been developed. For example, Severn Trent Water has 12 visitor centres for recreational activities which promote environmental and water conservation (Severn Trent Water, n.d.). A study by Kids Industries (2007) analysed the opinions of 9-12 year olds on water before and after visiting an STW education centre, or engaging in outreach education. Both experiences were seen to have a clear effect on attitudes, with centre visits in particular increasing the enthusiasm of the children for water conservation.

Environmental education campaigns in the UK have predominantly focused quite narrowly on climate change, with notable efforts made by 10:10 and the government initiative Act on CO_2 (Directgov, n.d.-a, 10:10, 2011). Little has been done in terms of wider sustainability aspects though, and the House of Commons Environmental Audit Committee criticised Defra for its attempts at informal public sustainability education campaigns and recommended that future efforts reward positive behaviour and give practical steps for action that individuals can take (EAC, 2003).

Water efficiency campaigns in the UK have tended to be small-scale and local, such as Waterwise's *Save Water Swindon* (Save Water Swindon, 2010) and collaborations with brands, shops and television programmes (Waterwise, 2011). Other prominent efforts include the Waterwise and Ariel *3 Minute Shower Challenge* in association with World Water Day 2008 (PRNewswire, 2008) and the 2009 *Shower Power* campaign (Waterwise, 2009). Both of these programmes used celebrities for promotion on television, in magazines and on posters. Additionally, a 2009 government campaign linked water saving to carbon dioxide using television, press and radio advertising (Directgov, n.d.-b). The Energy Saving Trust promotes this link as well in terms of the contribution of heating water to household electricity bills (Energy Saving Trust, 2011).

While water efficiency campaigns in the UK are occasional and small-scale, in Australia, this area is much more developed and a focus has been made on sustainable behaviour change in reaction to a 5-7 year drought (Tucker, 2010). The *Water For Life* campaign by the New South Wales Government aims to be reducing water consumption by 145 billion litres a year by 2015, and has already cut water use to the levels of the 1970s (NSW Government, 2010b). This has been done through a range of schemes including *Water Wise Rules* and *Water Savings Action Plans* for businesses (NSW Government, 2010a). In Brisbane, water bills are now filled with information about a customer's water usage, including a comparison to average water use, how it

compares to this time last year, and advice on how they can reduce this (Tucker, 2010).

Information on water education programmes specifically was collected for the thesis during a Universtias21 funded visit to partner universities in Australia. I met with an education officer at Yarra Valley Water, supplier to the north and east suburbs of Melbourne. Yarra Valley Water engages in the State Government Victoria *Schools Water Efficiency Programme* (*SWEP*) which installs data loggers in schools for pupils and staff to track and analyse usage (Schools Water Efficiency Programme, 2013). *Water- Learn it! Live it!* was an accreditation programme linked to curriculum requirements, which encouraged strong take-up. However it is being redeveloped due to a shift in policy focus now Melbourne is no longer in drought (pers. comm. J. Hiller, 2012). This indicates different drivers to water education in Australia. The water company also runs school gardening programmes, as well as presentations and theatre visits in a similar vein to UK water company work in schools.

The travelling *Our Water* exhibition (viewed at Scienceworks Melbourne in April 2012) consisted of around 20 informative and interactive standalone exhibits. These included finding out ways of saving water around a virtual home, with the user registering whether or not they already carry out these actions, and then seeing a pie chart displaying the percentage of visitors acting the same way. Another display encouraged the visitor to try to balance a reserve of water between different stakeholders. Finally, I met with the founders of the Victorian Women's Trust initiative *Watermark Australia*. This worked by getting people together in social groups which gathered around kitchen tables to work through a set of resources, with the aim of learning more about water issues (in a way similar to Davies' (2009) learning communities). The materials and the resulting book *Our Water Mark: Australians making a difference in water reform* (Victorian Women's Trust, 2007) focus heavily on Australia (and Melbourne more specifically), making the information very relevant to the reader. The initiative was one of the

first users of the term “water literacy”, and the book is effectively a guide to increasing the reader’s water literacy, by making complex information into a readable and engaging format. These two examples in Melbourne represent major lifelong learning initiatives which, while not the focus of this PhD research, can be noted to be less readily available in the East Midlands of the UK. If present, these could offer sources of professional development for teachers or information for parents.

A more specific and in-depth analysis of the provision of water education, focusing on the East Midlands in particular, forms the basis of Chapter 4.

2.5 Conclusion to literature review

The development of environmental education in the school context has shown the potential for water education efforts to thrive in this environment, and some excellent examples have been noted, for instance in the UK and Australia. However, I suggest that there is potential for education for water literacy and water citizenship to be developed more in the UK secondary school context. Equally, there is a great opportunity for the place of water in geography lessons to be developed further, building links with other topics. However, the framework of water education efforts needs to be carefully constructed to encourage active water use, which is where water literacy and water citizenship could play a major role. Water citizenship and the development of a sense of responsibility seem to provide a route through the impasse between the social practices model and the rational actor model, but they will require water to be brought to the forefront of conversations and acknowledged in its roles in household activities.

There are also difficulties in developing water citizenship over a range of scales: it is a public resource individually consumed, but its consumption is socially shaped (Wong and Sharp, 2009). As the hydrological cycle operates globally, and we regularly consume items with internationally-reaching water footprints, it is essential to draw out connections with water across spatial scales. Connecting present water use to future availability under climate and population scenarios through futures education and intergenerational responsibility may also be useful for encouraging water citizenship.

In order for individual demand to be reduced, people must be able to manage their water use. A way for this to come about is by making people water literate: knowledgeable and informed about water use and issues, and able to apply this knowledge to their values and actions. This will require people knowing how, when and where they use water,

and how much of it is being consumed. There will be a need to make water use more ‘visible’ in the household. Equally, in order for this goal to be met, social practices and norms will need to be ‘de-formed’ and more sustainable ones created (Shove, 2011). Teenagers may have less developed personal norms and be more heavily influenced by social norms, so it is useful to consider the different networks and communities they are involved in. The role young people take in the household must also be considered, including their power, sense of responsibility and influence on adults, as well as their parents’ influence on them. Indeed, while some studies have focused on teenagers’ water use (e.g. Gram-Hanssen, 2007, 2005), this is not a major focus of much UK-based research and there is a need for further studies into this area.

Chapter 3: Research Methods

3.1 Introduction

As summarised in the last chapter, there are a number of gaps in the literature that this thesis looks to address, relating to young people's use of water in the context of its invisible role, and education for water literacy and water citizenship.

The data collection for this thesis fell broadly into two categories: a review of the water education currently on offer, and a school-based study of young people's water literacy before and after water education lessons.

In order to answer the research questions, there was a need for quantitative and qualitative data collection firstly around evidence of water in education materials, and secondly the present state of water literacy amongst young people in East Midlands secondary schools. However, this needed to be joined by an in-depth qualitative enquiry into the themes evident in both water education resources and the attitudes displayed by young people towards water use, in order to understand the reasons for water's invisibility in the domestic setting. Therefore a mixed methods approach to data collection was taken, utilising document content analysis, observations, questionnaires and focus groups (Table 3.1).

In this chapter I describe how each research method was selected and how the data collection instruments were designed. Recruitment of teachers, schools and pupils will be discussed. I will also explain how ethical issues were addressed.

Table 3.1 Data collection methods and detail

Method	Who/what	How recruited/ collected
Water education provision review		
Document content analysis	Edexcel examination specifications	Edexcel website
Document content analysis	Water education materials	Online search, contacts, conferences, site visits
Questionnaire	Secondary geography teachers	Geography PGCE mentor meetings at University of Nottingham
Site visits and meetings	Local	Internet and word of mouth
Observations	Severn Trent Water education team	Via CASE contacts through studentship collaboration
School-based study		
Questionnaire	School pupils	Via recruited teachers
Focus group	School pupils	In-class volunteers
Lesson design and observation	School pupil lessons	Via recruited teachers

3.2 Justification for chosen research methods

3.2.1 Document content analysis

I considered document content analysis to be the best way of gaining an accurate picture of the water education resources currently on offer to young people in the East Midlands. Previous studies have focused on school textbooks, for example the amount and accuracy of information for children on health issues in school textbooks (Nomoto et al., 2011) or a more strategic analysis of word density and page layout

(Weir and Doherty, 2006). Other document content analyses can be found in the health and medicine field, including the readability of documentation for patients (Glanz and Rudd, 1990, Hansberry et al., 2013). Examples of the analysis of environmental education resources are scarce, but environmental discourse analysis is fairly common, with examples including US press coverage of climate change (Boykoff and Boykoff, 2004) and discourse of support and objection to a wind farm proposal in Northern Ireland (Ellis et al., 2007).

3.2.2 Questionnaire

Gallagher (2009) provides a good summary of the pros and cons of using questionnaires in this type of research (Table 3.2).

Table 3.2 Pros and cons of using questionnaires with children (After Gallagher, 2009)

Pros	Cons
Enables collection of large amounts of data in a standardised format	Children may perceive them negatively, for example as a piece of school work; as an intrusion into their private lives; as a boring exercise
A high level of anonymity can easily be achieved	Voluntary consent is especially problematic for this method- when administered through schools, often children do not consider non-participation as an option
Can be useful to obtain the views of children who would not have the confidence to speak in an interview or focus group	If using self-complete questionnaires, these may exclude children with low literacy
Children may be familiar with the format	Can produce unwieldy, messy datasets, especially if design is flawed
When administered through schools, it is often possible to obtain a high response rate	

In response to the negative elements of conducting questionnaires in schools identifiable above, efforts were made in this PhD research to make the questionnaire engaging and colourful, with language tailored to the age group in question. A note was included at the top of the questionnaire (which I reiterated verbally) that the pupils could leave out any questions they did not wish to answer.

3.2.3 Focus group

While questionnaires can yield a large amount of quantitative and qualitative data, richer and more in-depth information can be gained

from focus group discussions, which also allow the possibility of following emerging lines of enquiry. There is a large body of literature on the use of focus groups with children and young people, for example to investigate youths' attitudes, or turn research findings into educational materials (Hennessy and Heary, 2005).

I decided to work with groups rather than individual pupils because this was likely to provide a more comfortable supportive atmosphere for young people to share their views than one-on-one interviews, particularly if the young people could have negative connotations of one-on-one conversations with adults (Hennessy and Heary, 2005, Gallagher, 2009). The focus group approach was chosen over a more structured group interview to allow for an activity with younger pupils, and to encourage discussion around topics. Conradson (2005) suggests that focus groups could enable the researcher to investigate the value-action gap in a way that wouldn't be possible through a questionnaire, and Robinson (2012) highlights how focus groups aid interaction between those participating in the research, spawning additional insights. Interestingly, Robinson notes that this can be particularly useful for uncovering more private behaviours (ibid.): an idea which could be applied to water use in the home. Indeed, the brief discussions which took place around water use in the bathroom would not have been appropriate for individual interviews with young people.

There are drawbacks to the focus group approach. Clearly even a well-managed focus group would not portray each participant's views equally (Conradson, 2005). Moreover, the researcher must make sure that children do not share things with the group that they do not wish to, nor become distressed due to pressure within the group (Hennessy and Heary, 2005). Krueger and Casey (2000) stress that children, unlike adults, may not realise when the moderator is looking for elaboration on a response rather than a short answer, so this is something to bear in mind when framing questions.

It is recommended by a number of authors that single sex focus groups are most effective (e.g. Hennessy and Heary, 2005). However, as only one group of students was engaged for each age group and school in my research, it was necessary to have mixed groups and no particular issues were encountered, possibly because most groups included classmates who would have known each other fairly well. A time limit of one hour is generally recommended for children and younger teenagers, with a readiness to cut short the session if the participants are weary (Vaughn et al., 1996).

3.3 Philosophical approach

The research comes predominantly from a Grounded Theory approach, where theory is generated from the data and is built upon in the analysis process, with the creation of codes and categories (Glaser and Strauss, 1967, cited in Creswell, 1997). Reflecting this approach, I did not start the research with a hypothesis. However, I recognise that I embarked on data collection with ideas drawn from the literature, and potential themes that emerged from data collected early in the process will have had some effect on subsequent focus groups. Equally, Cope (2010) points out that generating texts to code, for instance through focus groups, is less inductive than coding historical documents for instance, because the researcher will have directed conversation according to their research interests.

In a Grounded Theory approach, social actions are observed in practice and/or reported and probed (Starks and Trinidad, 2007). While I did not view water use in action, I observed young people learning about water, and probed values, attitudes and behaviours with questionnaires and focus groups. Starks and Trinidad (2007) also suggest that a Grounded Theory approach is applicable when the researcher is looking to potentially inform future interventions such as training and education.

My position as the researcher is discussed further in Section 3.6.2.

3.4 Research location

The East Midlands region of England was selected as part of the remit of the PhD CASE studentship, in conjunction with Severn Trent Water and Papplewick Pumping Station Trust. The schools engaged in the study were all located in this region. The area experienced a drought in Spring 2012, after data collection had ended at Braveley and Alfon Schools, but prior to data collection at Chalksmere College.

3.4.1 The schools and classes

The basis for working with young people and schools was outlined in Chapter 2. The first stage of school engagement was via PGCE geography mentor meetings at the School of Education, University of Nottingham, in June and December 2011. This was considered the most straightforward way to access secondary school teachers and I was able to present my research project to the audience at the start of each meeting, increasing support for the research. The teachers were given the opportunity to say if they would like to play a greater part in the research, and almost half expressed an interest. In total, 23 teachers from different schools across the East Midlands were approached for the questionnaire, and three schools were taken forward to take a major role in the study.

The school names that follow are pseudonyms, and only limited details are provided in order to maintain the anonymity of schools and pupils as far as possible.

Braveley School

Braveley School (BS) was selected due to the enthusiasm of the teachers to be involved in the project. This is a large school with a very good academic record. Braveley School is an Eco-School with Green Flag status.

Alfon School

Alfon School (AS) was selected as it provides a good contrast to Braveley School in terms of location, catchment and size. This is a smaller school where the proportion of pupils with special needs or disabilities is well above the national average, as is the percentage of pupils entitled to free school meals. Examination results are below the national average.

Chalksmere College

Chalksmere College (CC) is a sixth form college, which was recruited retrospectively from the PGCE mentor meetings. The teacher had attended the meetings and expressed an interest in the research, but it was left until later in the data collection process (June 2012) to secure participation. This was because the experiences at Alfon and Braveley Schools were reflected on, and it was decided that an older age group studying geography at AS or A2 level was needed. Chalksmere College offered a context where a large number of students would be studying a water-themed module for a whole term.

Table 3.3 summarises key information about each school. Heads of geography were used as gatekeepers to access head teachers, class teachers and pupils. The terms of engagement were agreed with the gatekeeper at each school and signed by themselves, the head

teacher, and the class teacher (if this was not the gatekeeper themselves). The schools had the benefit of being involved in a university research project and the opportunity to build links with the university and the CASE partners towards future studies. A copy of the letter to head teachers, teacher consent form and information for focus group participants can be found in Appendix A.

Table 3.3 Summary of information about each school engaged

School	Type of establishment	Age group worked with	Number of classes and students	Dates worked with
Braveley School (BS)	Academy 11-18	Year 9 (age 13-14)	2 classes (56 students)	October-December 2011
Alfon School (AS)	Academy 11-18	Year 7 (age 11-12)	1 class (24 students)	January-March 2012
Chalksmere College (CC)	Sixth Form College	Year 12 (age 16-18)	6 classes (78 students)	June-November 2012

3.5 Research design and analysis

3.5.1 Document analysis

Document content analysis

Two types of documents were coded: examination specifications, and water education materials.

Elo and Kyngäs (2008) provide a summary of the differences between deductive and inductive approaches to content analysis:

> "Deductive content analysis is used when the structure of the analysis is operationalized on the basis of previous knowledge.

> Inductive content analysis is used in cases where there are no previous studies dealing with the phenomenon or when it is fragmented. A deductive approach is useful if the general aim was to test a previous theory in a different situation or to compare categories at different time periods." (Elo and Kyngäs, 2008:107)

On balance I took an inductive approach, as the theories emerged from the data. However, document analysis began prior to the school-based data collection, and so initial concepts drawn from the materials informed the production of questionnaires and focus group schedules. Document analysis was returned to after the qualitative data collected in schools had been analysed, so that findings from working with the pupils could inform the reading of the documents.

Examination specification analysis

The first step was to review the 2011 Ofqual national subject criteria for geography and the sciences at GCSE and GCE A-level. It was noted that the word "water" featured very infrequently, and for this reason, I decided to instead look at the GCSE and A-level specifications for each subject.

It was considered an unnecessarily large undertaking to analyse in detail the water education provision of every examination board, particularly when detailed information about water teaching had been supplied by the teachers surveyed in the teacher questionnaire. Instead, one examination board was selected for detailed exploration. Edexcel was chosen because water is a significant component of the GCSE B specification, particularly in the unit *Water World,*[1] while water consumption and supply are also detailed in the GCSE A specification.[2] At A2, the module *Contested Planet* incorporates the major theme of water conflicts, which was studied by the students I worked with at

[1] Edexcel (2008a) GCSE in geography B specification
[2] Edexcel (2008b) GCSE in geography A specification

Chalksmere College.[3] However there are some noticeable omissions in subjects covered by Edexcel, such as information and communication technology at GCSE and A-level.

It is pertinent to briefly summarise water in specifications from two of the other major examination boards: AQA and OCR. AQA geography A specification details a unit named *Water on the land*, but this focuses on river engineering and flood management, with a minor element about water demand and supply.[4] The GCSE geography B specification includes *Water- a precious resource* as a geographical issue investigation.[5] At A-level, water cuts across a number of the topics including desertification in the Sahel, and fluvial landforms.[6] The OCR geography A specification features water as a cross-cutting element in desertification and desert and mountain life;[7] the GCSE geography B specification features water in terms of the hydrological cycle and river dynamics;[8] while water supply and pollution feature briefly in terms of environmental issues at A-level.[9]

The guidelines for the Edexcel review were to survey the specifications used for teaching 16-18 year olds in East Midlands schools and colleges, to gain a sense of where water appears in the formal curriculum. This covered the GCSE (the Edexcel English Baccalaureate follows the Edexcel GCSE specifications) and the GCE AS and A2 Level (which includes the Baccalaureate). The survey did not cover applied GCE, professional or BTEC qualifications, of which Edexcel offers a number focused on water management and efficiency for environmental technicians, as these specifications would not have been studied by a young person at the surveyed schools and colleges. Table 3.4 shows the number of syllabuses surveyed for each qualification. All

[3] Edexcel (2010) GCE Advanced Subsidiary (first examination 2009) and Advanced GCE (first examination 2010) in geography
[4] AQA (2008a) GCSE specification geography A for teaching from September 2009 onwards
[5] AQA (2008b) GCSE specification geography B for teaching from September 2009 onwards
[6] AQA (2010) GCE AS and A-level specification: geography for AS exams 2011 onwards and A2 exams 2011 onwards
[7] OCR (2008a) GCSE in geography A specification: for teaching from September 2009
[8] OCR (2008b) GCSE in geography B specification: for teaching from September 2009
[9] OCR (2010) Advanced Subsidiary GCE and Advanced GCE geography: specification

those available, taking into account the considerations in this paragraph, were downloaded from the Edexcel website. Syllabuses were reviewed for the 2011-2012 school year, and therefore they apply to the modular system and not the new linear system, operational from 2014.

Table 3.4 Number of Edexcel specifications surveyed by qualification

GCSE	19
GCE AS and A-level	35
Total	54

It is important to note that examination specifications describe ‘what’ to teach and not ‘how’ to teach, and therefore pedagogy remains the responsibility of the teacher. This is explored further through the lesson observations, considered later on.

The documents were initially coded quantitatively in NVivo as they were searched for the term “water”. It could then be seen how many times the word appeared in each syllabus by subject and qualification type, and where it was absent. A table was made of the context which appeared around the word “water” each time. Water could be seen to be a common term in biology as a requirement of healthy plants, in chemistry as a compound, and in physical education as the setting for a number of sports. These topics were not included in the key terms as they were not considered relevant to water literacy and water citizenship for the purposes of this PhD research, which focuses on domestic water use. The results were used to inform a key term search for a more thoughtful analysis of the context water use and efficiency is being studied in.

Water education resources

A systematic search of resources readily available online was carried out between early 2011 and late 2012. Many were found through the search function on the Global Dimension website, which lists thousands of educational resources from across the Internet, available to freely download or purchase. I also attended the Geographical Association (the professional association for geography teachers) annual conference in 2011 in order to do further research, and I was alerted to some resources by individual school teachers. Overall, it was found that the vast majority of materials available were aimed at primary school age children, and there was a lack of resources aimed at the secondary school aged child in the UK. Further detail on the documents collected and analysed can be found in Chapter 4.

Table 3.5 lists the resources found that were then analysed for content. Primary/Key Stage 2 is only listed if the resource was aimed at a broad age range which included secondary school year groups.

Table 3.5 Water education documents for secondary school pupils (focused on or relevant to the UK)

Provider	Name of scheme	Age group	Resources	How located
Oxfam Education	*Water Week*	KS2 and KS3	*Learn, Think* and *Act* teacher and pupil resources: Teacher guides, worksheets, presentations, classroom activities, videos	Online
	Water for All	KS2 and KS3	Teacher notes, quizzes, case studies and activities	Online
UK Water Education	*The Water School*	KS2 and KS3	Online pupil games and teacher resources; information sheets; water audit	Online
Water Aid	*Human rights and sanitation* *Women and water* *Learnzone Waterwise*	Secondary	Lesson plans, experiments and investigations	Online
CAFOD	*Life without taps* *From taps to toilets*	KS3, KS4 and post-16	Games, activities and practicals	Online

Geographical Association	*KS3 Geography Teachers' Toolkit: Water Works* *Do we have equal rights to resources?*	KS3	Book and CDROM	GA conference
Greenpeace	*Water Warrior*	KS2 and KS3	Game	Online
BBC Education	*World Water Crisis*	None given	Interactive map	Online
Tourism Concern	*Water for Everyone: Sustainability and Tourism Issues for Geography KS 3 and 4*	KS3 and KS4	Teaching units with lesson plans and resource sheets	Online
Unicef	*Discussing Global Issues* *Water – a right or a commodity?*	KS3	Activities, briefing papers and role play activity	Online
FAO Water	*FAO Water Promotional & Educational Material*	KS2 and KS3	Animations, games and posters	Online
Centre for Alternative Technology	*How much water does it take to make a burger?*	KS2 and KS3	Activity	Online
Action Aid	*Unpredictable Rain*	KS2 and KS3	Teacher notes and presentation	Online

Greater detail on each of the resources is presented in Table 4.3.

Severn Trent Water resources and observations

As the Severn Trent education programme is a key part of the research, it is here considered separately from the content analysis of other water education resources. Clearly water companies will be major providers of water education and I began the research process by looking into what each water company provided. Every water company has an educational or efficiency aspect to their website, and best practice is shared by UK water companies through the Water Education Forum at regular meetings (Pers. Comm. E. Woodland, 2011). Therefore each water company's efforts tend to be similar.

A large number of materials were collected and observations undertaken (including at some primary schools, where the opportunity arose). There were many other materials available for primary schools, and also site visits on offer such as to the Severn Trent Water site Carsington Water in Derbyshire. It was not possible (or deemed necessary) to fully analyse every element of Severn Trent Water's programme for the purposes of this PhD, and instead a focus was maintained on the materials that could be acquired and observations that could be made, relevant to the thesis aim, in a feasible time period.

Table 3.6 shows the resources and observations taken forward to the analytical chapters.

Table 3.6 Outline of selected features of Severn Trent Water's water efficiency education programme- materials and visits

Name	Description	Age group	Where and when observed
Water Saving Tips flier	Short facts on water use in the home and how to reduce it	Secondary	N/A
Water Saving Guide	Camel character-led guide to saving water in different spaces around the home	Secondary and adult	N/A
Water Reporters Handbook	Multi-disciplinary workbook with 10 lessons around water and carbon dioxide, encouraging calcalutions, writing and pledges	Secondary	N/A
Water Street game	Pupils read about different houses on a street and have to work out which are most and least water efficient using beakers and action cards. They then compare this to their own behaviour	Primary and Secondary	Secondary School in East Midlands (September 2012)
Konflux *Theatre in Education* Visit	Company works with a group of pupils to put together a pre-written play on saving water	Mostly secondary but applicable to all ages	Secondary School in East Midlands (February 2011)
Water Reporters – Maths Challenge	*Water Reporters* booklet incorporated into secondary school "Maths Challenge" maths lessons	Secondary	Secondary School in East Midlands (September 2012)

Analysis of water education materials

Corbin and Strauss (2008) suggest asking a set of questions of the documents being analysed, while keeping an open mind as to possibilities for other directions of enquiry (open coding). The questions asked of the materials are outlined in Table 3.7, and these were devised in relation to the research questions. This structure was used to produce a spreadsheet of the materials and categorise them in multiple ways, drawing concepts together (previously termed axial coding but now considered part of open coding by Corbin and Strauss (2008). While behaviour change does not feature in the thesis research questions, I was interested to see how this was communicated by the materials and how heavily it featured as a theme.

Table 3.7 Document analysis: representation of water literacy and water citizenship in UK educational resources

Presentation of water and water use	**Citizenship**	**Overarching message**	**Behaviour change**
How is water presented?	How is water citizenship represented?	What are the themes?	What are the changes suggested that we should make to our behaviour?
How is water literacy represented?	How is this drawing out the significance of water?	Is the resource designed to fit a particular school subject(s)?	What are the suggested incentives for behaviour change?
How is this drawing out the significance of water?	What model of citizenship is being assumed?	What is the purpose of the document and agenda of the provider?	Through what means is behaviour change encouraged?
How is current water use presented?	What kind of agency is assumed?	Are there any contradictions in the message?	
		How is learning encouraged?	

As will be considered in more depth in the lesson observation section, where resources were designed and viewed 'in action', it is essential to keep in mind how materials will be 'read', although Prior (2008: 824) asserts that "the ways in which such material is actually called upon, manipulated and functions cannot be determined (though it may be constrained) by an analysis of content".

3.5.2 Questionnaire

Questionnaire to teachers

The questionnaire, distributed to 23 geography teachers at PGCE mentor meetings, asked what was taught in terms of water education to each year group in geography lessons, and whether water features as a concept or theme in fieldtrips, environmental targets or special events. This data was used to explore the presence of water education in teaching across the region (though it should be acknowledged that a sample of 23 secondary schools does not cover the whole East Midlands region). A copy of the questionnaire can be found in Appendix B.

Questionnaire to school pupils

The statements used in the questionnaire were informed by reading a selection of related studies: The OECD Programme for International Student assessment (PISA) report on assessing scientific, reading and mathematical literacy of 15-year-olds in 65 countries (Fleischman et al., 2010), bearing in mind recent criticism of PISA rankings (Stewart, 2013); McLean and Dellot's (2011) proposal for a new *Civic Pulse Model* to measure active citizenship through know-how, attitudes, institutions and relations; and Fielding et al.'s (2008) paper which utilises the Theory of Planned Behaviour (TPB) to consider the factors affecting individuals' active environmental behaviour. Table 3.8 shows how the concepts presented in these papers were used to inform the

survey questions, and copies of the questionnaires can be found in Appendix C. Two statements from the questionnaire to pupils were not taken forward to analysis due their potential to be leading, or due to being double-barrelled statements.

Table 3.8 Questionnaire design: questions and reasoning

Statement/Question	Reasoning/ What question is testing for
• It would be easy for me to use less water at home • It would be easy for me to use less water at school	Perceived behavioural control (PBC): one's own perception of their capacity to perform a particular behaviour
• I see myself as an environmentally friendly person • Looking after the environment is an important part of who I am • The way my family behaves towards the environment affects how I behave • Climate change is a worry for me • Compared to the average household in my area, my household is [select option on scale from "much less" to "much more"] environmentally friendly • Compared to the average household in my area, my household uses is [select option on scale from "much less" to "much more"] water each day	Self-identity: how one defines oneself
• I feel personally responsible for making sure there is enough water for future generations • It is everyone's responsibility to ensure there is enough water for future generations	Sense of responsibility
• At my school, saving water is seen as important • It is important to have a shower every day	Personal norms: our own standards for our behaviour

• If I tried to reduce the amount of water I used, my friends would….[select option on scale from “strongly approve” to “strongly disapprove”] • If I tried to reduce the amount of water I used, my family would….[select option on scale from “strongly approve” to “strongly disapprove”] • If I joined a society or group that helps the environment, my friends would….[select option on scale from “strongly approve” to “strongly disapprove”] • If I joined a society or group that helps the environment, my family would….[select option on scale from “strongly approve” to “strongly disapprove”]	Subjective norms: expectations we see others having of us Descriptive norms: perceptions of the actions of others
• How much water does the average person in the UK use each day? • [World map with 5 countries indicated] Do you think a person in this country would use more or less water than a person in the UK? Why do you think this is? • Put these activities in order according to how much water you think they use [see copy of questionnaire in Appendix C]	Water literacy- concepts and understanding
• While I am waiting for the water from the tap to run hot, I collect the cold water and re-use it • I leave the tap running when I brush my teeth • I put the plug in the sink when I wash my face • I leave the bathroom to do other things while the shower is running to give the water time to heat up • I try to cut down the length of my showers (Extra statement added for CC students)	Specific water conserving/ wasting behaviours

The method of questionnaire completion differed by school. At Alfon and Braveley Schools, the pupils completed the survey on paper in class, while it was requested by Chalksmere College that a survey that could be completed online was sent to the students. This was still completed in class but on laptops, meaning that Chalksmere College students had a greater degree of anonymity between each other, whereas pupils at the former two schools tended to show each other their answers. Alfon and Braveley School pupils therefore may have been less likely to give answers which are not as socially acceptable, particularly in relation to saving water in personal cleanliness actions like showering. There was also greater incidence of copying amongst the younger groups, despite best efforts to get the students to fill in the survey on their own.

Many of the same statements were used in the second survey (post-teaching) to see how conceptual knowledge, attitudes and reported behaviours had changed. The pupils were asked if they believed specific attitudes or personal actions had changed, and if so, why. However, as I matched the first and second questionnaires, I could "test" whether this was the case.

3.5.3 Focus group design

Although a pilot study was not held, as preparation I took part in a several focus groups myself. The first focus group with each class used a warm-up exercise or icebreaker as is usually recommended (e.g. Robinson, 2012). Guidance on focus group design was gained from Krueger and Casey (2000), so the aim was to gain between five and seven volunteers from each group wherever possible and the questions were tailored to the age group where necessary. It was also emphasised to the participating students that the focus group was not a test and the outcomes were not being marked. Equally the participants were free to "jump in" and discuss what anyone said, though they were

asked to try to avoid talking over each other wherever possible. The length of the focus group was kept under 40 minutes and where possible, the furniture rearranged to create a circle as is generally recommended, e.g. by Hennink (2007). However, at Braveley School, I had to stand at the front of the room and the pupils needed to sit at desks, which was certainly not ideal. Equally, at Chalksmere College, the follow-up focus group needed to take place in the office of the Head of Geography, which may have had stressful or negative connotations for some of the students.

The topic guide for the focus groups was informed by the same literature that was referred to for the questionnaire design. In particular, I wanted to explore evidence of the value-action gap further by deliberating essential and non-essential water uses with the group. I also wanted to investigate PBC by talking about how the pupils thought their families and school could use less water, and the power they perceived themselves as having in these decisions.

For each school, I used a semi-structured approach with the same set of questions. For focus group 1, held before any water education, this was almost identical between Alfon and Braveley Schools, altered slightly for the older age group at Chalksmere College. At Alfon School, I had more time available so I included a short activity on virtual water at the end of the focus group because this had proved to be a popular and engaging topic in the lesson designed for Braveley School. For focus group 2, conducted after water teaching at all three schools, the questions were tailored slightly according to what the pupils had learned about in their water lessons, and also to develop some of the topics that arose in each of the initial focus groups. Topic guides for each focus group can be found in Appendix D. Focus groups took place approximately four weeks after the water lesson at Braveley School, five weeks after teaching on water ended at Alfon School, and approximately eight weeks after the students finished the topic of water conflicts at Chalksmere College. Timing depended primarily on

convenience for the teacher, but in all cases allowed time for the topic to settle in and longer term value and attitude changes to be noted.

3.5.4 Focus group and questionnaire content analysis

Content analysis of the open-ended questionnaire responses and the focus group transcripts was done by hand. This was a purely qualitative process: there was no counting of the number of instances particular phrases were verbalised, for instance. Again I took an inductive approach to content analysis of the questionnaire responses and focus group transcripts, however as mentioned in the previous section, this was informed by findings from the document content analysis.

In a common process as described by many (e.g. Creswell, 1997, Elo and Kyngäs, 2008) the transcripts were open coded by hand on printed scripts, and the codes were organised into categories and then broader themes, according to similarities between them and emerging stories that I wanted to tell. This enabled a coding tree to be developed. Drawing ideas (though not method) from La Pelle (2004) and Meyer and Avery (2009) on using Microsoft Office software for qualitative data analysis, these codes were transferred to a Microsoft Excel spreadsheet, where each quotation was listed under its code(s), categor(ies) and theme(s).

3.5.5 SPSS and Excel statistical analysis of questionnaire responses

In addition to content analysis, statistical analysis of data from the pupil questionnaires was carried out in Microsoft Excel and SPSS.

The first set of surveys collected (before water education) was analysed separately (by school) and together (all three schools). For the factual questions, including “How much water does the average person in the UK use each day?”, it was possible to determine the percentage

answering correctly and the mode response. For this question, the possible options to select an answer from were not equidistant from one another, and therefore more complex statistics, such as calculating mean distance from the correct answer, could not be done. For other opinion-related questions, such as the Likert-scaled statements, mode responses were also determined. Likert scale data is not strictly continuous, however in practice it is commonly treated as interval data and t-tests are carried out (Norman, 2010).

The specific questions I sought to answer through statistical analysis were:

- Is there a significant difference in specific water attitudes and behaviours between the three schools/age groups prior to water education?
- Is there a significant change in specific water attitudes and behaviours following water education?

The null hypotheses (that there is no significant difference or no significant change) were rejected where the calculated p-value was less than the significance level of 0.05.

To analyse differences between the three schools before education, one-way ANOVA was the appropriate test, but as the data was not normally distributed, its non-parametric alternative- the Wilcoxon matched pairs test- was used. Similarly, to explore differences within each of the schools before and after education, paired t-tests would need to be carried out, but due to a lack of normal distribution in the data, the Kruskal Wallis test was utilised (Table 3.9).

Table 3.9 Summary of statistical tests used

	Test (Parametric/non-parametric alternative)	**Purpose**	**Data analysed**
Between the 3 schools (first questionnaire)	One-way ANOVA/ Kruskal Wallis test	Compare differences between answers	Likert attitude and behaviour statements; factual question on water consumption
Within the 3 schools (comparing first and second questionnaire)	Paired t-test/ Wilcoxon matched pairs test	Compare differences between answers before and after education	Likert attitude and behaviour statements; factual question on water consumption

The three schools cannot be compared after education as each school cohort received a different water education programme.

It is important to note that the pupils surveyed after education were not always exactly the same pupils as surveyed beforehand, due to a small number of absences from the lessons. Where I consider changes in knowledge, I consider this for the group as a whole. However, in terms of more specific changes in attitudes, I have matched each “before” and “after” questionnaire to determine an individual’s attitude change, in the manner described in more detail in Section 3.7.

3.5.6 Lesson design and observations

After liaising with each class teacher and briefly studying the results of the first questionnaires and focus groups, I gathered resources to design lessons with three aims:

- To develop the water literacy and water citizenship of the students by making water use more visible
- To complement the current scheme of work
- To assist me in answering my research questions

Lesson plans were created with guidance from Lambert and Balderstone's (2000) chapter on lesson planning, and some materials used for the School of Education PGCE Geography course.

The resources I supplied to teachers had been located through the research process up to that point. Table 3.10 outlines the lessons designed and observed at each school. It should be noted that I did not design the lessons at Chalksmere College: these were written by the teacher in accordance with the AS level specification. The Chalksmere College Year 12 students received around 12 two hour lessons on water in total: a mixture of taught and research based lessons preparing them for the examination. I observed two of these lessons (see Table 3.10) but also obtained information about the whole unit. As I did not design the lessons, I was able to analyse the content with an outsider's view, unlike for the other two schools where much of the content was designed by me.

I produced a guide to aid my observation of the lessons (Appendix E) and recorded my experiences in each school using detailed field notes, including direct quotes wherever possible to bring in the voices of those being studied, as advised by Patton (2002). In addition, I noted down

my reactions and emotions after each observation and typed up all notes the same day if possible.

Cunningham and Jones (2005: 2) outline a range of “ethnography-lite” tools to meet the need for ethnographic studies in time-pressured situations. One of these, autoethnography, involves the researcher focusing on themselves and their experience in as objective a manner as possible: Starr (2010) argues that autoethnography has a focus on the area between yourself and practices or relationships with others. Bryman (2004) describes more generally the method of structured observation, which is often used to examine the interactions between a teacher and his or her pupils in the classroom. This involves a set of questions and rules (or an observation schedule) utilised for each observation. I did not examine in detail the balance between teacher and student speech and the number of seconds for each interaction, for example. Nor did I take extensive notes on the size and floor plan of the classroom. Therefore the descriptions that follow and the field notes used are not strictly autoethnography nor structured observations, but do take elements of both types of method.

Table 3.10 Outline of lessons designed/observed for each class

		Did I help design lesson?	Topic	What was produced by researcher?
Alfon School	Lesson 1	Yes	Introduction: Why do we need to manage water?	Lesson plan
	Lesson 2	Yes	Introduction continued: Why do we need to manage water?	Lesson plan
	Lesson 3	Yes	Water across the world	Lesson plan
	Lesson 4	Yes	Water Futures	Lesson plan
	Lesson 5	Yes	Virtual water	PowerPoint
Braveley School	Lesson 1 and 2 (the same lesson observed twice with different students)	Yes	How does our use of virtual water affect Africa?	Resources were assembled for teacher to make presentation and worksheets
Chalksmere College	Lesson 1	No	Case study: The Colorado River and Las Vegas	N/A
	Lesson 2	No	Water conservation and desalination	N/A

Observing the lessons being taught and the resources and documents being used draws parallels with what Prior (2012: 432) calls “ethnographies of documentation”, where the use of a document transcends its textual content, perhaps acting as a tool to bring people together. While the document analysis section of the research aimed to consider the potential audience, context and use of materials; classroom observations allowed for the resources to take on an even more active role and be analysed in the way they were utilised by teachers and consumed by pupils.

I used a question and topic prompt list to help me when observing the lessons (Appendix E). This allowed me to make some comparisons between the lessons when writing up my observations.

3.6 Issues and considerations

3.6.1 Gaining access and ethical issues

The research was designed in accordance with the Economic and Social Research Council (ESRC) *Framework for Research Ethics* (2010) and the British Educational Research Association (BERA) *Ethical Guidelines for Educational Research* (2011). The design also passed the requirements of the School of Geography Ethics Officer and the School of Education Ethics Committee at University of Nottingham.

All three participating schools were asked about their individual ethics procedure. If deemed necessary by the school, each pupil selected to participate in the focus groups, and a parent or guardian of each, would have been given a consent form to sign along with a participant information sheet. In fact, none of the schools required this step to be taken as the teachers and head teachers confirmed that general

parental consent was gained at the start of the school year for this type of situation. I wrote text to be placed in the school newsletter ahead of data collection taking place inviting parents or guardians to contact me with any questions. I collected signed class teacher consent forms as well as head teacher consent forms (Appendix A) (as all teachers engaged with as part of the research process are deemed participants by BERA), and teachers were informed that they could opt out of the research at any time prior to thesis submission.

Children were not taken out of the school environment to participate in the research, and I signed in and out of the school on entry and exit. On most occasions, a teacher was present with me or in a room next door, but having gained CRB clearance (which was checked by each school) I was allowed to talk to the children unsupervised within the research process. There was no risk of physical harm, and any other potential risks were only those that children are normally exposed to during the school day. The topics discussed in the focus groups and lessons were not sensitive, although I acknowledge that discussions which touched upon showering and bathing, or flushing the toilet, had the potential to make pupils uncomfortable, and where I sensed this was the case I moved conversation along. An example is discussed in Section 3.6.3.

The questionnaire was anonymous and questions were not of a sensitive nature, although again bathing habits were touched upon, but a note at the beginning of the questionnaire asked the pupil to skip any questions they did not wish to answer. I reiterated this verbally upon introducing myself to the classes as I recognise pupils may view a questionnaire in a similar manner to schoolwork, which they could feel must be completed. A brief description of the research was provided along with the conditions under which data will be managed. If, after reading this, the participant went on to fill in the questionnaire, their consent was implied. Participants were also informed that they could opt out of the research at any time prior to thesis submission.

All data relating to minors was kept anonymous, and adults' names were removed from the final thesis and any material seen by people other than the PhD supervisors. No financial compensation was given, in order to ensure that participants did not feel encouraged to give certain responses to questions. However, each student taking part in the focus groups was given a certificate and a small reward (University of Nottingham stationary) to thank them for their participation.

3.6.2 My role as the researcher

I was introduced to each class by their geography teacher as a PhD student carrying out research about water. The way the pupils viewed me seemed to depend upon many factors. The Chalksmere College students seemed marginally intimidated and concerned about giving the wrong answers. They tended towards quoting from their geography lessons and were not keen to 'open up'. On the other hand, the Braveley School pupils were generally very confident and chatty. The Alfon School pupils were quieter but once they were doing an activity, were easier to engage with and did not seem to be concerned about the answers they gave.

Hennessy and Heary (2005) recommend that the researcher makes clear their role is not that of discipline but to hear about what the children think. Several authors recommend using one's first name with young people in order to separate themselves from the teacher (e.g. Mauthner, 1997, Gallagher, 2009). However, this was difficult when a teacher or pupil would call me "Miss", particularly at Alfon School. This was also the school where I was asked to help with some of the lessons rather than simply observe them, which placed me into a role of teaching assistant rather than purely a researcher. It is essential to consider that measurement is a change agent, and it is very likely that me sitting in the classroom will have had an effect on the experience. In particular at Alfon School, due to the layout and capacity of the classroom it was necessary for me to sit at the front, constantly in the

view of the pupils. At Braveley School and Chalksmere College I could sit at the back and became a much less visible observer of the lesson.

Particularly in the focus groups, there was potential for the skewing of attitudes towards that which is seen as 'good' behaviour, which I as the researcher may have unintentionally encouraged through my responses or the questions I posed. Students may have then found it difficult to express a view which goes against this. On the other hand, younger pupils interviewed in some cases seemed to have a tendency to boast about their or their family's water consumption, potentially promoting one-upmanship. Indeed, while there were a number of benefits to the focus group approach, a downside is that schools are a place where young people's behaviour and schedule is managed by adults. For this reason, I was likely to be perceived as someone in control of the situation (Krueger and Casey, 2000). It is likely that this would have increased the children's propensity to try to give the 'right' answers.

3.6.3 Focus group dynamics

Only two students attended focus group 2 at Chalksmere College, so the discussion took on much more of an interview format, as is recommended by Robinson (2012) for this kind of unanticipated situation. Three of the absent participants submitted written responses to the focus group topic guide via email; in effect altering the session to more of a structured interview or even a questionnaire. Clearly this was not ideal but it did enable opinions to be noted from as many of the initial focus group participants as possible. The other five focus groups conducted for the thesis research were in the traditional format described in Section 3.5.3.

The Braveley School focus group, despite consisting of generally very chatty pupils, was dominated by one very confident student whom the other pupils seemed reluctant to disagree with. Equally, when

discussions were being had about flushing the toilet, one pupil suggested this was not entirely necessary every time the toilet was used. This idea was met with mild disgust from the other members of the focus group, resulting in the first individual staying rather quiet for the rest of the session. Indeed, group dynamics can have a big influence on whether a focus group session goes well or not (Gallagher, 2009), or indeed, as I found, the time of day that the focus group takes place. My final session with the students at Alfon School was held at 9am on a Friday morning, as this was the most convenient time for myself and the teacher. The students were tired and appeared bored of the topic before the focus group had even begun! This, of course, will have had some effect on the richness of the data collected in this session.

Shyness can also be a particular barrier. At Alfon School, participants were chosen by the teacher instead of volunteering (the focus group took place during lesson time so the students did not have to give up part of their lunch break or a free period, unlike at Braveley and Chalksmere). However this may have meant that the selected Alfon School pupils felt they should take part in the focus group, which was certainly not my intention.

3.7 Summary of participation and response rate

To summarise the data collection for the school-based study, a questionnaire on water knowledge, attitudes and behaviours was distributed to and completed by 156 students aged between 11 and 18 years old, from three schools. All students completed the questionnaire in-class and therefore there was a 100% return rate. Focus groups were held at the same time with 5-7 pupils from each school, discussing these issues in greater detail (Table 3.11).

With Braveley School a questionnaire was carried out with two Year 9 geography classes (ages 13-14; 54 pupils in total) and a focus group with seven pupils. With Alfon School a geography class of 24 Year 7 pupils (age 11-12) was surveyed and a focus group held with five children. With Chalksmere College six Year 12 geography classes (age 16-18; 78 students in total) were surveyed, and a focus group held with six students.

Minor adjustments were made to the questionnaire after reading responses from Braveley School (clarity was increased by highlighting selected words in one question), and for Chalksmere College, the format was changed to allow the survey to be filled in and submitted via computer. Equally, a small number of questions were added to the survey to follow up new lines of interest.

It is important to point out that upon transcribing the focus group conversations, it was not possible to identify each participant. This was not considered an issue as opinions analysed in the thesis are not allocated to an individual child. Therefore the identification used in the remainder of the thesis (e.g. P1, P2 etc) does not refer exclusively to one individual person; rather it distinguishes between different voices in a given exchange.

For the second set of surveys, 122 were completed (25 from Alfon School, 54 from Braveley School and 43 from Chalksmere College). Numbers for Alfon School and Braveley School are very similar to the first survey response rate, however for Chalksmere College numbers dropped due to a significant number of students choosing not to continue studying geography at A2 level. Before and after education surveys were matched, resulting in 93 matching pairs of questionnaires (where the same pupil filled in the questionnaire before and after water education): 19 from Alfon School, 40 from Braveley School and 34 from Chalksmere College.

While I suspect that the same students filled in the before and after questionnaire at Alfon and Braveley Schools, it was difficult to match

the surveys as some pupils gave different answers to questions about family size and gender in the second survey: indicators which were used to match the 'before' and 'after' surveys, as I did not ask for names in order to keep the responses anonymous. This difficulty encouraged me to adopt a more effective system for data collection at Chalksmere College, asking students to generate a code to identify themselves without providing a name. While it was still possible for errors to occur in matching the 'before' and 'after' surveys, it was much less likely.

All Alfon and Braveley School focus group participants attended both sessions. At Chalksmere College, one participant had decided not to take geography forward as an A2 option, and so could not be contacted to take part in the second focus group. Two students attended this second focus group, and three submitted responses to the topic and question guide by email.

Table 3.11 Summary of participation numbers in the school-based study

	Questionnaires (before education)	Focus group participants (before education)	Questionnaires (after education)	Focus group participants (after education)	Matched sets of questionnaires (before and after)
Alfon School	54	7	25	7	19
Braveley School	24	5	54	5	40
Chalksmere College	78	6	43	2 (plus 3 responses by email)	34

Chapter 4: Current provision of water education for young people in the East Midlands

4.1 Introduction

In this chapter I review the presence of water in formal and non-formal education, primarily provided in the school environment. Here, formal education refers to that which is provided by teachers, normally in accordance with the National Curriculum or examination specifications; while non-formal refers to the education provided by charities and companies through outreach or materials (as opposed to informal education, which is acquired through daily life experiences). The research question is:

How, and how well, do education materials currently encountered by young people in the East Midlands work with respect to making water use visible?

The chapter begins by providing context on the presence of water in the secondary curriculum. This is followed by the main part of the chapter, which is informed by a content analysis of collected materials.

The predominant theme in this chapter is how water use can be made more visible by bringing it to the forefront of conversations and demonstrating connections between the different scales at which it is used. As outlined in Chapter 2, Desforges et al. (2005) note the spatial and time scales over which citizenship can be enacted, including a model of the sustainable citizen (Desforges et al., 2005). If connections

between scales (such as local, national and global) are made clear, I suggest that water becomes more visible, for instance in terms of its physical use at the household scale, its role in local and regional landscapes and climates, its place in national policy, and its use in manufacturing goods exported to the UK. This could help to develop a sense of responsibility and agency amongst young people. In this chapter I also consider efforts to directly change behaviour.

Following on from pedagogical discussions in the literature review chapter I will be considering the ways in which education materials engage learners. I refer predominantly to the pedagogies listed by WWF-UK (2010) in their report *Learning for sustainability in schools: effective pedagogy*, based on research by Chris Gayford, with methodologies outlined in Gayford (2009) (Figure 4.1). Utilising a range of these is important as a means of keeping pupils engaged.

- Pupils taking responsibility for finding out information about different elements of a theme
- Pupils presenting what they had found to the class or an audience
- Articulating reasoning
- Stimulus materials like DVDs and video clips
- Collaborating in a group
- Participating in real-life decision-making (e.g. around environmental issues)
- Enquiry and problem-based learning
- Role play, taking on different viewpoints
- Active learning
- Reflective learning
- Creative activities (arts and music)
- Exploring real-life opportunities to take action using what they have learned
- Organising an event or co-ordinating a project (e.g. a sustainability day)
- Engaging with nature in the school grounds (or growing plants)
- Engagement with parents and the local community
- Linking local to global (e.g. connections with schools in other countries)
- Involvement of outside experts (e.g. on sustainability issues)
- Dialogue
- Didactic teaching
- Experiential learning
- Extended inquiry
- Snowballing
- Structured debate

Figure 4.1 Pedagogies to support learning for sustainability (after WWF-UK, 2010)

Of particular importance is reflection as a way to synthesise knowledge and encourage pupils to think about the direction of their future learning (Brown, 2004); and potentially transformative learning, keeping in mind Mezirow's (2009) reservations that children and teenagers would not be capable of this. I also consider active learning, where thinking is encouraged and connections to real-life situations emphasised (Bonwell and Eison, 1991, Education Scotland, 2013); enquiry-led learning, where students are guided to design their own research questions and conduct investigations, (Justice et al., 2007); and

experiential learning, which utilises actual experiences and reflection (Smith, 2001, 2010).

I highlight materials that strive to stimulate constructivist learning environments, providing a route from current knowledge to the new knowledge being taught, demonstrating the importance and potential applications of acquired information, and utilising real-world settings (Hein, 1991, Chen, n.d.-b). This is also an element of geographical enquiry work, where students are encouraged to link studied topics to their lived experiences and future lives (Roberts, 2003).

4.2 The presence of water in formal education materials

This section explores formal teaching in East Midlands secondary schools. As documented in the Research Methods chapter, water does not feature heavily in the Ofqual subject criteria at GCSE and A-level, and so Edexcel was chosen as a case study examination board, due to the range of subjects covered and a known strong presence of water at Key Stage 4 and 5 in geography.

4.2.1 Review of Edexcel examination specifications

54 GCE A-level and GCSE specifications were searched for the word “water” using NVivo software. 207 references were returned from 21 sources. Figure 4.2 shows that geography A-level and GCSE (Specification A) contain by far the most references to water. The primary reason for such heavy incidence at A-level is the *Water Conflicts* module. There is also coverage in the sciences.

A scan through the results informed a set of key term searches related to the research, as shown in Table 4.1.

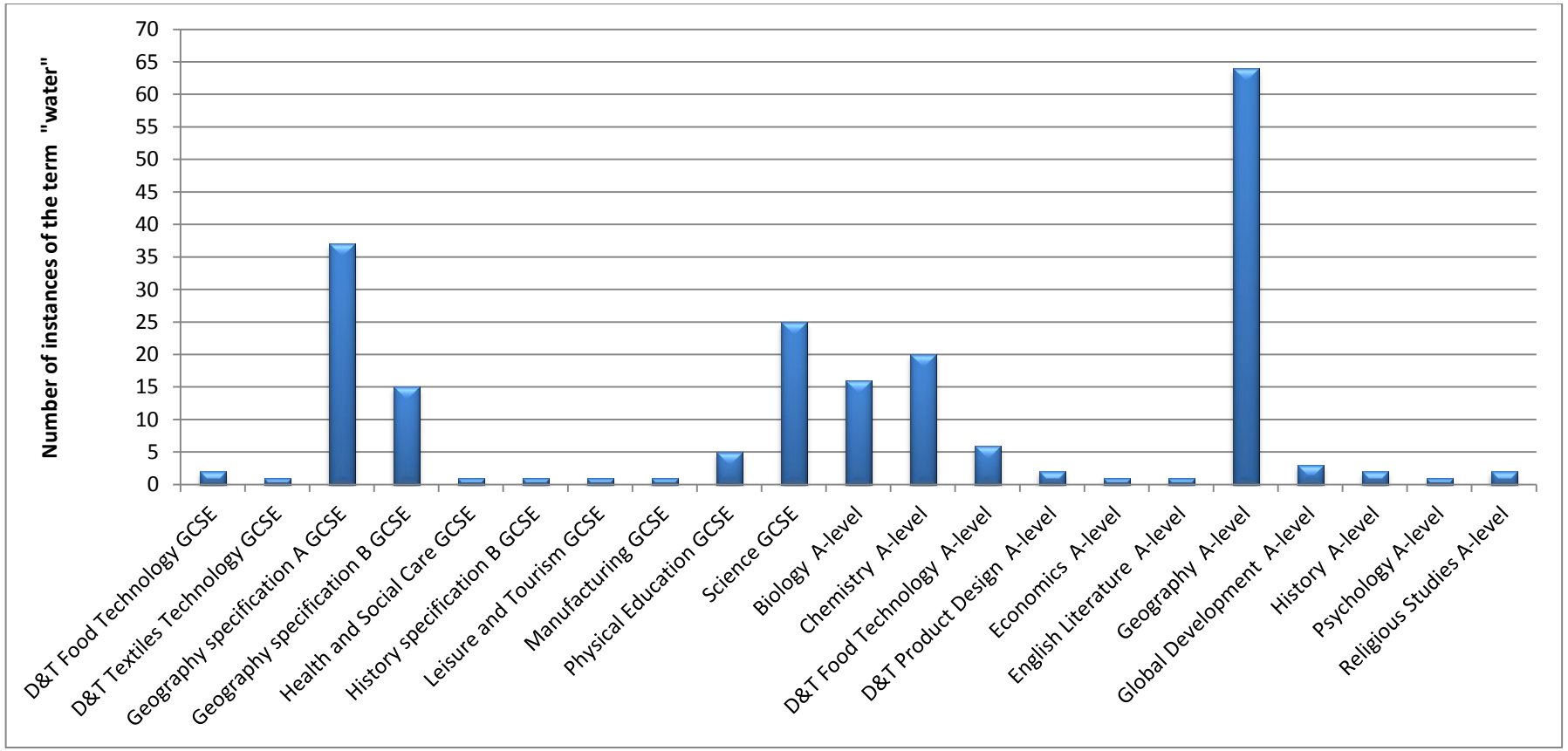


Figure 4.2 Instances of the word "water" in Edexcel GCSE and A-level specifications (only those with one or more incidences are displayed)

Table 4.1 Results of queries in NVivo for key terms relating to water use and availability featuring in Edexcel specifications

Theme	Search terms used	Number of references found	Number of sources references were found in
Water cleanliness	"Clean water"	5	3
	"Water pollution"		
Water security	"Water conflict(s)"	7	1 (Geography A-level)
	"Water security"		
	"Water insecurity"		
Water scarcity	"Water scarcity"	4	1 (Geography A-level)
	"Water stress(es)"		
	"Water shortage(s)"		
Water availability	"Water availability"	30	5
	"Water supply/ies"		
	"Water resource(s)"		
Water management	"Water management"	6	3
Water use	"Water use"	11	2
	"Water usage"		
	"Water consumer"		
	"Water consumption"		
	"Water demand"		
	"Demand for water"		
Water efficiency	"Water efficiency" "Water efficient"	1	1 (Geography A-level)
	"Water saving" "Save water"		
	"Water conservation" "Conserve water"		

It can be noted from Table 4.1 that three of the themes only feature in the geography A-level specification. However, other themes show a slightly greater spread across the subjects, with mentions of water pollution and clean water in chemistry and economics A-level specifications respectively (Figure 4.3), and water supply mentioned in history at both GCSE and A-level (Figure 4.4). Figures 4.5 and 4.6, however, show water management and water use to solely be mentioned in geography specifications.

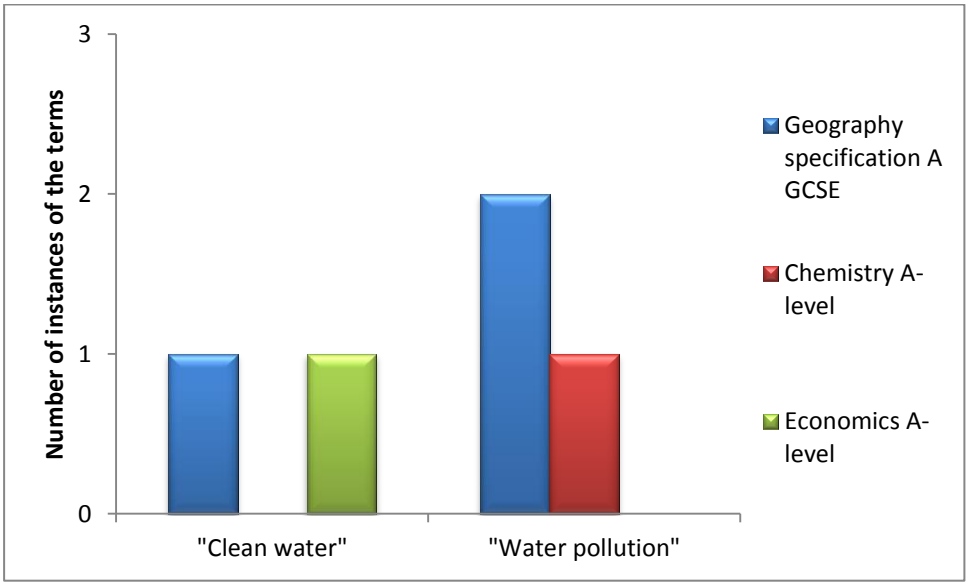


Figure 4.3 Bar chart to show incidences of terms relating to the theme 'Water cleanliness'

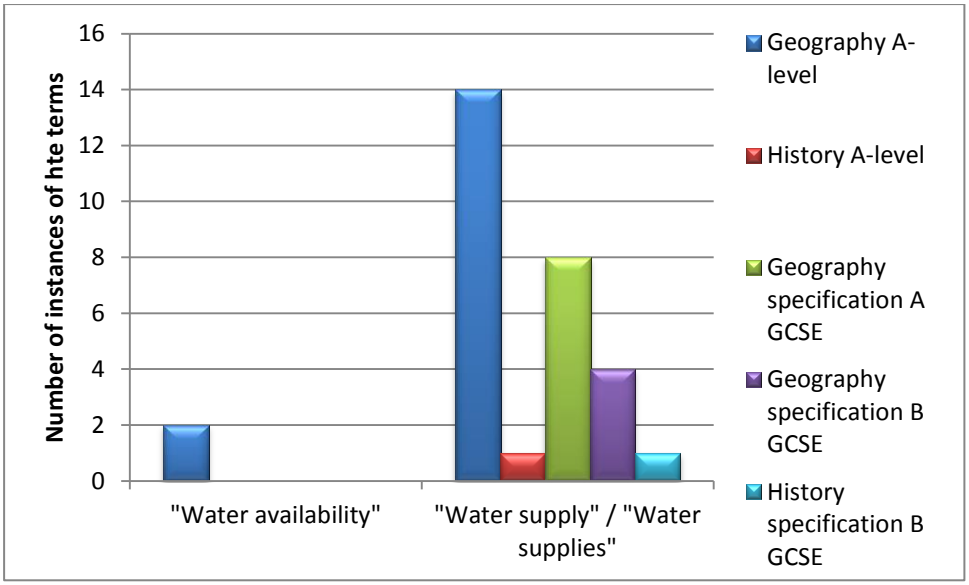


Figure 4.4 Bar chart to show incidences of terms relating to the theme 'Water availability'

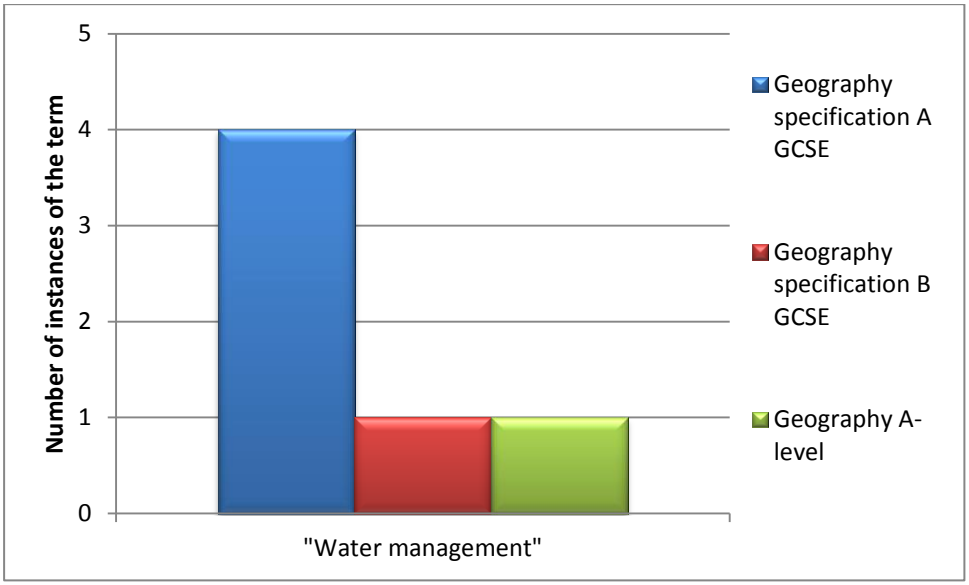


Figure 4.5 Bar chart to show incidences of the term "Water management"

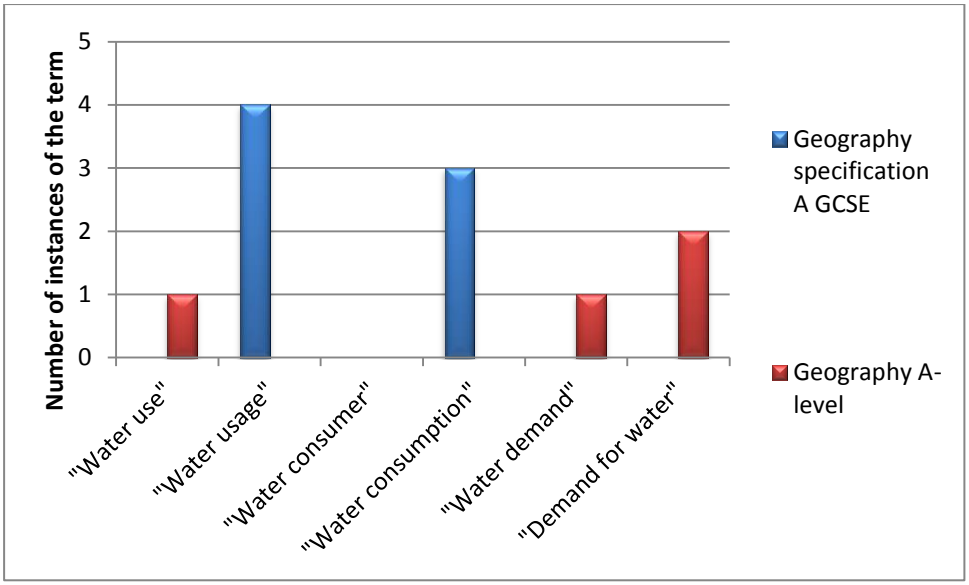


Figure 4.6 Bar chart to show incidences of terms relating to the theme 'Water use'

In sum, "water" as a term features frequently in the Edexcel A-level specification and multiple times at GCSE (specification A), but also in 21 GCSE and A-level subjects, which demonstrates its interdisciplinary nature. Water use and availability feature much more commonly in geography GCSE and A-level than in other subject specifications. These findings support the school-based research for this PhD thesis taking place in geography classes (Chapters 5 to 7).

4.2.2 Water education teaching in the East Midlands

While the Edexcel case study shows frequent mentions of water at GCSE and A-level, it is important to broaden consideration to both younger age groups and other examination boards.

As detailed in Chapter 3, a questionnaire was completed by 23 teachers of geography in the East Midlands. Given the number of instances of key water literacy terms in Edexcel geography GCSE and

A-level specifications, it was considered appropriate for the survey to be taken by geography teachers.

Of the six examination boards approved by Ofqual for use in England and Wales, Figures 4.7 and 4.8 show that for geography, OCR is the most common examination board at GCSE level, and AQA at A-level, with strong representation of WJEC at GCSE, and Edexcel at A-level. Therefore water may not feature as frequently in East Midlands secondary geography teaching as suggested by the survey of the Edexcel specifications.

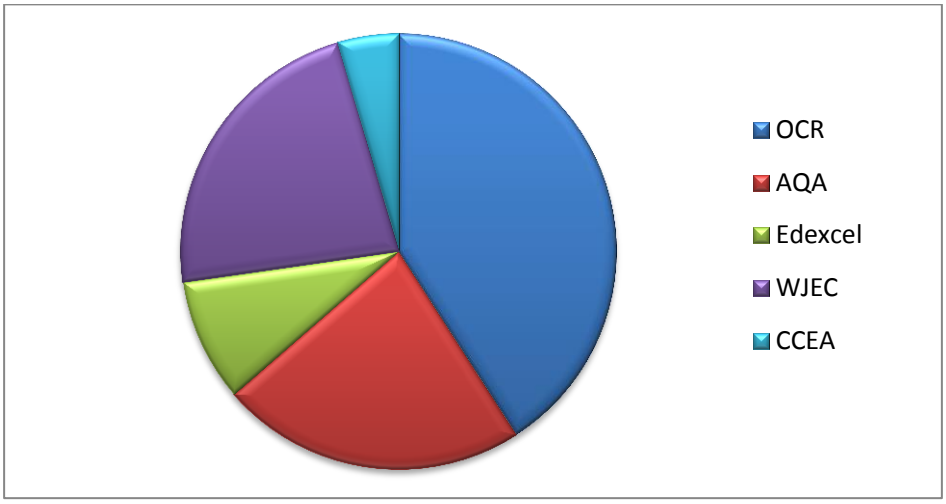


Figure 4.7 GCSE/ EB Board representation (n=23)

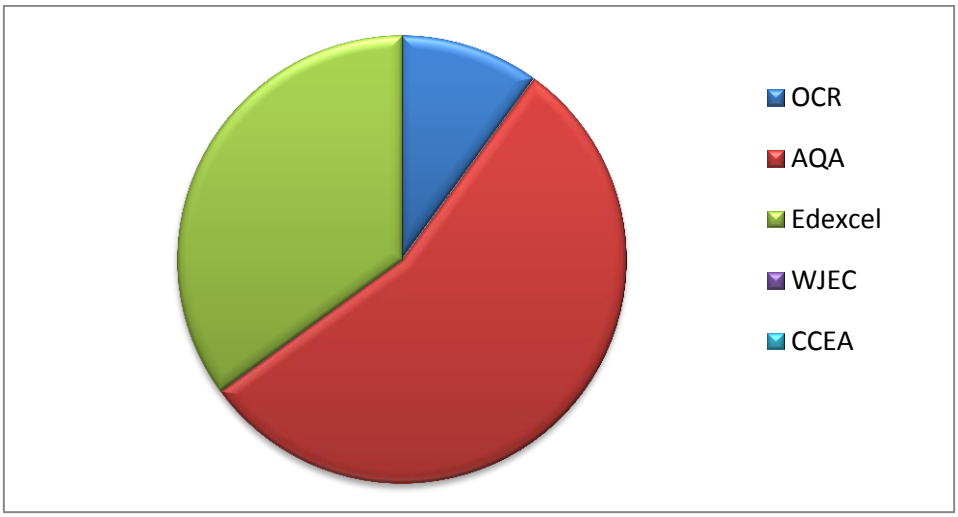


Figure 4.8 A-level/IB Board representation (n=23)

The questionnaire asked teachers which year groups were taught about water, and to briefly describe the topic covered. From this, I deemed it useful to divide incidences of water teaching into “briefly covered”, for example water as a minor sub-topic or the subject of one lesson; and “major topic”, where water was the focus of a number of lessons or a whole unit. Therefore the information displayed in Figure 4.9 incorporates my own interpretation of the data collected.

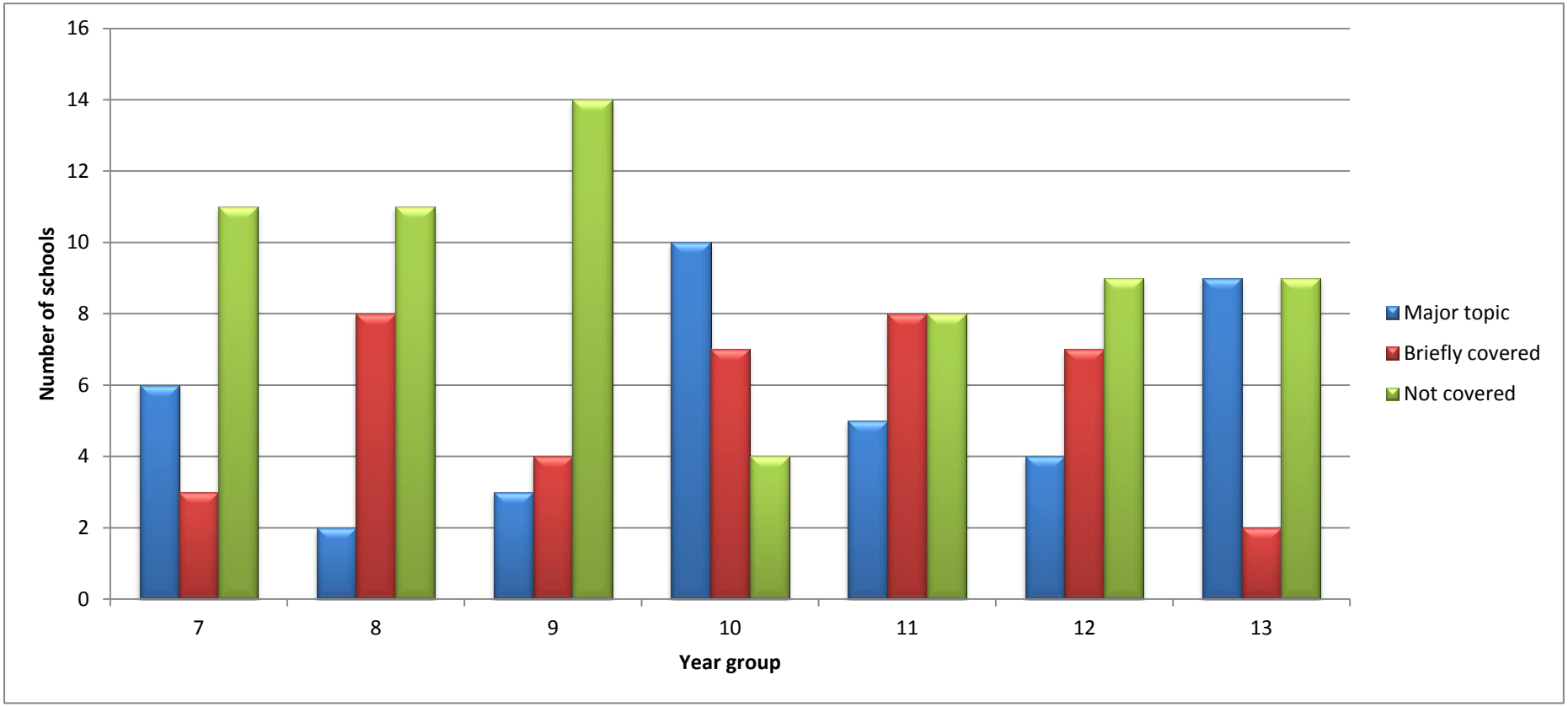


Figure 4.9 Representation of water in geography teaching across 23 surveyed schools in the East Midlands by year group

Contrary to the findings of the Edexcel case study, Figure 4.9 demonstrates that water is not covered in geography classes in Years 7 to 9 at the majority of the secondary schools surveyed. The lowest incidence is in Year 9, where water is not covered at all in geography classes by two thirds of the surveyed schools. Coverage is higher at Key Stages 4 and 5, with 45.0% of schools teaching water as a major topic in Year 13, and 47.6% in Year 10.

It can be seen from Table 4.2 that school water audits are not commonly undertaken by pupils at schools in this sample, but almost half of the schools run a special event linked to the environment or sustainability, and 52.2% of the schools have sustainability or environmental targets, although a number of teachers were unsure what systems were in place at their school. Equally, some teachers added that their school's sustainability or environmental targets focused on energy conservation rather than water.

Table 4.2 Teacher responses to questions about water audits, special events and sustainability targets (n=23)

	Have pupils ever been asked to carry out an audit of the school's water consumption?	**Does your school run an Eco Day, Sustainability Week or something similar?**	**Is your school working towards environmental or sustainability targets?**
Yes (%)	13.0	43.5	52.2
No (%)	73.9	56.5	30.4
No response/ unsure (%)	13.0	0.0	17.4

One school holds a "Water Day" and also teaches water to every year group in geography classes. Water was noted to be the teacher's specialist interest. This was one of the three schools later engaged for

the school-based PhD research. Many schools noted on the survey that they were Eco-Schools, and on further investigation, it was found that 73.9% of the schools surveyed are registered for this award, with three (13%) having achieved prestigious Green Flag status (Figure 4.10). The East Midlands ranks fourth out of the nine English government regions for the total number of Eco-School accolade awarded (Eco-Schools, n.d.-b).

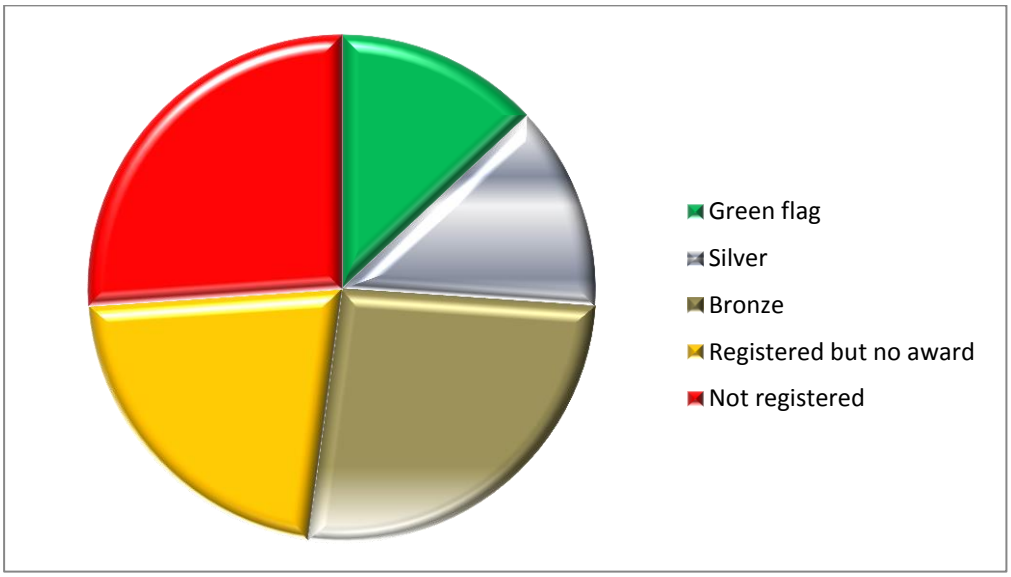


Figure 4.10 Percentage of the schools surveyed with each Eco-Schools award (n=23). Data gained from teacher survey and also from Eco-Schools website (Eco-Schools, n.d.-b)

Water is one of the nine key topics that the Eco-Schools programme focuses on, but energy is the sole compulsory topic (Eco-Schools, n.d.-e). In order to gain Green Flag status, only three topics need to be addressed, but for each renewal of the Green Flag (occurring at least every two years), two further topics must be tackled (Eco-Schools, n.d.-c). This means that water is not an essential component to gain Green Flag status, but after six years it would be necessary to pay attention to school water use in order to retain the award.

To summarise, water was found to be taught in geography in over half of schools in Years 10 to 13, reflecting the results of the Edexcel case study. This means that teachers of geography at Key Stages 4 and 5 are likely to seek water education resources to support their teaching. However, a different story was uncovered in Years 7 to 9, with particularly low coverage of water in Year 9. This may signal a lack of appropriate resources available. On the other hand, heavy coverage from GCSE stage onwards may mean few teachers choose to cover water in earlier years, which could in turn lead to a lack of demand for resources to be produced. The majority of the schools surveyed were registered with Eco-Schools, but this does not require working towards water-saving targets, and a number of the teachers told me that their whole school targets either did not include or did not focus on water.

All the questions in this survey were answered to the knowledge of the geography teacher surveyed, and it should be noted here that they may not know what has been done in other subjects or in the school more widely.

4.3 Water education from non-formal providers

Teachers are likely to seek education resources from non-formal providers to supplement their teaching. Similarly, pupils may search for and utilise materials to help with homework and revision. Therefore it is pertinent to consider these materials alongside the formal education a young person receives.

4.3.1 Materials

The water education materials from non-formal providers were selected according to the strategy outlined in the Research Methods chapter. Table 4.3 shows the documents collected for analysis, the central themes identified in each material and the main pedagogical techniques noted.

Table 4.3 Water education documents for secondary school pupils (focused on or relevant to the UK)

Provider	Name of scheme	Age group	Format	How located	Key themes	Pedagogical strategies used
Oxfam Education	*Water Week*	KS2 and KS3	*Learn*, *Think* and *Act* teacher and pupil resources around water vulnerability in developing countries Teacher guides, worksheets, presentations, classroom activities, videos	Online	Symptoms and causes of water vulnerability Unequal impacts Lack of access to safe drinking water and sanitation Water in developing countries Water as a shared human need and right	Diary (reflective learning) Understanding symptoms and causes Linking personal experiences to global issues Analysis of images and film clips Venn diagram Case study
	Water for All	KS2 and KS3	Website about reasons for and impacts of water issues in developing countries	Online	Range of causes and impacts Optimism and celebration Water in developing countries	Analysis of images Collaborative learning Case study Enquiry-led learning Creative activities

			Teacher notes, quizzes, case studies and activities		Analysing photographs and graphs Challenges assumption that water shortages 'just happen'	'Speech bubbling' different viewpoints (imagining the views of people in certain positions) Futures perspective
UK Water Education	*The Water Family*	KS2 and KS3	Online game for children about saving water	Online	Water uses all around the home	Interactive website Quiz and tips
Water Aid	*Women and Water* *Human Rights and Sanitation*	KS3 and KS4	Lesson plans and accompanying resources for citizenship, geography and sociology lessons	Online	Water in developing countries Factual experimentation	Mind map Card sort activity Enquiry-led learning Constructivist-based learning Problem-based learning Experiential learning Case study Making posters, magazine articles and radio programmes Investigation Film clip

						Campaigning
Water Aid	*Water wise*	KS3	Lesson plans, experiments and investigations	Online	Factual experimentation	Active learning
CAFOD	*Taps for Toilets* *Life Without Taps*	KS3, KS4 and post-16	Games, group activities and practical	Online	Water in developing countries Global water use Practical activity- water carrying Gender inequality Fairness Millennium Development Goals Prayer Personal water consumption Virtual water Human/child rights	Game Reflection Linking personal experiences to global issues Dialogue Brainstorming Ranking exercise Case study Quiz Active learning Campaign

Watts, S. For the Geographical Association	*KS3 Geography Teachers' Toolkit: Water Works* *Do we have equal rights to resources?*	KS3	Nine lesson plans and disc of resources. Themed around water resources and rights Book and CDROM	GA conference	Space and place Interdependence Environmental interaction and sustainable development Conflict and cooperation- relating to personal life Water consumption Virtual water Ownership of water Rights and responsibilities Equality and inequality Impacts of bottled water	Media literacy (challenging the media representation) Dialogue Maps Linking personal experiences to global issues Enquiry-led learning Game Problem-based learning (mystery solving) Creating a chronology/ 'fortune line' (a graph showing the feelings of a character) Layered decision making/ranking exercise Video clip Articulate reasoning Futures perspective

Greenpeace	*Water Warrior Toolkit 11+*	KS3	Game and classroom activity about the availability of freshwater and the number of stakeholders	Online	Discovering fresh water availability Conflicts over water sources	Game Reflection Role play Collaborative learning Active learning Enquiry-led learning
BBC Education	*World Water Crisis*	None indicated	Interactive map with case studies of freshwater issues	Online	International case studies Water conflicts shared resources Health Futures	Case study Interactive website Use of maps
Tourism Concern	*Water for Everyone: Sustainability and Tourism Issues for Geography KS 3 and 4*	KS3 and KS4	Five lesson plans connecting the tourist industry to water resources	Online	Virtual water Responsibility Corporate social responsibility Pros and cons of tourism	Venn diagram Concept mapping Case study Ranking exercise 5 “W” questions (What happened; who was there; why, when, and where did

			Teaching units with lesson plans and resource sheets			it happen) Moral dilemma Opinion line (marking position of one's opinion on a continuum) Mapping WebQuest enquiry-led learning (obtaining information from the Internet) Role play Decision-making Dialogue
Unicef	*Discussing Global Issues* *Water – a right or a commodity?*	KS3	Case studies of water supply from Ghana and Vietnam Activities, briefing papers and role play activity	Online	Water as a commodity Millennium Development Goals	Case study Graphs Snowballing (building on ideas from pairs, to small groups, to whole class) Ranking exercise Role play Presentation skills

						Extended inquiry
FAO Water	*FAO Water Promotional & Educational Material*	KS2 and KS3	Materials for World Water Day 2012. Theme is Water and Food Security Animations, games and posters	Online	Virtual water	Quiz Graphs and graphics
Centre for Alternative Technology	*How much water does it take to make a burger?*	KS2 and KS3	Activity about water content of food. Data deriven from Water Footprint Network website	Online	Water footprints Futures	Futures perspective Active learning Enquiry-led learning
Action Aid	*Unpredictable Rain*	KS2 and KS3	Stemming from Rio+20 summit. International case studies on rainfall and drought, starting with UK 2012 drought	Online	Heavy rain not necessarily meaning high availability of water Drought	Linking personal experiences to global issues Constructivist learning

			Teacher notes and presentation		Linking UK experience to that of other countries Short and long term patterns and changes Increasing demand Food shortage in other countries Links with energy and climate change	

Severn Trent Water resources and observations

Table 4.4 outlines a selection of the materials STW produces for secondary school-aged children. Table 4.5 details a selection of the activities Severn Trent Water offers, which I was able to observe. This is not an exhaustive list but indicates the materials and activities aimed at secondary school students that I was able to obtain and view during the research period.

Table 4.4 Outline of features of Severn Trent Water's water efficiency education programme: documents and materials

Name	Age group	Format	Key themes	Pedagogical strategies used
Water Saving Tips flier	Secondary	Short facts on water use in the home and how to reduce it	Taking care of the planet How to save water in the home	Setting challenges Water saving tips
Water Saving Guide	Secondary and adult	Camel character-led guide to saving water in different spaces around the home	Personal water use in the home and how to save it	Setting challenges Water saving tips Fun images Enquiry-led learning

Water Reporters Handbook	Secondary	Multi-disciplinary workbook with 10 lessons around water and carbon dioxide, encouraging calcalutions, writing and pledges	Links between water and carbon dioxide Role of people in water availability	5 “W” questions Game Questions from video Graphs Ranking exercise Enquiry-led learning Reflection Media literacy (critical reading of article) Active learning Mind mapping ‘Speech bubbling’ Opinion scale Articulate reasoning

Table 4.5 Outline of features of Severn Trent Water's water efficiency education programme: activities

Name	Description	Age group	Where and when observed	Key themes	Pedagogical strategies used
Water Street game	Pupils read about different houses on a street and have to work out which are most and least water efficient using beakers and action cards. They then compare this to their own behaviour	Primary and Secondary	Secondary school (September 2012) And Primary school (July 2011)	Group game Water saving tips Measuring out volumes of water	Involvement of outside expert (STW) Game Dialogue Collaborative learning
Konflux *Theatre in Education* Visit	Company works with a group of pupils to put together a pre-written play on saving water	Mostly secondary but applicable to all ages	Secondary school (February 2011)	Water saving tips- '5 Top Tips' How water travels to our taps Recent issue of frozen pipes Who STW are and their role	Role play Group work Action Dialogue Memorising lines Involvement of outside expert (Acting coach)

Water Reporters – Maths Challenge	*Water Reporters* workbook incorporated into secondary school *Maths Challenge* Mathematics lessons	Secondary	Secondary school (September 2012)	As for *Water Reporters* workbook	As for *Water Reporters* workbook as well as: Involvement of outside expert (STW) Data inputting

4.4 Discussion

This section discusses three themes that emerged from a content analysis of the non-formal water educators' materials: the temporal and spatial dimension, responsibility and agency, and behaviour change. These are deliberated through analysis of the providers' attempts to develop water literacy and encourage water citizenship; the ways in which water is made more 'visible'; providers' apparent purpose and agenda in producing the document; and the pedagogical strategies utilised. Insights from the formal education review are brought in where appropriate.

4.4.1 The temporal and spatial dimension

While work on place and space in human geography is extensive, the temporal dimension is less well documented. The idea of different possible futures has been taken up however, particularly in geography education (see Chapter 2 for a full discussion). In this section I suggest that encouraging students to think about water usage on different scales promotes citizenship: an argument also made by Hicks (2008: 120) in reference to the futures dimension.

Futures

The Geographical Association *Water Works* toolkit brings in the concept of possible, probable and preferable water futures. The book states that this helps teachers and students to:

> "…develop a future-oriented perspective on their lives and events in the world…[and] engage in responsible citizenship in the local, national and global community, on behalf of both present and future generations" (Watts, 2009: 33).

Hicks (2008) stresses that nurturing a futures dimension in young people's education is very important. In other work, he has described how geography teachers may not 'claim' the temporal dimension, when the past is seen to be the role of history teachers. This means the future can get overlooked in school education (Hicks, 2007b).

The GA toolkit encourages the learner to describe a water future for the year 2050, either where water demand has risen and not been restricted, or where water resources have been safeguarded (Watts, 2009). This scenario-style approach could inspire pupils to think about how their actions can affect their futures, developing a sense of intergenerational responsibility and citizenship. In the plenary, children write a 'message in the bottle' about the water future they would like to see, either locally or globally, for a classroom display.

Hicks (2007) writes about possible, probable and preferable futures (reflecting previous work by Bell (1998)), which can be mapped onto timelines in the classroom. He suggests students think about who else (individuals, organisations or charities, for example) might share their preferable future. This could be a way of encouraging children to be critical about what they read and decide for themselves what their values are (Hicks, 2007b). A number of the materials touch upon probable water futures, such as rising water tables in the Australian Murray-Darling basin leading to increasing salinity (BBC Education, n.d.). Readers of the Severn Trent Water *Water Reporters* workbook are asked to consider the potential impact of climate change on water supply, but are also given the statement "Water consumption will lead to climate change", and asked to rank their viewpoint on an opinion scale. Following this, they must explain their view in writing (Severn Trent Water, 2010a: 16). Here they are reflecting on and consolidating their knowledge, putting it into their own words, and articulating their opinion (Figure 4.11). There could also be a role here for teaching about uncertainty in futures, as Wals (2010) advocates.

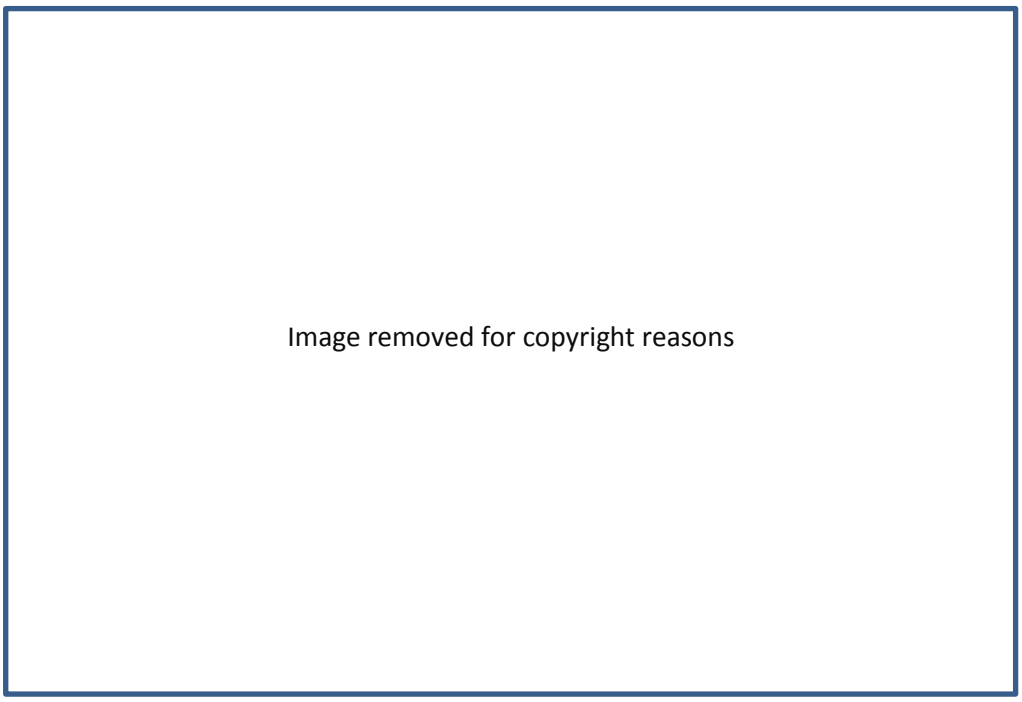


Figure 4.11 STW *Water Reporters* workbook: Climate change and water consumption futures (Severn Trent Water, 2010a)

Spatial scale

As suggested in the literature review (e.g. Herod, 2009), the concept of nested scales could work to encourage water citizenship amongst young people as it demonstrates the nesting of the personal experience within the global context, effectively using constructivist pedagogy. Some of the analysed materials clearly attempt to do this, while others focus solely on the global scale, or just personal experiences.

Global and international scale

Some materials centre on increasing learners' knowledge of water resource patterns across the world. Overwhelmingly the charity materials can be seen to have an international case study focus, due to the charities' remit of international aid (Unicef, Oxfam, WaterAid, CAFOD and Action Aid). For instance, the main feature of the Unicef resource is pupil role plays about either Ghana or Vietnam, so this text

takes on a very international focus with in-depth case studies (Unicef, 2004). The CAFOD game *Life Without Taps*, after asking pupils briefly to add up their own water uses, moves on to focus on case studies from Zimbabwe and Zambia (CAFOD, 2012a).

The case study method of teaching has its critics, and Brooks and Morgan (2006) instead advocate the 'place study' enquiry to bridge the gap between academic understandings of ‘place’ and what is being taught in school geography. However, the use of both case study and ‘personal story’ is common in charity resources, in order to encourage the development of empathy with people affected by the issues concerned.

The use of case studies can also be unhelpful if it is not explicitly connected to young people’s personal experiences. However, in many cases the materials do this: interestingly the WaterAid resource *Human Rights and Sanitation* asks students to share good and bad experiences of toilets, and do an audit of their school’s facilities. By asking students to “think of an occasion when access to a toilet has been a problem. Why was it a problem, what did they do and how did they feel about it?", a connection is built between learners and the people described in the personal stories about sanitation in Uganda, Ethiopia and India which follow (WaterAid, n.d.- a: 4). This connection helps the learner to visualise difficult situations relating to water cleanliness and access.

Action Aid’s resource begins with a discussion of the 2012 UK drought as a gateway to dialogue about food shortage in The Gambia (Figure 4.12). To finish, it considers what we use water for around the home and how we could save it (ActionAid Schools, 2012). This is an example of where the national, international and personal scales are all included, though a clear link between the impacts of personal actions on national and international situations is not necessarily apparent. The resources that link personal experiences to global issues exemplify

elements of constructivist teaching, where the teacher provides a route for the student from what they already know to new knowledge.

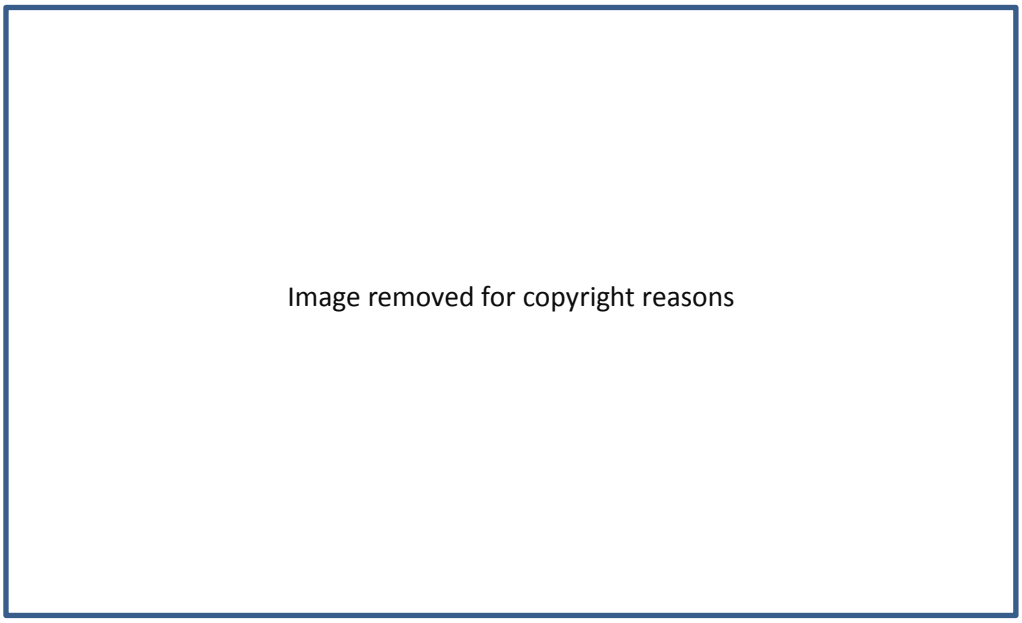


Figure 4.12 Selection of slides from Action Aid's *Unpredictable Rain* resource demonstrating connection between local and international experiences of drought (ActionAid, 2012)

National

While most of the charity materials make reference to UK water use, it is not a main feature and the focus tends to be on understanding water use in developing countries and considering this when using water at home. Action Aid's *Unpredictable Rain* resource has a strong UK emphasis alongside its main focus on food shortages in The Gambia (ActionAid Schools, 2012). The GA *Water Works* toolkit also begins with the two most common focal points: personal water use, broadening out to international case studies (in this case, in the Middle East). However, interestingly it also considers water supply in the UK: pupils study mission statements from UK water companies to try to identify the relative importance of increasing supply and encouraging water

conservation from the company's point of view. This is a good way to increase media literacy and critical reading of resources (Watts, 2009).

Local

Moving on to the local scale, for its final lesson the GA *Water Works* toolkit queries pupils on who supplies their water, and where it is sourced from: key information for locally engaged water literate students to know (ibid.). Lesson 6 of the Oxfam Education *Water for All* resource is named "Act locally- learning from change". However, the actions listed for students to take (like inventing a targeted watering machine or looking at water under a microscope) are more about appreciation of water than actively improving local situations. Nonetheless, this is still bringing water to the forefront of discussion and therefore helping to make it 'visible' (Oxfam Education, n.d.).

In theory, the local (or at least regional) focus should be the place of the water company, whose agenda will be concentrated on its specific region of the country. The English Midlands are not mentioned in any of the STW materials surveyed, however, with only a handful of general points about England or the UK (for instance, the STW *Water Saving Guide* begins with an introduction: "I know it's no desert here but believe it or not, England has less water available than Spain or Australia!") (Severn Trent Water, 2010b: 2). Reflecting on local water experiences such as drought, or landmarks such as lakes and even swimming pools would provide tangible and visible 'water places' for young people to connect with.

Personal and household

Continuing to narrow down the scale brings us to the individual and the household. After witnessing a gap in material provision at the local level, many resources are focused at the personal scale.

The STW *Water Saving Guide* and *Water Saving Tips* flier both focus almost entirely on the individual or their household and the practical action that should be taken. The emphasis is on ‘water saving tips’ and facts, organised in the booklet by which room they would be carried out in in the home (Severn Trent Water, 2010b, 2010c). The STW *Water Reporters* workbook also focuses on personal water consumption, though international case studies are referred to in terms of links between water, energy production and climate change (Severn Trent Water, 2010a). This provides a wider context for individual action.

In the *Water Reporters* workbook, students are encouraged to undertake reflective and enquiry-led learning through conducting an audit of their water use and answering questions about what they could change. After conversations about the volume of water used in everyday household actions, students complete a ranking exercise to test their understanding of what actions consume the most and the least water (Figure 4.13) (ibid.). In this way, understanding of personal household water consumption is explored repeatedly in the resource. Clearly the household is the simplest scale at which to make water use visible, and conducting an audit is a straightforward way of making consumption more conspicuous and encouraging active thought about water use.

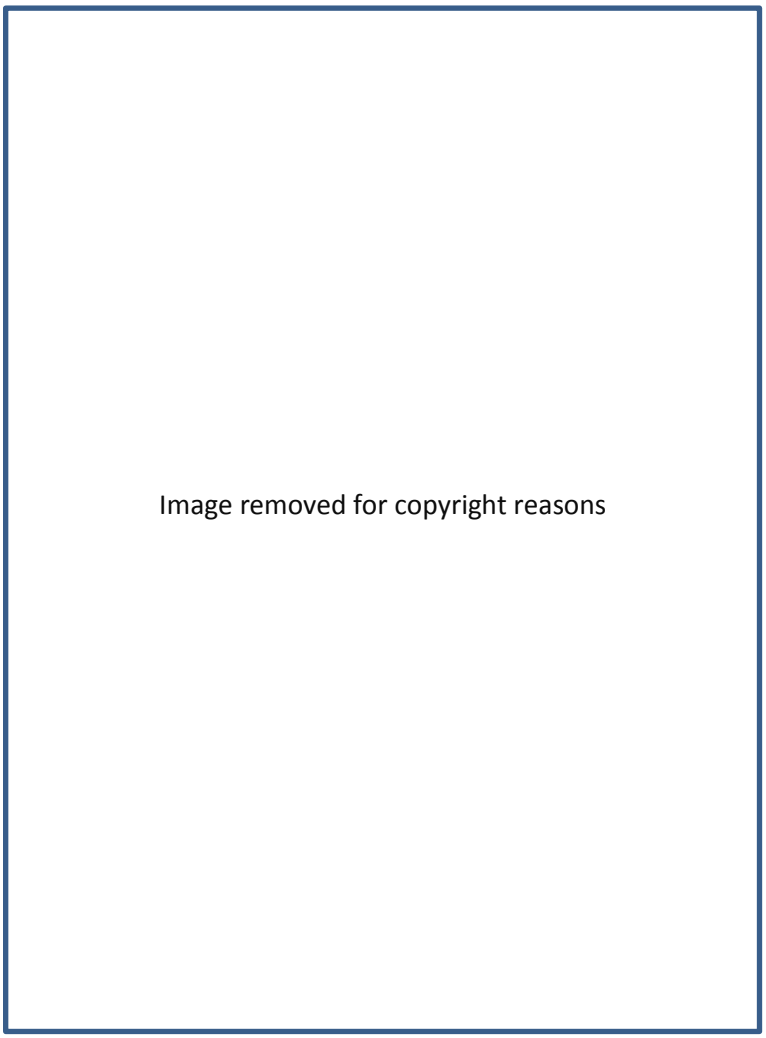


Figure 4.13 STW *Water Reporters* workbook: activity to rank household activities by water consumption (Severn Trent Water, 2010a)

Personal and household direct water use is generally mentioned briefly in each of the charity materials, though it is absent from Unicef's *Water - a Right or a Commodity?* resource, with this focused solely on water consumption in other countries (Unicef, 2004).

Focus across scales

A number of the materials encourage young people to connect their thinking across scales. Making connections could encourage water

citizenship and a sense of responsibility towards others over space and time.

The concept of virtual water is used by the Centre for Alternative Technology (CAT) activity *How much water does it take to make a burger?* in order to connect international water availability with personal consumption. Speaking in terms of the number of litres of water used to make particular food products helps the learner to visualise this 'hidden' ingredient (Centre for Alternative Technology, 2011). Morgan (2001a) touches on the imagined geographies brought to light through the consumption of food produced in other countries: an idea that encourages consideration of the consumption of virtual water at a range of scales. This could have a positive impact by increasing young people's awareness of their relationship with people elsewhere in the world, but it may act to reinforce stereotypes of poverty and difference if care is not taken (Morgan, 2001a).

The Tourism Concern documents also have a concurrent individual and international focus as the student reads about the contrasting water situations tourists and locals have within miles of one another. Impacts of these situations are explored in card sort games and class debates. They are then related to personal steps individuals can make, such as reporting dripping taps to hotel staff (Tourism Concern, n.d.). International tourism is a clear opportunity for young people to link 'faraway' situations to their personal actions, though the impact of these resources may be limited if the student has never been on holiday abroad. However, this is again an example of constructivist learning.

Just one of the resources utilises the time and space dimension: in the GA *Water Works* toolkit, students are asked to "imagine what could happen to water demand and supply in their local area by 2050" (Watts, 2009: 32). I have argued in this chapter that the local or regional focus is missing from many of the education materials examined for the PhD research, and therefore thinking about local futures can be seen as

quite innovative. Hicks (1996) found children to rarely think about the future of their community or discuss this subject with their friends. He found discussion to still be minimal about global futures but children were much more likely to have given this topic some thought. If both the local scale and futures are not covered in most of the educational resources produced by non-formal providers, they may not be incorporated into lessons by teachers and therefore local futures would not be considered.

Summary

To summarise, the international and the personal focus are common in the water education materials surveyed. The missing scales within the resources tend to be the local and the national scales, which provide important links from household water consumption to global water scarcity and particular water concerns in other countries. The Walker Review (prior to publication of the 2012 UK Water White Paper) suggested a campaign of key national messages targeting the community level would be the most effective way to encourage efficient water use (Walker, 2009). A regional focus could be most appropriate scale for water companies to work at, but young people might have less of a connection to their 'region' than to their local community.

Where multiple scales are included in the resources, connections between the scales are not always made clear. Consideration of both water futures and water footprints is an innovative way of crossing scale boundaries (if boundaries are considered to exist), making water use at the global scale more visible, and also provides a route into discussions about international and intergenerational rights and responsibilities, which will be considered more fully in the following section. This helps to develop sustainability citizenship across scales, as Desforges et al. (2005) advocate. Constructivist learning environments and enquiry-led learning could potentially utilise the concept of nested and connected scales, working from the locales a young person is familiar with

(personal, household and local scales) to those less familiar (regional, national and global scales).

4.4.2 Responsibility and agency

As mentioned, connecting the distant with the local and the future with the present may work to engender a sense of water citizenship and responsibility amongst young people.

Agency

Some of the providers appear to have an agenda to increase young people's perceptions of their own responsibility and ability to change situations, perhaps due to previous research finding a lack of both amongst the young (e.g. Hicks, 2007b). However, the water education materials all differ in the power that they assume of young people to take action. The Oxfam Education *Water For All* resource portrays a limited level of agency, with the materials aiming to increase visibility and appreciation of water, and encourage students to celebrate it (Oxfam Education, n.d.). Other resources see a role for children to fundraise for a water cause or perhaps write to their local MP.

Many materials present 'water saving tips' or ask students to come up with their own, and these are generally targeted at what the individual young person would be capable of doing. These raise the visibility of water in its often hidden roles in household activities. However, *The Water Family* website appears to assume that the child will influence family behaviour, or has a high level of agency in their home (for instance, making decisions about laundry practices) (Crystal Presentations, 2009). The STW *Water Saving Guide* also assumes a high degree of agency of the reader, listing suggestions like collecting rainwater in water butts, and planting drought-resistant turf. However, this resource is aimed at a mixed-age audience from teenager to adults

(Severn Trent Water, 2010b). On the other hand, the *Water Saving Tips* flier suggests children ask an adult to order a *Save-a-flush* bag for the toilet cistern, and encourage their parents to only run the dishwasher on a full load (Severn Trent Water, 2010c).

Responsibility

A conversation about young people's ability to act leads on to the level of responsibility they are seen to have. The STW *Water Saving Guide* includes two sections entitled "Doing Your Bit" and "Doing Our Bit". This expression of a shared problem that is not being placed entirely on the water user may help to increase buy-in from consumers (Figure 4.14).

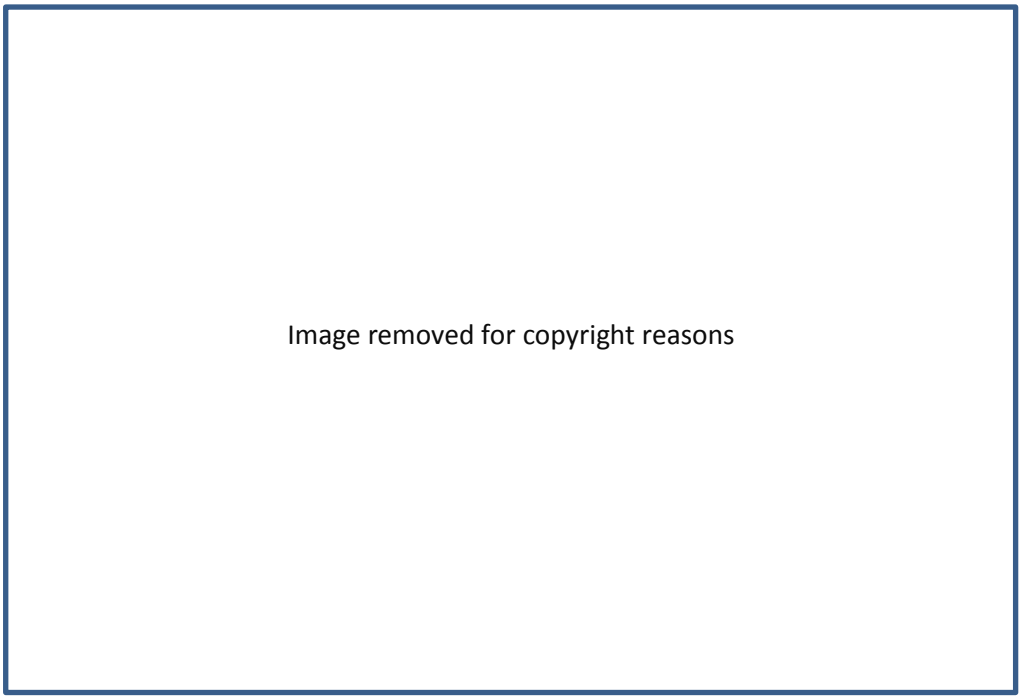


Figure 4.14 STW *Water Saving Guide*: "Doing our bit" and "Doing your bit" (Severn Trent Water, 2010b: 10, 13)

In research into a British and an Australian environmental scheme, Hobson (2013) found that some participants appreciated the option to 'do their bit' and make small, manageable lifestyle shifts. For other

participants, Hobson suggests that “engaging fully with such programmes felt like an implicit endorsement of the status quo and the identity subsumed therein, the obedient citizen ‘doing their bit’ and interested for the most part in ‘feathering their own nest’” (Hobson, 2013: 62). Other academics have also criticised this message, for instance because it encourages simply changing the style of consumption rather than reducing it (Maiteny, 2002), or because it erroneously suggests small simple steps will have a big impact on the environment (Crompton and Thøgersen, 2009).

One of the main focuses of most of the charity education materials analysed appears to be raising awareness of the charity’s work, in order to encourage campaigning and fundraising. Oxfam Education’s *Water Week* resource consists of four slideshows: *Introduction*, *Learn*, *Think* and *Act*, with the latter providing ideas for campaigns and activities, including statements such as “£10 will pay for tools for one farmer to clear and maintain their swamp farm” (Oxfam Education, 2012). CAFOD’s documents also aim to motivate the learner to take action, with one of the suggested Key Stage 3 follow-up activities being “Planning action”. Students are encouraged to write to their local MP and the Secretary of State for International Development, as well as organising fundraising activities (CAFOD, 2012a) and making a personalised sign to send to David Cameron encouraging him to take the lead on water at the 2012 G8 summit (CAFOD, 2012b). Arguably, these activities take responsibility for action away from children and place it more onto government. On the other hand, this is an act of citizenship in itself, relating to political action as opposed to direct action.

The STW materials tend to be focused on personal action around communicating the need for more efficient use of water and how this can be achieved. In the STW *Water Street* game classroom activity, the class is divided into groups, and each group is designated a family on Water Street. The aim of the game is to determine whether your family

is a water saver or a water waster.[10] While it could present a 'black and white' picture of water use as either efficient or wasteful, the game shows variations along the scale between wasting and saving, and also within households. Again, the activity raises visibility of the water being used by different members of a family around the home.

In terms of emphasising responsibility of youngsters, the CAT activity *How much water does it take to make a burger?* highlights that many food items come from abroad and may just be processed in the UK, which "…means that we are consuming 'other people's water' in the things we buy" (Centre for Alternative Technology, 2011). The use of language here emphasises responsibility of the individual extending beyond their direct water consumption, and echoes the argument made by Hoekstra (2006) that we bear some responsibility for water availability in places where our water footprints stretch. In a similar vein, the GA *Water Works* toolkit discusses use of water in a ski resort in water scarce Dubai (Watts, 2009).

However, arguments such as this could be seen as troubling: how much responsibility for sustaining water resources do we want to put on the shoulders of young people? As Jessica Pykett (2011: 236) asks in relation to citizenship education and teaching fair trade, "…how can we teach a topic like fair trade without falling back on idealizations of the individual ethical consumer-citizen? How do we avoid reinforcing the view that the school student is entirely responsible for global inequality…?".

As mentioned in the last section, the GA *Water Works* toolkit also considers levels of responsibility and action in the final lesson of the pack, where the futures perspective is referenced. The book states that this helps teachers and students to "…engage in responsible citizenship in the local, national and global community, on behalf of

[10] Researcher's observation of Severn Trent Water 'Water Street' activity with Y7 pupils, September 2012

both present and future generations" (Watts, 2009: 33). Here we can see nested scales of responsibility and citizenship over space and time considered, in a similar vein to Dobson's (2007) arguments about the international and intergenerational responsibilities of environmental citizens. In terms of pedagogy, the GA toolkit encourages students to articulate reasoning on responsibility, asking them "How far do you agree" with statements about water rights, responsibilities and management (Watts, 2009). However, as Barnett and Land (2007: 1066) discuss, it can be difficult to maintain care (such as that we may feel towards friends and neighbours) over long distances. Therefore, can we expect young people to feel a sense of responsibility for people in faraway locations, which they may know little about beyond a case study?

One way of tackling this may be through building empathy, and this is certainly what many of the charity providers work towards through their educational resources. The role play game is a feature which appears in many of the charity resources, as it encourages the development of empathy through putting oneself 'in someone else's shoes'. CAFOD's *Life Without Taps* and Greenpeace's game within the *Water Warrior Toolkit* are similar in that students work in teams to extract 'water' from an imaginary source. In CAFOD's game, real (but empty) buckets are carried by pupils via a 'river' to a 'storekeeper' who hands over resources in return (CAFOD, 2012a; Greenpeace, n.d.). The Greenpeace game is about conflict between different stakeholders using the river, each with their own priorities. Taking a different tack, the Oxfam resource *Water for All* promotes a responsibility to young people to simply spread the word about water being wonderful! (Oxfam Education, n.d.).

Responsibility is a central theme in the Tourism Concern education materials, encouraging students to recognise the impact of tourists (and themselves as tourists) on water scarce regions. Rights and ethics are touched upon where tourist and local water consumption is contrasted:

> “The estimated daily domestic water consumption of local people on the island of Zanzibar is just 30 litres per day. In contrast, luxury resorts in Zanzibar use up to 2000 litres of water per tourist per day. Some hotels even have guards patrolling their water pipelines to prevent thirsty locals from trying to tap into them” (Tourism Concern, n.d.: 4)

The pedagogical technique of using a ranking exercise suggests pupils rate different suggestions on the topic “Saving water: how can individuals make a difference?”. By weighing up options, students may become aware of changes they can make to their own lives to have a positive impact on the lives of others (Figure 4.15).

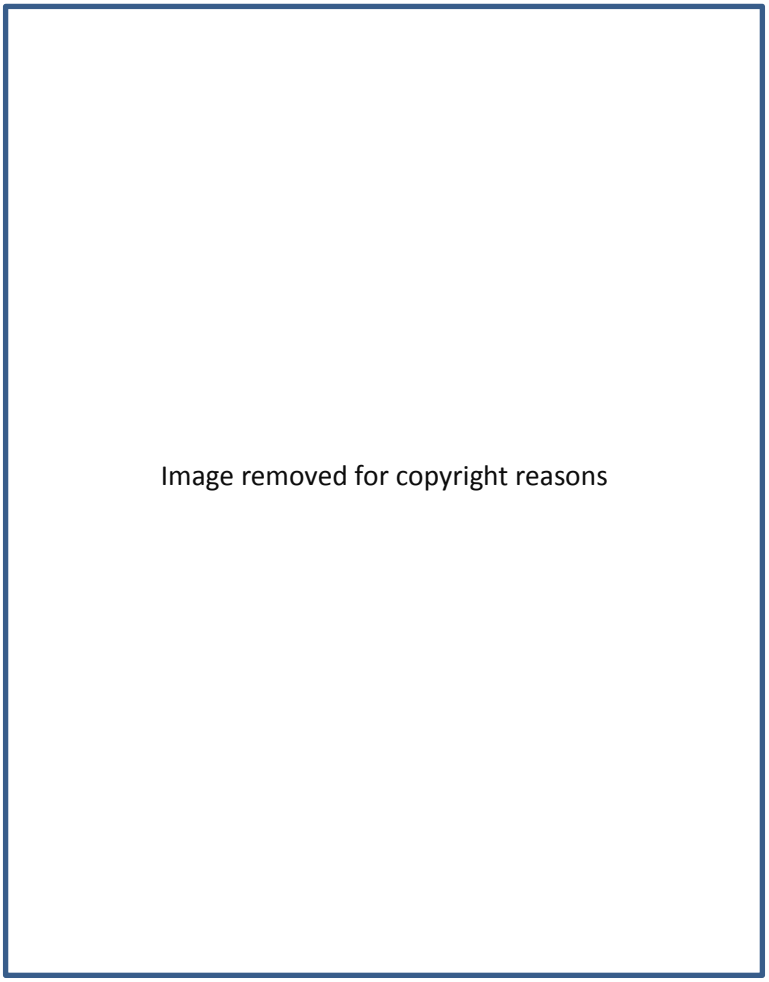


Figure 4.15 Tourism Concern: “Saving water- how can individuals make a difference?” (Tourism Concern, n.d.: 7)

To sum up, while in some of the materials, children's connection to water availability in other countries is not made clear, with empathy and campaigns appearing to be key goals instead, others strive to form deeper connections, for example through the impacts of tourism or increasing the understanding and visibility of water footprints. Where children's potential impact on the water resources of people in 'other countries' is explained, international responsibilities and citizenship are insinuated.

4.4.3 Behaviour change

All of the education materials considered have at least one overarching purpose or agenda, and for many this is to encourage some kind of action such as campaigning or making personal changes to lead a more sustainable lifestyle. Others indirectly target water consumption through virtual water and tourism, or make linkages between water use and energy or carbon emissions. By designing water education materials, the providers link increased water literacy to changes in everyday behaviour.

Most of the documents centre on providing information in order to encourage attitude change (which it may be hoped will to lead to behaviour change), though a handful provide information with the intention of directly changing behaviour. There is an important distinction to be made between these two types of agenda.

Increasing knowledge

One of the main barriers to understanding water consumption is an inability to comprehend and visualise volumes of water, particularly when it is hidden in pipes or drains away almost instantly. Measuring out water in order to understand volume is a common theme in the non-

formal education materials surveyed: the STW *Water Street* game involves measuring out the water used for different actions around the home,[11] and as discussed earlier in this chapter, a number of the charity resources involve children carrying water around the classroom to see what it would be like to have to do this. In a different way, in the Greenpeace resource *Water, water everywhere…* the teacher is asked to demonstrate to the class what volume of water would be fresh if the entire world's water was one litre (with the answer being 1.5 millilitres) (Greenpeace, n.d.). The CAT activity asks students to carry out an enquiry, weighing components of a burger in order to work out its water footprint (Centre for Alternative Technology, 2011). WaterAid's *Learnzone Waterwise* activities also include a series of small experiments to demonstrate the characteristics of water and its supply, such as creating a model siphon toilet flush with a paper cup and drinking straws. These active learning experiences are memorable for young people and are likely to help commit facts to memory, along with enabling them to visualise the volumes of water being discussed (WaterAid, n.d. – b).

Practical 'water saving tips'

One of the focuses of the Severn Trent Water documents is to provide 'water saving tips' to the reader: short, snappy and easy to remember facts. While these have been critiqued for their connection to small actions (Crompton and Thøgersen, 2009), Troy and Randolph (2006) argue that concepts like turning off the tap whilst brushing teeth have the potential to reach wide stretches of a population so should not be ignored. These tips tend to utilise facts and figures. In the case of the STW *Water Saving Guide*, this includes statements about water use in the home like "Simply turning off the tap while brushing your teeth, washing your hands or shaving can save over 5 litres of water every minute!" (Figure 4.16).

[11] Researcher's observation of Severn Trent Water 'Water Street' activity with Y7 pupils, September 2012

Figure 4.16 STW *Water Saving Guide*: tips about how to save water (Severn Trent Water, 2010c: 5)

The STW Konflux *Theatre in Education* visit (where pupils learn a play about water conservation) encourages children to memorise their 'lines', many of which are in the form of water facts such as "A bath uses eighty litres of water and a shower uses sixty" (Konflux Theatre in Education, 2011). In small groups the pupils act out being a bath, a shower and a tap, brushing teeth, washing up and washing face, watering plants, and tightening dripping taps. These are linked to the "5 Top Tips" the pupils are told: as this is a small number the ideas should be easy to remember. The actions will remind them of the tips when

they go home and carry out the activities as part of their daily routine. Equally, after a discussion of water use in The Gambia, the Action Aid resource moves on to highlight what we use water for and then provides tips for saving it. Most are centred on not running taps (when brushing teeth or when waiting for drinking water to cool) but another is "Use a water butt to store rain water and use it to water the garden" (ActionAid Schools, 2012). As mentioned earlier, it is interesting that this is a suggested action to a schoolchild, but it is probably intended that the child will pass this tip onto their parents.

Quizzes

In some cases, tips are communicated through short quizzes. The interactive website *The Water Family* guides a user around a virtual house, where they have to answer questions about how fully they would fill a bath or a washing machine (Crystal Presentations, 2009). Oxfam Education's *Water for All* resource also features a quiz where students match photographs to potential causes of water shortage (Oxfam Education, n.d.). Indeed, the main feature of the FAO UN World Water Day 2012 resources is a guessing game where students are quizzed on how much water they think is needed to produce an item. First, second and third prizes are awarded with certificates (UN Water, 2012).

CAFOD use a 5 minute quiz, including questions like "How many litres of water does a person in Europe use each day for drinking, cooking and washing, on average?" (CAFOD, 2012b: 3). The answer, 200 litres, is given with the supplementary information that 200 litres is more than a bath filled to the brim. This allows the pupil to visualise the volume of water, the effectiveness of which was argued earlier in this section. The quiz is a very useful way to gauge prior knowledge (formative assessment) or learned knowledge (summative assessment). However, it is important to be mindful of the 'snippets' of information children gain from this type of learning, which without context, may not be very useful.

Personal actions

The STW *Water Saving Tips* flier and *Water Saving Guide* are heavily focused on behaviour change and making clear the personal changes that can be made to the reader's lifestyle. Challenges are made to the student in the *Water Saving Guide* to take one minute off their showering time (and encourage friends and family to do the same!) (Severn Trent Water, 2010b). However, no specific behaviour changes are suggested in the STW *Water Reporters* workbook: instead, adaptations to daily routines are to be proposed by the young people themselves after working out how much water they use in a day through a water audit, and determining what actions result in this (Severn Trent Water, 2010a). The pupils are then asked to make a pledge to reduce usage in one or more ways. This is a key way in which behaviour change is motivated, particularly as the pupil chooses the action themselves which could promote commitment. This kind of critical self-reflection is indicative of transformative learning.

The Tourism Concern materials also feature suggestions of how individuals can make a difference, and while some of these require confidence and maturity ("Ask the hotel managers or your tour operator what they are doing to reduce water consumption"), they are all feasible for a young person to achieve (Tourism Concern, n.d.: 6).

Influencing others

While personal behaviour changes may be encouraged, a number of the resources promote the idea of having an influence on individuals outside the group. The STW Konflux *Theatre in Education* visit may achieve this as it is performed in front of a school audience of younger pupils, who are likely to look up to the older children (Konflux Theatre in Education, 2011).

Clearly by some of the actions described on *The Water Family* website (washing the car and watering the garden), it is intended that pupils will talk to parents about saving water (Crystal Presentations, 2009). In the STW *Water Reporters* workbook, six pledge vouchers are provided for the child to fill in after their household water audit (Figure 4.17). The pupil is encouraged to think about how they and their household could save water, so it is seen as a group effort (Severn Trent Water, 2010a: 12, 20). I suggested in Chapter 2 that there is a need for more research into the power and influence of young people on parent and family household behaviours, but it is clear that many of the non-formal education providers take for granted that children will have an impact on the way their families use water.

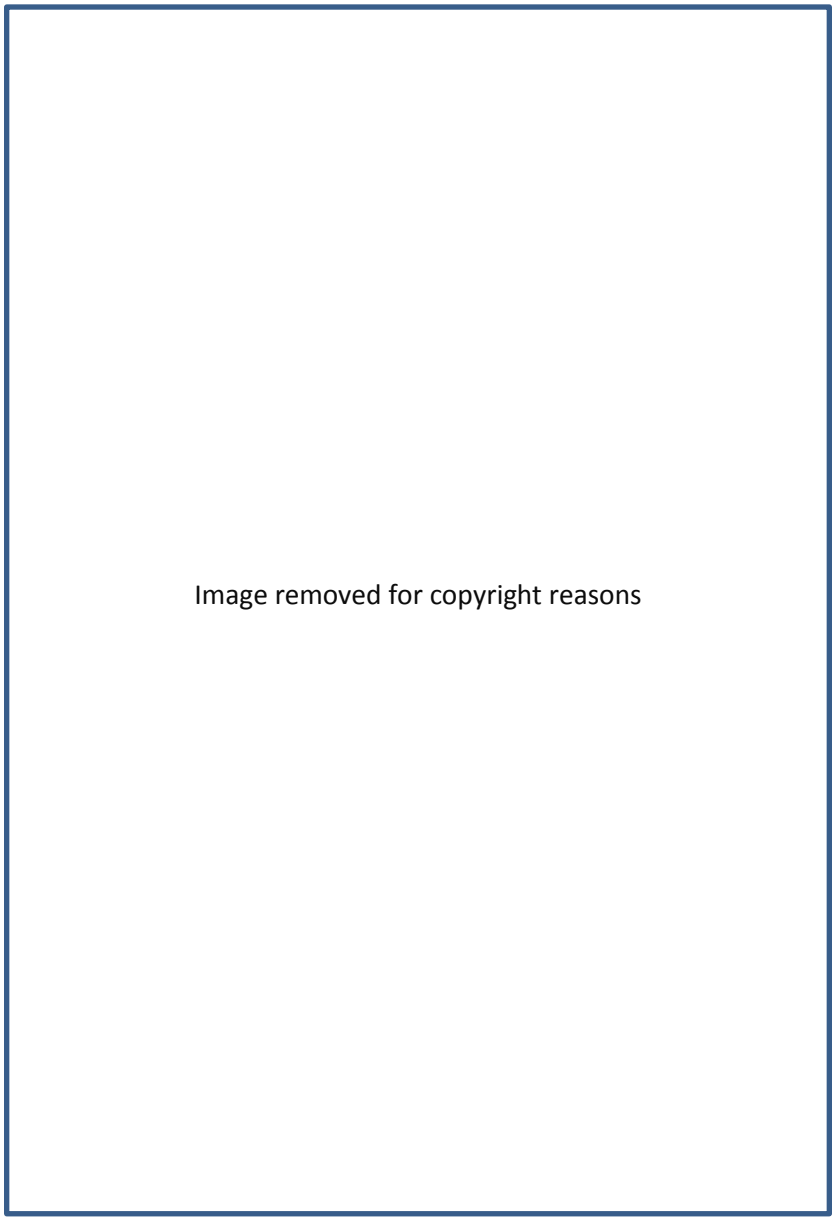


Figure 4.17 STW *Water Reporters* workbook: pledges to save water (Severn Trent Water, 2010a)

Social norms

Another more subtle way of changing behaviours is by putting social norms to use. After asking students to calculate their own water use, the STW *Water Reporters* workbook asks the reader “Looking at your water efficiency rating, what band are you in? How many litres does a person in your house use per day?” (Severn Trent Water, 2010a: 11).

This encourages the pupil to consider how ‘normal’ their water usage is, perhaps nudging them towards more sustainable usage. Similarly, the STW *Water Saving Guide* encourages enquiry-led learning by providing resources for a water audit to be done. Afterwards it asks:

> “How did you score? The average person in the Severn Trent Water region uses about 130 litres of water a day. If you are using more than this, you can save water by following the tips below” (Severn Trent Water, 2010b: 12).

As mentioned in Chapter 2, where an action is found to be influenced by social norms, telling individuals what “most people” are doing could lead to the activity being more readily taken up (Thaler and Sunstein, 2008). The *Water Saving Guide* also indicates high use habits in red and low use in green: for instance in terms of dishwashing, "in a bowl with tap off" is written in green text, and "under a running tap" is written in red (Severn Trent Water, 2010b: 11).

The *Water Reporters* workbook asks the pupil “Who is most responsible for this in your household? Is it your mum? Dad? Brother? Sister? Are you all responsible? Why?” (Severn Trent Water, 2010a: 11). Answering this question would highlight discrepancies within the household, making unsustainable water use more visible, and suggests who the pupil needs to ‘target’ in order to reduce their family’s water consumption.

An important note is that the section also asks the pupils in which category they use the least water. This works to identify where the pupil is already water efficient, encouraging them to feel a sense of pride in this which may lead to a desire to save water elsewhere. However, it could also make them feel that they are already ‘doing their bit’, relating to the concept of negative spillover (Crompton and Thøgersen, 2009).

4.5 Summary and concluding comments

We can see evidence of a range of pedagogical strategies which work to make water use more visible, and bring out the themes of nested and connected scales and responsibility towards water.

It was argued that young people need to have or perceive personal agency in order for them to take action. These means positively highlighting steps they personally can take, rather than communicating a negative message about current water use and availability. Where behaviour changes are encouraged, some of the materials focused on what a young person would be able to achieve themselves, but others provided general tips for actions around the home. Many teenagers will not do the laundry or water the garden at home, and so providing tips about these actions relies on pupils pestering their parents to change habits, or remembering the behaviours for when they are older. While the materials could be effective in achieving these things, presenting behaviours children do not have the ability to change could act to reduce their sense of efficacy and result in apathy.

Indeed, making the issue personally relevant is important, whether that be through describing the impact of individual water consumption, or as found in some of the materials, through discussions about tourism or virtual water, which act to link the personal to water issues on a global scale. These materials make other aspects of water use visible in ways young people (and even their teachers) may not have considered before. This may help pupils to reconnect with the tangible water they see coming out of their household taps and increase their desire to save it, even if this topic is not explicitly covered in lessons.

Equally, they may decide to act more responsibly towards water on an international scale: reducing their water usage when on holiday in water scarce countries (as Tourism Concern is aiming to promote), or making more informed decisions about buying products which have smaller or

more sustainable water footprints. This relates to the characterisation of the sustainable citizen presented by Desforges et al. (2005).

Bringing responsibilities into discussions about rights (as the GA *Water Works* toolkit does) also helps young people to link the personal to the global. However, if these responsibilities are solely to raise awareness of campaigns, it is questionable whether water literacy and citizenship is truly being developed. Here it is important to consider the purpose of the water education materials surveyed, and whether there is a role for more resources which do not have a money-raising motivation.

It was noted from the survey to East Midlands geography teachers that there is a gap in water education from Years 7 to 9, perhaps because the requirements of GCSE and A-level are not at play. In particular, I found that water was not taught during Year 9 at two thirds of the surveyed schools. Resources like the ones surveyed in this chapter were predominantly aimed at the Key Stage 3 age group (and younger) so resources do exist to change this situation. However, with the dissolution of the *Sustainable Schools* strategy and the lack of pressure to create water conservation targets for Eco-Schools status, there is little motivation from outside the school to teach about water at Key Stage 3. While many of the schools were working towards Eco-Schools targets, at the time of writing (2013) energy is the sole compulsory topic to meet Eco-Schools requirements (Eco-Schools, n.d.-e). As schools are encouraged to draw links between their targets and what is taught in lessons, if water was a compulsory topic, this would have an impact on the teaching of water at Key Stage 3 as well as potentially on the water sustainability of secondary schools.

However, it could be critiqued that water is even considered as a separate target for the Eco-Schools programme. It is clearly connected to energy and carbon initiatives, as recognised in the STW *Water Reporters* workbook, but little is made of this connection elsewhere. Furthermore, its interdisciplinary nature makes water as a topic easier to teach at primary school, where its role in science and other subjects

can be acknowledged without passing off the topic as the remit of other disciplines.

Another major finding was the absence of attention to ‘the local’ as a scale. While the GA toolkit asked pupils to consider their water company region, it was notable that the water company resources did not tend to refer to local or regional water issues. It would be interesting to see teaching resources specifically focused on the region and its water supply and demand, as is more commonly done in Australia (see Section 2.4.8 in Chapter 2). This may make people feel a greater sense of personal connection to the area, and indeed, water citizenship, as their attention is drawn to local water bodies or weather patterns where water outside the home can be seen.

To summarise, there is a range of water education resources on offer to secondary school teachers from several providers. Arguably the most effective materials do not actively promote an agenda, but achieve transformative learning through encouraging pupils to construct new knowledge (through a range of pedagogies to suit different learning styles) and reflect upon what they have learned in order to assess the sustainability of their direct, indirect or virtual water consumption. Working to make water use visible across a range of scales from personal to global (including local and national), and paying attention to young people’s ability and responsibility to act, is likely to make the materials even more effective.

Chapter 5: Water literacy of young people in the East Midlands

5.1 Introduction

An essential element of this research is the investigation into the extent to which young people in the East Midlands are water literate citizens. This chapter predominantly draws on data collected in the three schools prior to lessons on water.

As outlined and justified in Chapter 1, I suggest that a water literate citizen is someone who is informed and knowledgeable about water use and issues, and is applying this knowledge to their values and actions, whether that is actively or subconsciously.

The research question to be addressed in this chapter is:

What is the current state of water literacy amongst young people in the East Midlands?

The main theme in this chapter is determining the understanding and conceptions young people have about their own water use and resources more generally. This is drawn out by discussions around the consumption of the resource. Indeed, a key framework for the research is to look at the extent to which young people's water usage fits with two opposing models. The first is the rational actor model or rational choice theory, which sees people as making logical decisions in relation to water. The second is the social practices model or social normative theory, under which people are envisaged as tied into routines and habits of water use, shaped by their social networks, and are not

making active choices about it. Grønhøj (2006) criticises a focus on the environmental consumption behaviours of individuals, when often decisions and actions which affect the environment are taken as a household. It is important to consider, in particular with young people, the external influences on attitudes and behaviours towards water. Therefore, while this chapter looks at individual responses, social influences will be the focal point of Chapter 6.

5.2 Discussion

5.2.1 Knowledge about water and water use

It is useful to first assess the baseline level of knowledge the young people had about water and water use. For this reason, the first section of the questionnaire was framed as a "water quiz" with questions which tested pupils' knowledge and perceptions about water use.

Figure 5.1 shows how pupils responded collectively to the question "How much water (in litres) does the average person in the UK use each day?". 150 litres was the mode response (closely followed by 100 litres), with a standard deviation of 68.7. On average, about a quarter of pupils (24.4%) answered correctly. The graph shows a good general understanding of how much water we use daily, though it is likely to be strongly informed by the options available to choose from.

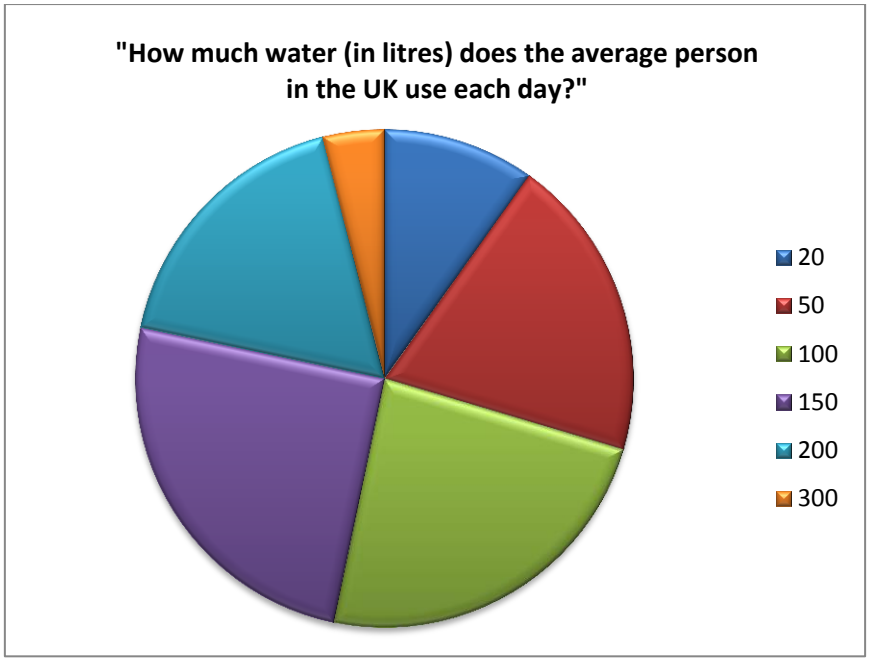


Figure 5.1 Perceptions of direct water use per person in UK – all respondents (n=154)

Table 5.1 shows that nearly 30% of the Alfon School students surveyed (Year 7) correctly answered that average per capita water use is 150 litres per day, but the mode response from this school was 20 litres, demonstrating that many pupils vastly underestimated their daily water consumption. Amongst the Braveley School pupils (Year 9), only 17.3% answered correctly with 150 litres, and this was the fourth most popular answer. However, the mode response of 100 litres is close to the reality. At Chalksmere College the mode response was correct with 28.9% of students choosing 150 litres.

Application of the Kruskal Wallis one-way ANOVA test (KW) showed a significant difference between responses at the three schools ($p=0.017$).

Table 5.1 Responses to the question "How much water does the average person in the UK use each day?"

	Mode response	Number answering correctly (150 litres)	Kruskal Wallis p-value
Alfon School (Y7)	20 litres	7 (29.2%)	0.017*
Braveley School (Y9)	100 litres	9 (17.3%)	
Chalksmere College (Y12)	150 litres	22 (28.9%)	
All pupils surveyed	150 litres	38 (24.4%)	

It should be acknowledged here that, at least with the younger two cohorts, these responses were likely to be guesses. As is discussed later in this section, some of the Alfon School students had great difficulty perceiving and visualising volumes of water, and therefore thinking in terms of litres may have been a challenge.

Knowledge about water was not actively tested in the focus groups, so as not to frame these as a test. However one exchange between the Year 7 pupils showed varying degrees of understanding about the water cycle and distribution amongst the focus group participants:

P1: "Well there's not really ANY water in Africa at the moment… I don't know how that's possible though"
GW: "You don't know how that's possible?"
P1: "'Cause on the adverts it has pictures of the taps and all that it says 'please donate money for the taps' and yet they've already

got 'em"

P2:"But then you need the water"
P3: "They just need foil, and to light a fire and then they boil the water"
P2:"Where's the water come from though"
P4:"But look at how many young children there is. There's loads of people there"
P2:'"Cause what happens when the water evaporates it goes into the air, but it won't rain because it's too warm" [Alfon School/Y7]

Here confusion is demonstrated first between the presence of infrastructure and water availability, and then also between making water safe for drinking and ensuring its availability. Three pupils raise the problems of access to water, supplying a large population, and climatic influences on rainfall. They seem to have been provided with the information to understand this issue and are drawing this from their memories, but the conversation demonstrates how complex issues or 'wicked problems' like water availability are difficult to comprehend and find solutions to.

Figure 5.2 Ranking exercise for pupils in first questionnaire (Data from Climate Choices, n.d., Defra, 2008c)

Pupils also completed a ranking exercise for different activities in the home according to how much water they use (Figure 5.2).

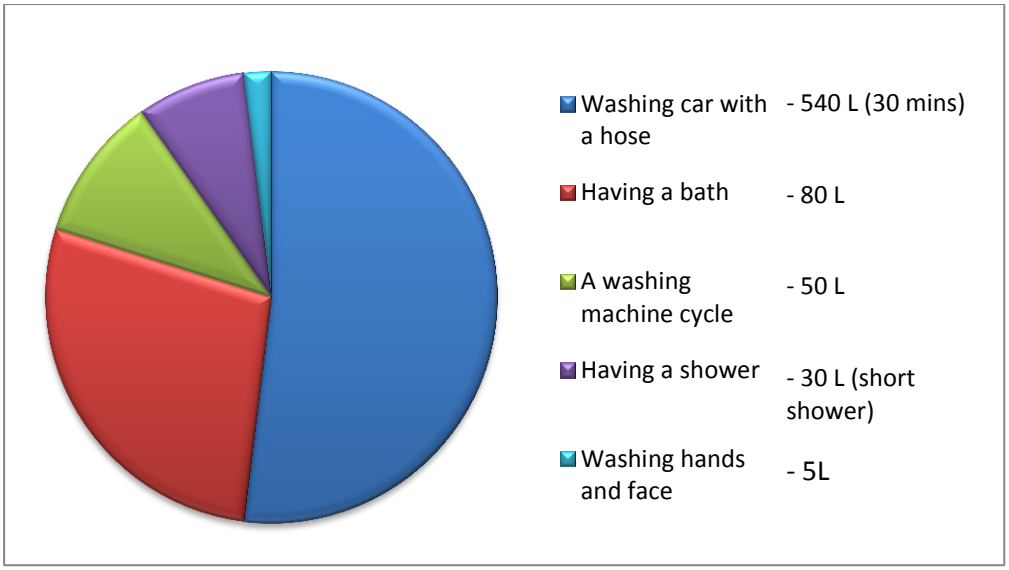


Figure 5.3 Perceptions of comparative water use of different activities- answers selected as the highest water use (All respondents. Correct answer: washing car with a hose)

Figure 5.3 shows that 51.3% of students across the three schools selected the correct answer as the highest water usage (washing a car with a hose). Increasingly smaller percentages of students selected the other options in order of volume, as demonstrated in Figure 5.3.

At Alfon School only four pupils out of 24 (16.7%) ordered the actions around the home correctly in terms of the volume of water used. However, almost all recognised that washing hands and face would use the least amount of water. As mentioned briefly earlier in this section, it was noticeable that at Alfon School some of the pupils found comparative volumes difficult to grasp on other occasions. On finding out average daily water use of 150 litres, one focus group participant said:

"My dad drinks that on his own, in teas and coffees"

and then later

"My dad uses more water [in the bath]. He uses about the same amount that he drinks" [Alfon School/Y7]

This demonstrates that there may be a lack of comprehension of how many litres are actually used in different actions, even those in which water is visible. It may be the case that when an object is not in front of the child (particularly for younger pupils), they find it difficult to compare the relative volumes.

Almost all of the Braveley School pupils surveyed also correctly answered that washing hands and face was the activity on the list that utilised the lowest amount of water. A high proportion recognised that washing the car with a hose used the highest amount, and 15 out of 54 (27.8%) put the five activities in the right order, although most of these were from the afternoon group which was much chattier than the morning group. Many pupils worked on their answers together, whereas the morning group were asked by the teacher to work on their own. At Chalksmere College, 16 out of 76 (21.1%) pupils correctly ordered activities in the home according to how much water they use, and all except one recognised that washing hands and face would be the lowest relative consumer of water. It is understandable that the oldest students would find this task easier.

While rudimentary knowledge about water supply was absent amongst some of the Year 7 pupils, it is knowledge about why to act that was not present amongst many of the Year 12 pupils:

"Yeah I think we've just grown up knowing to recycle, we've not really grown up knowing there's an issue with water or anything really" [Chalksmere College/Y12]

"I don't think there really is barriers to like…stopping you saving water…I just think people don't think about it 'cause they don't think

there's an issue with it really. So if they knew more about…water shortages and things like that then they'd probably think more about it but 'cause it's not affecting them they just...do whatever" [Chalksmere College/Y12]

As highlighted in the last section (and the previous chapter), a distinction needs to be made between knowledge about the issues behind water scarcity, and knowledge about how to act. An idea raised by Owen et al. (2009) is that people generally know they "should" conserve water, but do not fully grasp the reasoning behind this idea and therefore lack motivation to act. The statements from the Year 12 students suggest that attitudes towards water are something that will take a significant amount of time to shift, starting at a young age so that the knowledge becomes inherent, like "knowing to recycle" has done for these students. The second quote also shows a perception that 'public' knowledge about water issues (and why to act on them) is low.

Water as a resource with limits

Reflecting the misconceptions about water supply, it was also a challenge for some of the pupils to negotiate the idea of water as a cycle but one with limits, as demonstrated by a conversation between the Year 9 focus group participants:

P1: "We should use less, 'cause like the countries in like Africa, they don't have much water"
P2: "To be fair, there's only a certain amount of water in the world though"
P1: "But we keep reusing it, it recycles"
P2: "You can't lose water….So we can't really do anything about it" [Braveley School/Y9]

As something noted to be expressed by adults in similar research

(Owen et al., 2009), this difficulty in comprehension is highly understandable and addressing this in a programme of water education would be very important. The longer water is treated as part of an unlimited cycle (possibly corroborated by teaching of the hydrological cycle in schools), the less likely its limits are to be appreciated. The difficulty in comprehending this concept is entirely understandable since the water cycle is regularly covered in school lessons, and was found in resources from WaterAid and Severn Trent Water considered in Chapter 4. There is a need to ensure that students understand the limits to water within the hydrological cycle.

Standard water saving tips and water behaviours

It was noted in the course of data collection that a keenness in some (particularly younger) pupils to express what they knew about saving water tended to falter beyond standard 'water saving tips':

"*Don't leave the tap on when you're brushing your teeth" [Braveley School/Y9]*

"Stop like taps running when you're doing your teeth and that" [Chalksmere College/Y12]

As discussed in Chapter 4, these tips are found commonly in water education materials, particularly those which are focused on personal behaviour changes. Therefore it is not surprising that young people are able to condense what they know into these concise statements. It is debatable how effective a simple action like this can be: something that does not require a lifestyle change and is achievable by anyone, but that may not reduce total daily consumption by a great volume. Troy and Randolph (2006) argue that its potential to reach wide stretches of a population should not be ignored. The knowledge of this action amongst young children is evidenced in 'pester power', where youngsters tell their parents to turn off the tap (Owen et al., 2009).

Owen et al. (2009) found this actually led to adults adopting this behaviour without knowing the reasons for doing it.

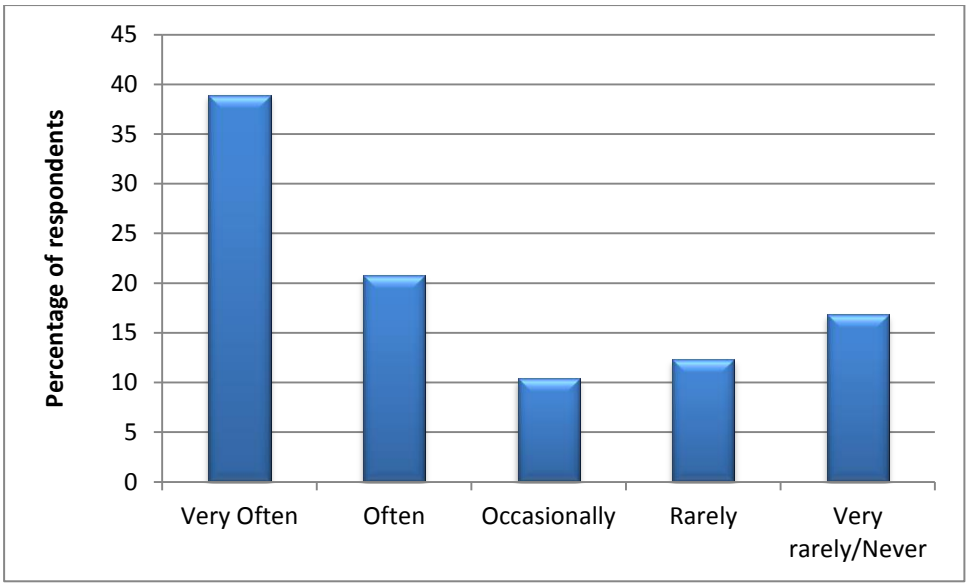


Figure 5.4 Responses to statement "I [turn off] the tap when I brush my teeth": respondents at all three schools (n=153: 1 pupil gave no response)

Figure 5.4 shows that the majority of participants reported to very often or often turn off the tap when they brush their teeth (60.1%) (in the questionnaire, the statement was "I leave the tap running when I brush my teeth" but it has been reversed to form a positive behaviour statement for the clarity of the chapter arguments). However, there is still a significant contingent that does not often do this. Breaking down the data by school and age group, Table 5.2 shows that the youngest students (Alfon School) are those least likely to turn off the tap, while Braveley School are the most likely. This fits with the theory emerging from the previous section of the chapter that pupils from Alfon School appear to be the least knowledgeable about water use, and perhaps the least engaged with water conservation. However, the small size and younger age of the sample of this pupil group must be taken into consideration.

Table 5.2 Responses to statement "I [turn off] the when I brush my teeth" by school

	Very often	Often	Occasionally	Rarely	Very rarely
Alfon School (Y7)	4 (16.7%)	4 (16.7%)	1 (4.2%)	6 (25.0%)	9 (37.5%)
Braveley School (Y9)	32 (59.3%)	9 (16.7%)	6 (11.1%)	5 (9.3%)	2 (3.7%)
Chalksmere College (Y12)	24 (32.0%)	19 (25.3%)	9 (12.0%)	8 (10.7%)	15 (20.0%)
All pupils surveyed	60 (39.2%)	32 (20.9%)	16 (10.5%)	19 (12.4%)	26 (17.0%)

When looking at turning off the tap alongside other fairly straightforward water conserving behaviours, all of which a young person would be able to carry out themselves, it is clear that this action is the most commonly performed (Figure 5.5). Collecting water for reuse is rarely or never performed by the majority of the respondents, while putting the plug in the sink is carried out by more than half the pupils surveyed, but is still not quite as common a behaviour as turning off the tap when brushing one's teeth.

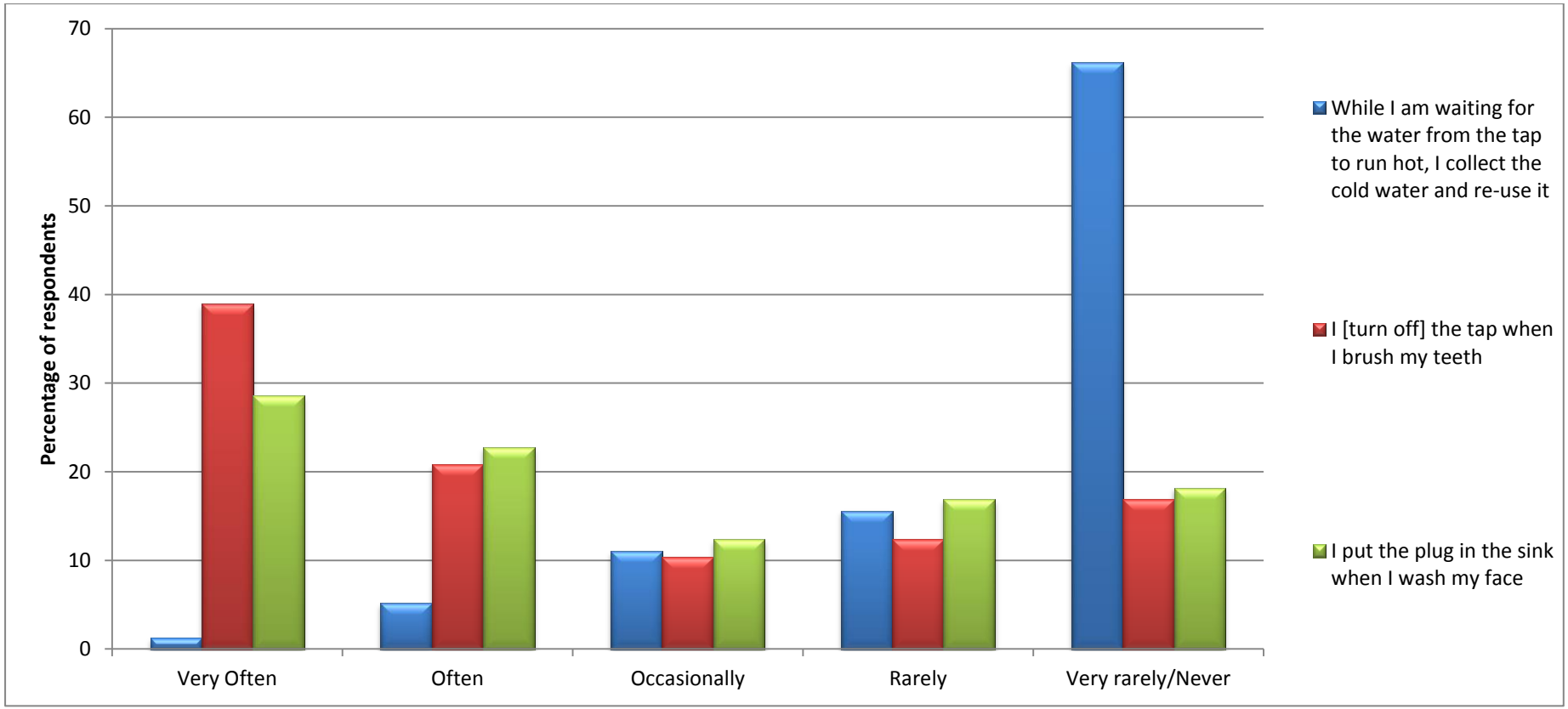


Figure 5.5 Comparing uptake of water conserving behaviours in the home –respondents at all three schools

Turning off the tap whilst brushing teeth does not involve changing behaviour to a manner which could be considered less hygienic, which means it may well be favoured over reducing toilet flushing and taking shorter showers. This is explored further in terms of norms of hygiene and cleanliness in Chapter 6. Indeed, it is a way in which children can play their part in being water efficient, without going against the norms or wishes of their parents. It is also easier for water companies and schools to promote for this reason.

Table 5.3 Difference between schools/age groups for behavioural questions in the first survey

	Kruskal Wallis p-value
While I am waiting for the water for the tap to run hot, I collect the cold water and re-use it	<0.001*
I [turn off the tap] when I brush my teeth	<0.001*
I put the plug in the sink when I wash my face	0.804

The Kruskal-Wallis test (Table 5.3) shows a significant difference between the schools for turning off the tap whilst brushing teeth and also collecting cold water (p=<0.001, rounded to 0.000 by SPSS), which could be seen to be a rare behaviour for the Braveley and Chalksmere students, but reported to be more common amongst the Alfon School students. There is no significant difference between the schools in terms of putting the plug in the sink whilst washing one's face.

An additional question posed to the Chalksmere College Year 12 pupils was "Where have you mainly learned about saving water, other than school/college?" (students were only allowed to select one answer).

Figure 5.6 shows that the most popular answer was TV/radio, with Internet and family following closely behind. No students said that their main source of knowledge was friends, which is probably not surprising. 16.7% of pupils said they did not learn about saving water outside school.

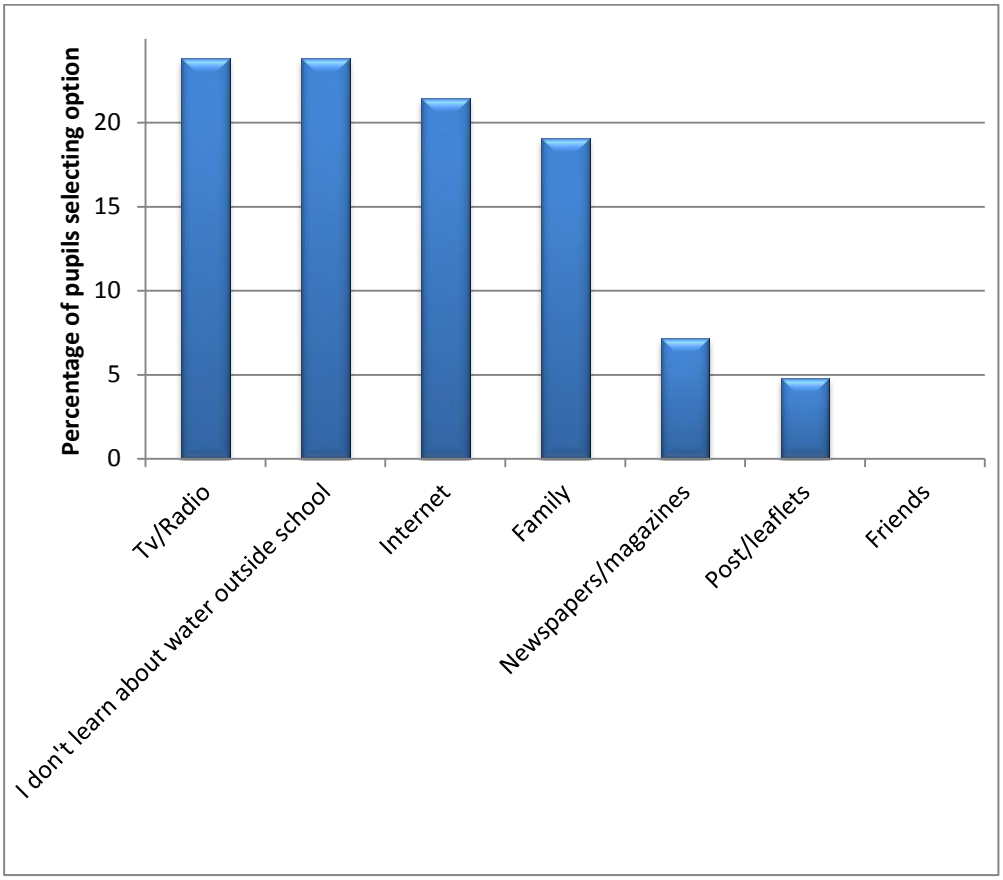


Figure 5.6 Percentage of Chalksmere College (Year 12) pupils selecting each option for the question: "Where have you mainly learned about saving water, other than school/college?"

Alfon School pupils were asked "Where have you learned about saving water, other than school?", and 41.7% of the pupils responded that they did not learn about water outside school. This high response may be indicative of their age, and not engaging with learning outside of school,

which the Year 12 students could be doing more regularly in order to complete essay assignments.

To summarise this first section, I have presented the idea that backgound knowledge about fundamental water issues is important: some difficulty in perceiving volumes and limits to water resources was seen, particularly amongst the Year 7 and Year 9 pupils, which could be attributed to the invisibility of water more generally and regular teaching of the hydrological cycle at school. In order for actions to become more sustainable, it is also important to know both why to act and how to act (in the way that some students related to “knowing to recycle”). Knowing one ‘should’ act alone is likely to have limited effectiveness.

Turning off the tap whilst brushing teeth was found to already be carried out by more than half of the pupils surveyed. I suggest that this is a straightforward action young people can take themselves, which has already been promoted regularly through ‘water saving tips’, and potentially water use is more ‘visible’ in this action than in less obvious (and more sensitive) water uses like toilet flushing.

5.2.2 The nature of water and active water use

A lack of knowledge about water and water use can be partly attributed to its nature. One of the reasons why water is interesting as an environmental and resource management issue is its visibility and invisibility: a substance we can see, hear and feel as it is used for activities around our homes, or as a key element of our weather and climate, or shaping the land in rivers and lakes; but yet an invisible actor in heating our homes, and an important but often not acknowledged player in personal and household hygiene, cooking and play. This inactive everyday use means that water is most likely to be ‘visible’ and actively thought about when it is causing problems such as

flooding and leaks. It is not celebrated in its normal roles; rather piped out of sight and treated as invisible. As described in Chapter 2, research exists on the distinction between clean or 'good' and dirty or 'bad' water, described by Kaika (2005) as a "hydrophilia" of water in the private space of the home, and a "hydrophobia" of water in the public domain (Kaika, 2005: 54). Bakker (2003) describes the water that runs through pipes to our homes as the "hydrosocial cycle" (Medd and Marvin, 2008, Bakker, 2003a: 49).

The younger pupils I spoke to could describe a number of instances where they had been affected by water problems and flooding:

"And where I live, it was raining too much…and we couldn't get out 'cause the car…well the water was up to the tyre" [Alfon School/Y7]

"We've had quite a few issues with water" [Alfon School/Y7]

"One of those pipes underneath my property were leaking…and the water was coming through the pipes where it shouldn't be" [Alfon School/Y7]

When it was visibly causing problems, its impacts were more memorable. However, water seems to be a much less visible component in the mundane running of everyday life.

Linked to the perceived visibility of water is how active its use is: whether it is purposefully thought about and considered, or whether it takes on a passive role in various activities. Table 5.4 shows that the older students appear to be using water more actively and had greater awareness, for example of how many showers their family members take and how often washing up is done. Yet some could not even make a guess as to the volume of their water consumption relative to a friend's or a relative's household. Responses to this question are considered more fully in the next chapter, but it can already be seen

that many of the young people surveyed gave little or no thought to their consumption, with water playing a largely hidden role in their daily lives. This provides a good grounding for the use of water audit exercises in education programmes (such as that in the STW *Water Reporters* workbook), which are likely to make visible the different ways in which a young person uses water each day at home, and in turn demonstrate where savings could be made if desired.

Table 5.4 Pupil quotations relating to inactive and active use of water

Inactive use		**Active use**	
"We don't really notice how much water we are using"	Chalksmere College/Y12	"I recycle and monitor water usage"	Chalksmere College /Y12
"I don't think me or family or friends think about how much water they use"	Braveley School/Y9	"Because everybody takes approx an hour in the shower"	Chalksmere College /Y12
"I don't know, I don't look at each other's water use"	Braveley School/Y9	"Our family has on average 2 showers a day and we don't have any water saving appliances"	Chalksmere College /Y12
"I don't know how long it's there, for our use so people think…they'll just use it, and you don't really think about how much you're using, at a time you're just using it 'cause you need it"	Chalksmere College /Y12	"We all shower daily and my mum has a daily bath. We haven't got a washing machine and wash up by hand up to 5 times a day"	Chalksmere College /Y12

5.2.3 Valuing water

Even if water consumption is made visible, it is not always the case that the resource is valued enough for sustainable use to be incentivised. There has been a push in UK water policy to encourage people to value water more, exemplified by Ofwat's (2010) report *Valuing water: how upstream markets could deliver for consumers and the environment*. Water can be valued in a multitude of ways, starting with the price applied to it in order to service our homes. The values children hold towards water may differ from those of adults, relating more to play activities and fun uses for the resource. Values also differ from individual to individual, depending upon one's life experiences, and will change over the course of one's life.

Part of the reason for a lack of water values in the UK may lie in its perceived abundance. Scannell and Gifford (2013) suggest that psychological distance (learning about global or international issues rather than locally relevant ones) increases the distance between awareness and engagement, or perhaps values and actions. This links to a sense of care and responsibility over spatial scales, which is covered in later in this chapter.

I begin this section by considering expression of general environmental values by the pupils surveyed, and then move on to study water values, including some interesting and unexpected examples.

Comparing environmental and water values

Responses to questions measuring the surveyed pupils' general environmental values showed a general self-perception of environmental friendliness (Figure 5.7): 57.1% agreed with the statement "I see myself as an environmentally friendly person". However, only three pupils out of the whole dataset strongly agreed with this statement, suggesting that few make a concerted effort to behave in a green manner. Interestingly, on breaking down the data by

school, at Alfon School 62.5% of pupils answered “neither [agree nor disagree]/don’t know” in response to this statement. This reflects a general arising pattern in responses from Alfon School, where pupils tended towards expressing uncertainty in their answers. It could be the case that these younger students felt unable to answer some of the statements or lacked confidence in doing so. In hindsight, the Alfon School students may not have understood the term “environmentally friendly”.

For the statement “Looking after the environment is an important part of who I am” the mode response overall and for all schools was “neither/don’t know” (48.7% of all students chose this answer). There was little difference between the three schools for this statement. From this data it is possible to see a moderately environmentally engaged sample of young people, with the children from Alfon School less so than the other two schools.

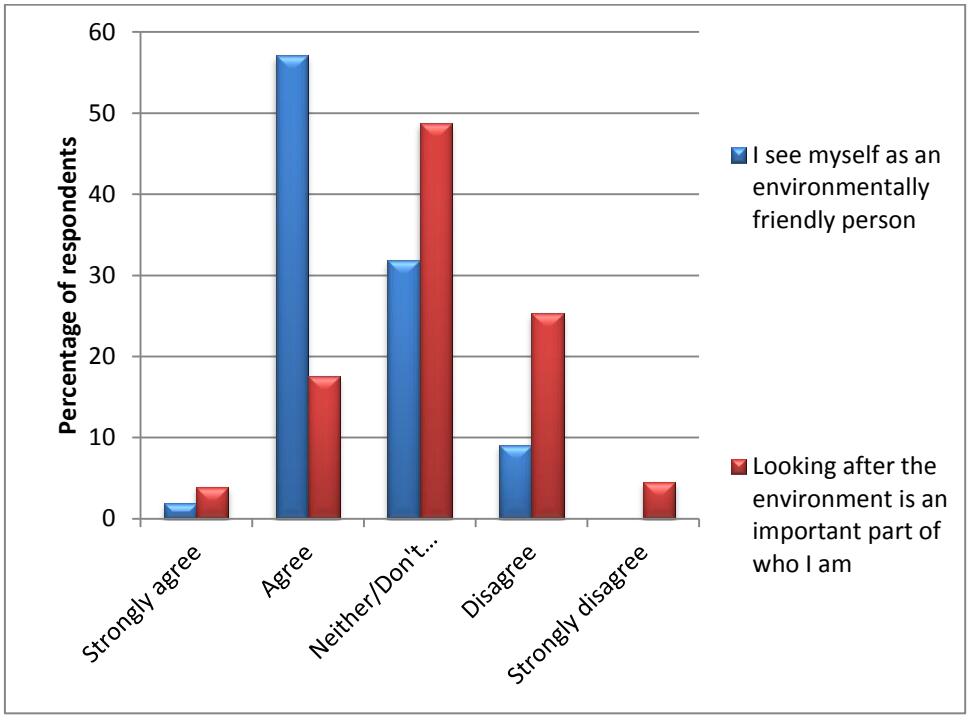


Figure 5.7 Responses to statements on self-identity and environmental values- all respondents

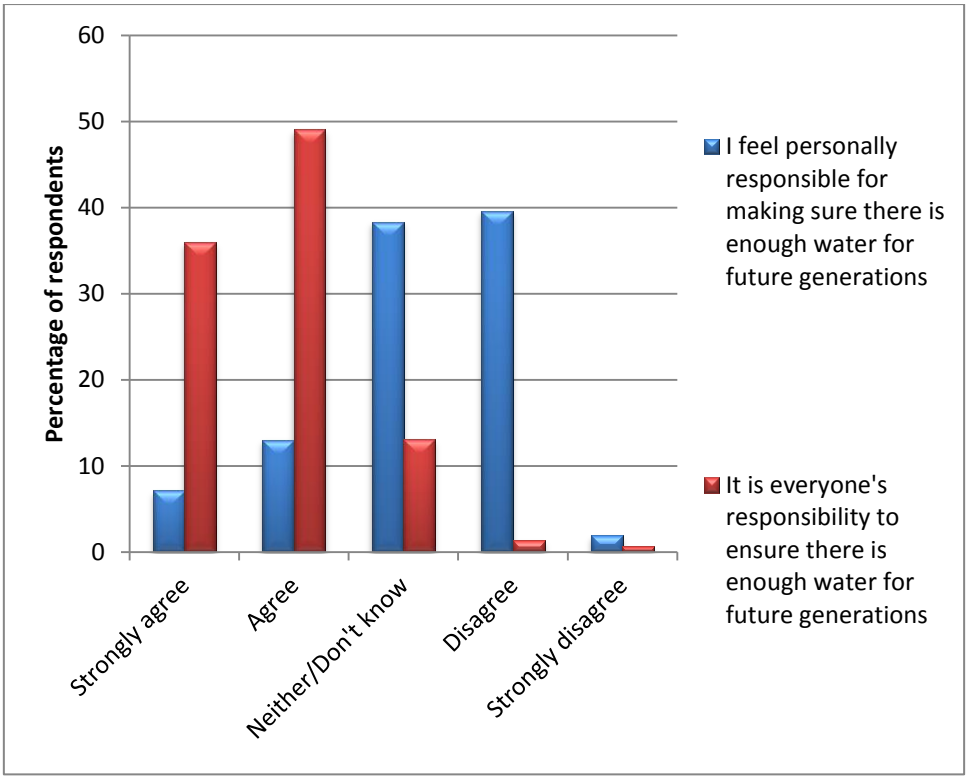


Figure 5.8 Responses to statements on perceived water responsibility and values- all respondents

In terms of water values, Figure 5.8 shows that the majority of students (85.0%) either agree or strongly agree with the statement "It is everyone's responsibility to ensure there is enough water for future generations". Again, at Alfon School 30.4% selected "neither/don't know". When asked if they felt "personally responsible", the mode response for both Alfon School and Chalksmere College was disagree, while for Braveley School, coming out as the greenest contingent, the mode was "neither/don't know".

Overall, responsibility seems to be felt on a wider scale towards water supplies globally or generally rather than personally, or indeed is expressed through everyday defined actions. In hindsight it may be that the statement was too strongly worded to accurately measure personal sense of responsibility.

The previous chapter showed many water education materials to focus on the global scale or on international case studies, which may be the reason for a high sense of responsibility towards water generally and globally. It may also be that water security is deemed to be an issue experienced in 'other' countries. As the other major focus of education materials was found to be small-scale 'water saving tips', the pupils may know more about *what* water conservation is or *how* to achieve it, rather than *why* it should be done, and therefore perhaps have less of a sense of personal responsibility to act.

Even fewer general water or environmental values were expressed in the focus groups, with one of the older students expressing notions that financial incentives were more important to their family than environmental drivers:

GW: "So, at home you've talked about how recycling is quite normal…what are attitudes like in your homes and in your families towards the environment more generally?"

P: "It's mainly just about the bills that it causes like…water and electricity bills but it's not really much about the environment" [Chalksmere College/Y12]

Table 5.5 shows that responses to statements on personal and general sense of responsibility were similar between schools, as were responses to the statement "Looking after the environment is an important part of who I am". A significant difference could be seen between the schools for the statement "I see myself as an environmentally friendly person", however (p= 0.016), due to the uncertainty expressed by Alfon School students (62.5% responded "neither agree nor disagree/don't know"). Again, it is important to consider here the level of understanding the Year 7 students had in relation to the questionnaire.

Table 5.5 Difference between schools/age groups in responses to affective questions in the first survey

	Kruskal-Wallis p-value
"I see myself as an environmentally friendly person"	0.016*
"Looking after the environment is an important part of who I am"	0.778
"I feel personally responsible for making sure there is enough water for future generations"	0.806
"It is everyone's responsibility to ensure there is enough water for future generations"	0.388

Interesting water use values

At Alfon and Braveley Schools, the focus group participants were asked to work in pairs to list the ways they use water (see Figure 5.9 for an example). This activity encouraged the young people to consider the different use values of water. After making this they were asked to consider which activities would be eliminated from their lists if they could only keep 'essential' actions.

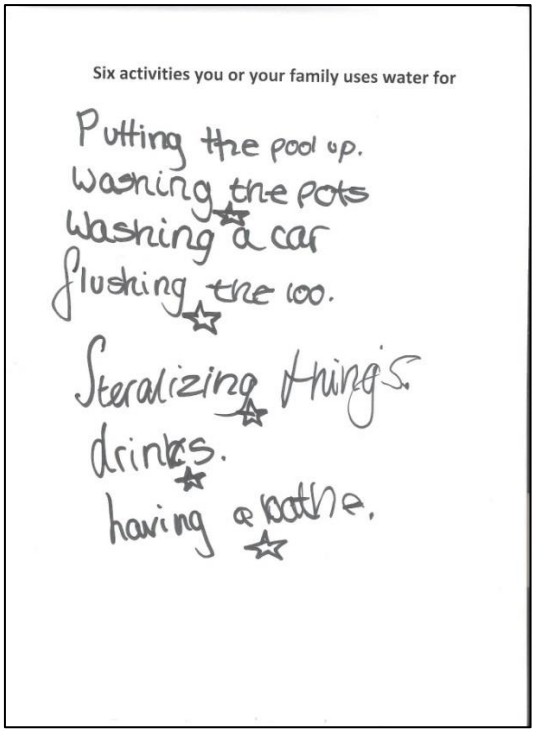


Figure 5.9 Example of sheet filled in by two Alfon School pupils in focus group

While pupils from both schools mentioned many of the same actions, almost all mentions of play activities were from the focus group with the youngest pupils (Alfon School). There was certainly a reluctance to remove these activities from the essential actions list which demonstrates the importance of water in play for younger children.

"I could live without putting the pool up, but it'd be boring" [Alfon School/Y7]

"Water fight's not exactly essential…but it's good fun" [Alfon School/Y7]

I also noted from observing the STW *Water Street* game with a different group of Year 7 pupils at another school in the East Midlands that water play is addressed by the water company as something for the pupils to think about; for example using water pistols instead of the hose for summer play time.

The Alfon School pupils were also much more likely than the older pupils to come up with inventive and unusual ways they used water at home. This included the care of pets:

"Washing the dogs" [Alfon School/Y7]

"Fish tank when you clean it out" [Alfon School/Y7]

"We've got to defrost the rats so the snakes can eat them" [Alfon School/Y7]

This ability to 'think outside the box' in terms of suggesting water consuming actions in the home could be characteristic of younger children, who do not feel pressured to give 'academic' responses in a school environment. These answers are very useful in considering the breadth of water uses in domestic settings, which could vary greatly according to the pets kept by different families. These types of uses, although consuming fewer litres of water on average than more common domestic practices, should not be ignored by water companies and could add an extra degree of interest and relevance to water education programmes.

Value-action gap

It has been suggested by a body of researchers (e.g. Brook Lyndhurst, 2009, Blake, 1999, Kollmuss and Agyeman, 2002) that instead of people acting according to rational choice and Ajzen's Theory of Reasoned Action (Ajzen and Fishbein, 1980), a dissonance exists between values and behaviours. The debates around these theories, and their potential replacement with a social practices theory, have been laid out in Chapter 2.

A gap between values and actions was evident in responses from all three schools:

"We are environmentally friendly but nothing has really changed" [Alfon School/Y7]

"Because we both care about saving water, but don't make a MASSIVE difference in what we do" [Braveley School/Y9]

"Try to use as little as possible but can be difficult" [Chalksmere College/Y12]

Participants from all three schools expressed some level of concern about the environment or water conservation, but a lack of concerted effort to convert their values to action. The Chalksmere College student quoted above describes how reducing water consumption is difficult, which may relate to the way in which the number of litres of water used is tied up with infrastructure, for example nine litres being used to flush a standard toilet. Equally it could relate to lack of control in the home, in terms of parents washing dishes and clothes for their children.

Conversely, the Alfon School pupil quoted above relates how values in their family may have become more 'green', but "nothing has really changed" in terms of behaviour. This seems to refer to a dissonance or perhaps even laziness in converting values to action. This is similar to the discord between 'caring' and 'acting' related by the Braveley School pupil. He or she seems to describe a 'reasonable' environmental effort being made: a theme that will be considered in detail later in the chapter. This ambivalence reflects the results of a large scale survey to Asian Pacific teenagers on their environmental attitudes, whose knowledge and concern about the environment was not reflected in their actions, particularly beyond small actions (Fien, 2000). It also relates to the idea that young people are settling for one or two behaviour changes linked to 'water saving tips'. Moreover, in the previous chapter, it was found targets for the Eco-Schools scheme

were more heavily focused on energy with fewer requirements to address water use. The survey to teachers also found fewer targets were being set in schools around reducing water consumption. This could mean there is a lower degree of support for the translation of values into action.

However, while some presented water values, an equal proportion of pupils demonstrated an absence of water values (particularly in the questionnaire) which could be for one of two reasons. First, it could be that cognitive dissonance has occurred, where the individual experiences discomfort from a discord between their beliefs and their behaviours. This can lead to a shift of reported values in order to fit with the actions that are carried out (in this case, less sustainable water behaviours lead to a reduction in water conservation values) (Crompton and Thøgersen, 2009). However, and perhaps more realistically with the youngest pupils surveyed, it may be the case that action is not taking place because water values have not been nurtured and developed fully, and therefore there is not actually a value-action gap at play.

5.2.4 Responsibility and care

A theme under which many observations could be grouped is responsibility and care. An increase in work on moral geographies followed the ‘moral turn’ in the early 1990s (Smith, 1997), resulting in a well-developed theoretical body of work by researchers including David M. Smith, Doreen Massey, Clive Barnett and Paul Cloke which cannot be done justice here. Chapter 2 introduced the topic and closed in on conversations around responsibility linked to consumption and behaviour change, including Barnett et al.’s (2011) suggestion that we should not focus on consumption because it is often unconscious and habitual. Supporting sustainable practices whilst encouraging conversations about everyday and ordinary behaviour in order to make these more conscious is an alternative focus (Barnett et al., 2011).

Responsibility and care towards people in other countries

Some pupils demonstrated an ethical responsibility towards water availability in other countries, whether that was in terms of actual water consumption or practical financial assistance:

"We should use less, 'cause like the countries in like Africa, they don't have much water" [Braveley School/Y9]

"And don't you think it would help if we gave them some money 'cause to be honest, like we need this much water, we've got reservoirs and stuff" [Alfon School/Y7]

It is not clear whether the Braveley School student felt that cutting domestic water use in the UK would directly increase the amount available in African countries, or whether this was more of a moral statement. Learning about virtual water (as argued in Chapter 4) could help support these students in translating their values into more feasible action.

As Barnett et al. (2005) argue:

> "Place is understood to be the location of clear-cut ethical commitments, while space serves as a shorthand for abstract, alienated relations in which distance intervenes to complicate and extend the range of moral duties" (Barnett et al., 2005: 24).

It is difficult to comprehend how we should act morally in terms of supporting those who we will, more than likely, never meet. As Scannell and Gifford (2013) relate, there is a psychological distance associated with learning about international issues, which increased the distance between awareness and engagement. This sense of responsibility is complicated even further when considering water: a global resource used locally but transferred globally.

Not all the students showed concern for our direct water use. An exchange between the Braveley School focus group participants showed the impact of informing the students (after they completed the first questionnaire) about average UK water use per person in comparison to other countries around the world:

GW: “Can you think of some problems that we face in the UK relating to water?”
P1: "We use too much"
P2: "But compared to other countries we don't use AS much" [Braveley School/Y9]

Learning that UK average per capita daily water consumption is less than that of USA and Australia may have hampered the development of a sense of responsibility to reduce water consumption. In a different way, a couple of students in the Chalksmere College focus group expressed a lack of responsibility towards their own water use due to the impacts of water issues not directly affecting them personally:

GW: “So you mentioned about the hosepipe bans earlier in the year. Did you find the drought affected you personally…
P1: No
GW: Did it make you think about anything differently?”
[Three students shake heads]
GW: No? Why do you think that is?
P1:"'cause it wasn't specifically affecting us"
P2: "It was different areas so we didn't really [think] we better do something about it…you don't think it's gonna affect you" [Chalksmere College/Y12]

These quotations reflect the less than positive responses to the statement “I feel personally responsible for making sure there is enough water for future generations” (shown in Figure 5.8). It is likely to be the case that young people do not feel the financial burden of excessive water use, or indeed other negative impacts of wasting water on their day-to-day lives. Even when events with local impacts like drought occur, changes in attitude seem unlikely unless there is an identifiable personal impact. In contrast, Phipps and Brace-Govan (2011) noted a change in public attitude after an alteration in Melbourne’s water marketing structure following the 2006/7 drought, when attitudes shifted towards seeing water consumption as a responsibility rather than an entitlement, following the examples of taking reusable shopping bags to the supermarket, or reducing car use. Indeed it may be the case that without long-term identifiable impacts, behaviours will not shift. This contrasts sharply with the sense of general concern and responsibility towards water availability globally, or towards people experiencing shortages in other countries, that was demonstrated in the data.

Personal concern

It may be that lessons can be learned from recycling and energy conservation in terms of how to engender a sense of personal concern and compulsion to act. However, what was more commonly expressed in the school-based research was a lack of personal concern towards the environment:

"We recycle our rubbish and turn taps or electricity such as lights off when not using it, however we are not overly concerned" [Chalksmere College/Y12]

"We don't leave taps on or leave showers running, however we often have baths that use a lot of water and aren't concerned about waste when using water" [Chalksmere College/Y12]

This ambivalence differs from the value-action gap in that environmental values are not strongly expressed: as argued earlier in this chapter, they may not have been developed. It seems to be more the case that the students just make what they deem to be a 'normal' effort. In the first statement above a lack of concern about being environmentally friendly beyond what is perhaps perceived as 'normal' behaviour is expressed, and again in the second statement the student seems to be making a 'normal' effort to be water efficient, rather than putting in a special effort.

Putting in a "special effort"

There is a disparity between young people viewing themselves as environmentally friendly, but yet still expressing apathy towards water conservation. As will be discussed further in Chapter 6, there is a tension between a desire to be 'normal' and do what others are perceived to be doing, and a wish to stand out as exemplary. This is exemplified in the idea of saving water as requiring a "special effort": the words used by one participant from Braveley School. This was echoed in many responses as a reason for not acting in a water efficient manner. However, it could be noted that those who do go out of their way to conserve water (predominantly some of the older Chalksmere College students, who gave lengthy descriptions of their pro-environmental actions) seemed to be rather proud of this, and wished their own "special effort" to be acknowledged (Table 5.6). This could highlight the potential for educational attempts to make water use more visible to have an impact.

Table 5.6 Pupil quotations relating to the "special effort" required or put in to conserve water

No special effort put in		Making a special effort	
"We don't go the extra mile. Just recycle what is obviously recyclable and try not to over use the cars or electricity"	CC/ Y12	"I believe my family like to go a bit out of the way to be a little more environmentally friendly (apart from my brother)"	CC/ Y12
"We use the same amount of water as everyone. And don't make a special effort to be environmentally friendly"	BS/Y 9	"Because we have water conserving habits that not all other people seem to have"	CC/ Y12
"Because I don't think we or anyone I know put much effort into saving water"	BS/Y 9	"We recycle everything that we can recycle and also we try to cut down our levels of waste. We only use heating when necessary and we don't overuse the water"	CC/ Y12
"Because we turn the lights off when we leave the rooms and recycle but we do not normally go out of our way to help the environment through our household usage"	CC/ Y12	"Because we collect used tea bags, fruit skins etc. to make organic fertilizer for our own use which is good for the environment as we don't use chemical fertilizer"	CC/ Y12
"We recycle but we don't make many moves to being environmentally friendly and I don't think many in my area do either"	CC/ Y12	"We recycle a lot of the materials from packaging of what we buy, and we also contribute a lot of waste material to composting production, and are conscious with our electricity usage, so help the environment"	CC/ Y12
"We recycle like most others on the street but do not do anything particularly drastic to be more environmentally friendly"	CC/ Y12	"We have a very eco-friendly family influenced by my step dad and we all think living this way is a much better way of living"	CC/ Y12

"We don't commit a clear action to reduce water use"	CC/ Y12	"Use as less heat as possible, collect water under running tap, not flush toilet water every time they use, have several buckets collecting rain water for gardening"	CC/ Y12
"As we don't make an extra special effort compared to other households"	CC/ Y12	"We save water wherever we can, (short showers, no baths, turning off the tap, no hose pipes etc), we also only use heating when it is essential during the winter months. We also have organized bins at home so it is easy to recycle. Lastly, we all have bus cards, so we try and use public transport as much as we can"	CC/ Y12

The top two statements in the right hand column show a sense of pride in environmental or water conservation whilst acknowledging the extra effort this requires. This appears to set them aside from what is 'normally' done by the general public. Other students seem reluctant to describe an effort which goes beyond the norm, as exemplified by the top two statements in the left hand column. Perhaps here an extra effort would distinguish them from the norm, which is not something they wish to do.

Owen et al. (2009) found certain water use behaviours to be deemed 'normal' by their adult study participants, including more sustainable actions like turning off the tap whilst brushing teeth; and other ones deemed 'good' behaviours, like leaving a tap on until it runs cold for a drink. This relates to my concept of a 'special effort'. There is a risk that

current water education programmes are not reaching those young people who wish to set themselves aside from the norm and make a special effort. By focusing on social norms, companies are more likely to engage those who are less engaged in sustainability and water conservation. This may well be what providers are aiming to do, but it is important to consider those who may be put off by this method of engagement.

5.2.5 Power and efficacy

It was possible to note a feeling of a lack of control over water efficient efforts amongst the pupils in the study: this either being something mediated by their parents or other family members, or simply a direct product of the number of people living in their household. This leads to expression of there being a limit to what is considered a 'reasonable' water conservation effort for them to make. This is described by Owen et al. (2009: 42) as "the feeling that 'I'm already doing all I can'". Connell et al. (1999: 101) report cynicism and "action paralysis" amongst 16 and 17 year olds in Melbourne and Brisbane, who portrayed a sense that major action was needed, but they themselves were only capable of small, relatively insignificant actions.

Lack of perceived personal impact

The idea of a lack of individual impact was demonstrated in relation to the efforts of one or two people being masked within a less environmental household:

"My household isn't bothered about recycling or being environmentally friendly, I am the only one that recycles paper and card and switches off lights and electrical gadgets" [Chalksmere College/Y12]

"Because we try to reduce our water wasting by turning off taps and not washing the car with a hose. Other members in my family don't follow our example" [Alfon School/Y7]

Here there is a sense of frustration shown at the lack of effort made by the respondents' families, yet it is promising that these students still choose to engage in sustainable behaviours despite recognising that theirs is not, overall, an environmentally friendly household. However, some participants seemed to feel that there needed to be a majority in favour of acting on an environmental issue within the household in order for discussion and action to occur: a finding echoed by Fielding et al. (2011), and also by Grønhøj (2006) in her research on Danish households, which found a lack of discussion amongst families where only one member of the family found an environmental issue to be of interest. It appears that a critical mass is required which limits the ability of the individual (and especially, the individual child) to act. Equally, we could be seeing influential norms acting within the household.

It is also apparent that young people are often not the main water users in the home, or may not be making the resource use decisions themselves. When asked how they could save water at home, one Year 7 pupil spoke very much in terms of what they personally could achieve:

"I'd stop doing all the stuff that doesn't need to be done like…I wouldn't be like, washing my hair every day, or like…I wouldn't have a drink every five minutes" [Alfon School/Y7]

Indeed, the youngest students are the least likely to be major household users of water, while the Year 12 students may well be helping out with water using household tasks.

Students at Chalksmere College expressed feelings of powerlessness more broadly, relating to leakage and individual action:

"Isn't there like, millions of litres of water lost in London from leaking pipes and stuff like that…so it's just wasting water really" [Chalksmere College/Y12]

"I think it'd be easier, like, if everyone else had to do it as well 'cause you sort of, you'd be a bit more motivated, 'cause everyone else is using the same amount of water whereas if it's just you, you're like 'well they're using it, what does one person...like the difference make?'. But if everyone's doing it, you're sort of motivated to do it as well" [Chalksmere College/Y12]

Here the idea is expressed that leakage is something we personally cannot do anything about, and that it limits the impact of our own actions. This echoes the findings of the Opinion Leader (2006) study for the UK Consumer Council for Water, which found respondents to express anger towards water companies and water use in industry, with little change in attitudes after receiving information.

The second Chalksmere student quotation above suggests that without a commitment from “everyone”, there is little motivation to act individually. This links to many of the arguments made around actions against anthropogenic climate change, and the point of personal efforts being made. Evidence from Defra’s Centre of Expertise on Influencing Behaviours argues that people want to see action from peers, and action from government and companies, before being encouraged to act themselves (Defra, n.d.). This is also the central argument behind *I will if you will*, the concluding report of the Sustainable Consumption Roundtable (Sustainable Consumption Roundtable, 2006)

Limits to reasonable efforts

In the questionnaire, pupils were given the statement **“**Compared to the average household in my area, I think my household uses...water”, selecting a response ranging from “much less” to “much more”, and asked to give a reason for their response. Many saw their usage as average, with efforts to save water seen as reasonable as well. What is seen as making a ‘reasonable’ environmental or water conserving effort will be discussed in Chapter 6, but here I consider what young people consider as the limits to ‘reasonable’ conservation efforts without making serious sacrifices: a theme arising in the Chalksmere College responses:

"You'd still struggle finding thing you could cut down. 'Cause you do need to use a certain amount of water a day" [Chalksmere College/Y12]

"No-one's keen on shortening shower times but that's because it's an 'in out' job anyway" [Chalksmere College/Y12]

"Try to use as little as possible but can be difficult" [Chalksmere College/Y12]

It seems from these quotations that at this stage in the project (prior to the lessons on water) the students feel that they already use water in an efficient way, and there is not much they could do to reduce their consumption. Equally, the idea of showering being an “’in out’ job” is interesting, and the extent to which this is likely to actually be the case could be debated. Indeed, a number of pieces of research have found that people tend to spend longer in the shower than they think they do, as highlighted in Chapter 2 (Smithers, 2013, ech$_2$o, 2010).

5.3 Summary and concluding comments to chapter

The main argument made in this chapter is that little thought is given to water use and a lack of responsibility to act was noticeable, but this may be due to the invisibility of water at the household scale, and the limited ability of young people to make changes in the home respectively. The idea of a “special effort” being made by some could have great potential for future educational resources: while it makes clear that water conservation is not yet something that has become ‘normal’ behaviour, it shows potential for efforts to make water consumption more visible to have a real impact.

In terms of knowledge about water and water use, this chapter has shown that knowledge of water conservation amongst the young people surveyed tends to falter beyond standard ‘water saving tips’ like turning off the tap when brushing teeth. The pupils also showed some difficulty in comprehending water as a resource with limits, as it is generally introduced to them through the means of the hydrological cycle. A lack of knowledge about water and water use could be partly attributed to the nature of water: hidden from sight to be practically invisible in its everyday use. The way in which it is inactively consumed and quickly removed from our homes makes it difficult to quantify, and therefore it is easy to see why water education programmes try to promote the ideas of young people carrying out a water audit at home. This in turn could help to develop personal water values.

A gap could be noted between views towards the environment and water generally (which were both fairly positive) and feelings of personal responsibility towards water conservation. A value-action gap could be distinguished amongst one contingent, but amongst others values towards water do not seem to be developed. It may be the case, as suggested in Chapter 4, that the lack of connection between personal water use and global water issues (as well as impacts on the local scale) in educational materials could be part of the reason for

these findings. Some expressed their concern but the overall pattern was for a lack of personal concern about water resources. There was an idea that many were already making a ‘reasonable’ effort themselves.

The youngsters seemed to express a feeling of personal inefficacy, reflecting previous similar studies. This is probably in part due to the smaller range of water-using activities they engage in inside the home, particularly the youngest students surveyed. The older pupils expressed feelings of powerlessness towards broader issues of leakage, and wanting to know that other people are taking action as well. A theme amongst discussions with Year 12 students was the limits to reasonable water conservation efforts, which was not really expressed by the younger pupils surveyed.

Chapter 6 takes some of these findings on personal water consumption forward, utilising social practices theory and norms to explain them in greater depth.

Chapter 6: Social and subconscious influences on water attitudes and behaviours

6.1 Introduction

So far I have examined the present state of water literacy and citizenship amongst young people. However, a number of other influences on water use can be identified. As discussed in Chapter 2, work on the sociology of ordinary consumption (e.g. Gram-Hanssen, 2007, Shove et al., 2009) raises an alternative model of understanding water use. While water education traditionally attempts to change attitudes and behaviours, sociological research asserts that consumption of water is the result of socio-technical practices, and therefore attempts to change behaviours through information provision with a focus on individuals will have little success. This chapter investigates the interactions young people have with social and subconscious influences, relating to the communities young people interact with and within, the norms they are exposed to, and the habits and routines they engage in. These expose both challenges to and opportunities for educational initiatives for water literacy and water citizenship.

The research question that I look to answer in this chapter is:

What are the social influences on water values, attitudes and behaviours and how do these affect the development of both water literacy and water citizenship?

Broadly, I seek to break through the impasse between educational and sociological research to find ways in which education programmes can be more sensitive to the influences on water use and make it more visible. The main theme in this chapter is examining the composition of 'everyday' water use, as constructed of habits, routines and lifestyles, and influenced by social norms, peers and family members, as well as technology and infrastructure. While the visibility of water in the household and in the production of consumer goods has already been discussed, water can also be seen as invisible in the way it is tied up in daily practices which are enacted subconsciously.

Moreover, this chapter draws out the scales of influence on the enactment of water-using activities in the home, such as immediate family members within the household, peers and teachers at school, and members of the local community. Where water use takes place at the personal scale within private spaces such as the bathroom, the influence of others is less likely but in these cases assumed norms may be influential instead.

6.2 Discussion

6.2.1 Everyday environmental behaviour and norms of use

This section looks at how environmental behaviours fit into the 'everyday' for young people. As discussed in Chapter 2, water is rarely used for its own means, instead forming an integral part of everyday mundane actions. Therefore it is often the case that little thought is given to its use, which raises the question of whether interventions should make water use more visible and active, or whether to subtly shape more sustainable social norms. Understanding the relative strengths of these strategies will help demonstrate how education and socio-technical understandings can come together.

Trading off environmental actions and 'doing your bit'

A theme which arose out of the first focus group held with Braveley School students was of the 'trade off' of environmental actions which could be seen to be done by some of the pupils, or the selection of what were perceived as 'easy' actions. Here we can see the idea of some young people potentially keeping to recycling because it is the only perceived way to easily reduce one's environmental impact:

"It's easier to get something you can recycle than something might…than save the water" [Braveley School/Y9]

"I think [recycling's] the easiest thing you can do so that's why a lot of people do it…'cause they like feel like they're doing something. 'Cause when you think about what you can do to help the environment it's a bit like…I don't know. And then recycling's just like the easiest option" [Chalksmere College/Y12]

Some young people seemed to relate recycling to 'doing their bit', which, as mentioned earlier, has been criticised as having limited potential to make a tangible difference (e.g. MacKay, 2008, Hobson, 2002). This idea can be explored further into what constitutes a 'reasonable' or 'normal' environmental or water-conserving effort, and whether this too can be seen as justification for behaving in a certain manner. Young people will have limited ability to influence household decisions and make changes, therefore 'doing your bit' may be a relevant and useful goal for them to take pro-environmental action. However, it will be important to communicate to teenagers that this attitude will not have vast impacts.

Owen et al. (2009) found UK adults to state a way in which they were 'doing their bit' to save water, for example by installing a dual flush. Conversely, a Braveley School student stated that they were *"more into"* recycling and reusing items rather than saving water. This

describes an active choice to recycle as opposed to conserving water, perhaps packaging these actions and others together under the umbrella of ‘efforts to help the environment’. This could relate to the concept of negative spillover, where undertaking one particular environmental action makes it less likely that another one will be done (Owen et al., 2009, Science for Environment Policy, 2012, Thøgersen and Ölander, 2003, Crompton and Thøgersen, 2009). This contrasts with Defra’s (2008a) headline behaviour goals, which are envisaged as encouraging positive spillover to other pro-environmental behaviours. Equally, the Defra study viewed members of the British public as both very willing and able to save water, which is not something strongly demonstrated by the participants in the present PhD research.

It is important to note here the power (or lack thereof) of young people to achieve positive spillover of environmental behaviour, where an individual begins one pro-environmental action and this makes them more likely to start doing other activities. The Chalksmere College student who says they *"Recycle a lot but rely on cars as transport"* would not yet have the power to move to a location where they could take advantage of public transport, for example. However, of course it may simply be, as a handful of students argued, that recycling is easier than saving water. Encouragement comes from the supply of kerbside recycling facilities and the prominent display of labels emphasising the recyclability of packaging.

Doing what others do

An idea that came up across the three schools was that individuals just ‘do what everyone else does’. This is explained by one student through the fact that there are common activities which are perceived to be carried out by everyone at the same frequency or to a similar degree:

"Because we do practically the same thing each day (showering etc) and turn off appliances at night" [Braveley School/Y9]

An idea was generally presented here that everyone acts in a very similar way. A Braveley School student's response that they "…*do exactly the same as what my friends say they do"* may shed further light on the origin of these assumptions. This quote demonstrates how self-reported behaviour could have a knock-on effect on the actual behaviour of others, although it is often not possible to know how much water others are using in their own homes, or in particular, in the privacy of the bathroom.

Doing what is 'normal'

A similar concept, but one that was much more evident amongst the oldest students, was that it was 'normal' to do what they do. These findings may reflect the difficulty people have in drawing out thoughts about mundane behaviours which slot subconsciously into daily routines: the idea of ordinary and everyday consumption discussed in Chapter 2. In Chapter 5, it was considered how young people may view themselves as environmentally friendly, but still express indifference or even apathy towards water conservation. Water conservation was viewed by some as something requiring a 'special effort', whether this was a justification for not engaging, or an expression of pride in their adoption of sustainable behaviours.

In contrast to this discussion of water conservation, waste recycling was perceived by many of the students in the questionnaire as a normal behaviour, and not a special environmental effort:

"Do the average recycling" [Chalksmere College/Y12]

"We recycle, but a lot of households in our area do the same" [Chalksmere College/Y12]

"Because everyone does the same things to help the earth (e.g. recycle)" [Braveley School/Y9]

Recycling can be seen to have successfully made the leap from niche ‘green’ behaviour to an everyday, routine action. Barr et al. (2001) found environmental values did not need to be present, and rather recycling behaviour was controlled by knowledge, convenience and norms. Where people know how to recycle, bins are provided and others around them are acting, uptake is likely to be high. Putting recycling out on the kerbside turns a household behaviour into one visible outside the home.

However, as suggested in Chapter 7, there could be a benefit for some in perceiving water conservation as a special effort. This suggests a sense of environmental (or water) citizenship, pride in behaviour and active engagement. Barr et al. (2001) found a link between an individual sense of rights and responsibilities, and a willingness to reduce and recycle waste. However, for those who do not identify with a reason for reducing water consumption, making it ‘normal’ may be the way forward.

Environmental actions not for environmental reasons

The predominant reason given for reducing water consumption where there was not an environmental or citizenship motive was a financial incentive. This was either related to the household water bill, or the cost of energy to heat water within the home. This theme was noted predominantly amongst the older students (Chalksmere College), who may have more control over water use in the home and may recognise parents’ financial pressures more fully, and the youngest students (Alfon School).

"We haven't been using water as much as we use to due to water bills" [Alfon School/Y7]

"Because [my neighbours are] cheapskates. They don't like paying for water" [Alfon School/Y7]

"It's mainly just about the bills that it causes like…water and electricity bills but it's not really much about the environment" [Chalksmere College/Y12]

Both Chalksmere College and Alfon School are located in areas of lower average socio-economic status than Braveley School, and this could have had an impact on what they spoke about in the questionnaires and focus groups. However of course, students may have come from different areas and in particular Chalksmere College has a widely spanning catchment due to being a sixth form college. The number of pupils entitled to free school meals at Alfon School is well above the national average, whereas this figure is lower than the national average at Braveley School.

Indeed, if financial motivations are an individual's or household's primary reason for conserving water, this motivation should not be ignored. However, it is less likely to be a major factor for young people who do not pay the water or energy bill, and also where households are not charged volumetrically for water.

6.2.2 Norms, practices, habits and lifestyles

Social norms, or informally held group beliefs, may heavily influence water behaviours, as outlined in Chapter 2. These include daily washing (Medd and Shove, 2005a) and keeping homes clean. Equally, we know that practices, habits and routines play a role in how water is consumed. People get caught up in unsustainable patterns of use (Southerton et al., 2004a, Sustainable Consumption Roundtable, 2006) with unconscious actions coming together in a conscious daily life pattern (Giddens, 1984). These contribute to the 'messiness of everyday life' (Dourish and Bell, 2011), and sustainable intentions potentially not leading to corresponding actions due to different barriers and pressures. Two of Dawnay and Shah's (2005) principles of behavioural economics presented in Chapter 2 are "Habits are

important" and "Other people's behaviour matters", so if these principles are found to be at play in young people's water consumption, there may be potential for nudges to be utilised. However, this would not work to make water use more visible.

Patterns of use and routines

A small number of the pupils' responses highlighted how water use is often just a necessary element of their routines, and therefore not actively thought about:

"Some days we always use the shower like on Sundays all of us have to use the shower because we all do sports, and other days we won't use the shower as much, so some days we use more or less" [Braveley School/Y9]

In this case water is being used for hygiene and refreshment after participating in sports, while another Braveley School focus group participant described the place of water in their younger siblings' night time routine. Drawing out the often unconscious role of water in these activities was an important function of the questionnaire (and even more so, the focus group) in order to increase conscious thought about water use, when it is an 'invisible' ingredient in actions like cooking, or used simply to enable comfortable and clean living. As Sofoulis (2005) relates, few people would express an attitude towards a tap: attitudes are more likely to relate to the specific activities which water use enables.

The older students (Chalksmere College) were particularly keen in the questionnaire to express how sustainable water habits had become embedded into their daily lives. However, this pattern did not continue through to positive responses to the statements on water behaviours, which were discussed in Chapter 5. It may be that students were asked in the questionnaire about different water conserving actions to the ones they are actually carrying out: for instance, a couple of students

related how they take showers instead of baths, though whether this is now considered action for water conservation or simply normal behaviour is debateable. However, others did not state specifically what their sustainable water habits were, which may mean they perceive that they are taking more action than they actually are. Again, completing the questionnaire may have helped to expose any dissonance between individuals' attitudes and actions so it is important to bear in mind the potential for changes in lifestyle later in life resulting from the research.

Reasons for unsustainable habits and practices

Conversely, many of the young people surveyed knew that they were not using water as sustainably as they could do. There is a limit to the amount of difference children can make individually, and some of the focus group participants recognised that their parents led busy lives. If environmental behaviour cannot be made an easy component of everyday life, it has the potential to become a chore that is less important than other concerns:

"...so my mum's basically got to try and keep all of us under control, and try and...help the environment and all of that..." [Braveley School/Y9]

"My parents have more important things to do" [Alfon School/Y7]

If young people are taking on board this message from their parents, they may feel less motivated to act themselves. However, it may be that pupils are having a greater impact on their parents' behaviour than they realise, and the influence of young people on families will be considered later in this chapter.

A key additional difficulty highlighted by a small number of Chalksmere students in the questionnaire was being part of a large household:

"As we try to be environmentally friendly, but we are a large family, so it may have little or no effect" [Chalksmere College/Y12]

"With 5 of us in the house, there's lots of washing, cleaning and so on so it's difficult to cut down drastically on water" [Chalksmere College/Y12]

While a household of six would be very likely to use more water than a household of three, per capita these individuals are likely to use less water than if they lived alone or in smaller households. However, a backlog of dirty clothes or dishes would be more noticeable in a larger household, and equally it may be more difficult for an individual child to influence the actions of a bigger family, particularly if they are one of the youngest.

Moving from unsustainable to sustainable habits and practices

Through the follow-up questionnaire and focus groups, I had the opportunity to see if the participants recognised any changes in their habits and practices after the water lessons. On querying the pupils after the education programme, a number of the Chalksmere College questionnaire respondents suggested that habit change was necessary but had not yet occurred for them, despite taking the water lessons over a much longer period than pupils at the other two schools:

"I haven't got into the habit, unfortunately :("[Chalksmere College/Y12]

"Difficult to change habits" [Chalksmere College/Y12]

"Because I get into a force of habit using lots of water" [Chalksmere College/Y12]

This could indicate several potential obstacles to habit change. Despite learning more about water use, barriers exist to changing behaviour

such as remembering what changes could be made at specific times and locations, like the bedtime routine. This indicates a potential role for ‘nudging’ efforts. On the other hand, it may be that a more sustained period of education would have a greater impact, or returning to the topic at a later date. However, as mentioned earlier, it could be that impacts will occur later down the line, when the students reach adulthood and consequently are more in a position to make decisions and take responsibility for their water consumption.

A Braveley School questionnaire respondent summarised the short-lived nature of many pro-environmental behaviour changes, saying *"We'd do it for like a week" [Braveley School/Y9].* This highlights a need for efforts that result in sustained habit and behaviour changes, rather than engaging participants for nothing more than a passing phase.

“Forgetting” was also given as a reason for not engaging in water reducing behaviours, with one pupil saying their family *"… tr[ies] to save water, sometimes forgetting” [Braveley School/Y9].* This was expressed as something normal, particularly by the younger participants, and provided as a reason or excuse for water wastage. Perhaps it is a sign of their age that they feel able to use this as a reason, or it could be just a more juvenile expression of the difficulty in changing habits.

Returning to focus on the questionnaire that was administered prior to water lessons, all the students were presented with the statements “If I decided to, it would be easy for me to use less water at home”, and “If I decided to, it would be easy for me to use less water at school”. It can be noted that for all schools, the mode response in terms of ability to reduce water use at home was “agree”, and a strong contingent at Alfon and Braveley Schools selected “strongly agree” (Table 6.1). In terms of ability to save water at school, Alfon and Braveley pupils were again more positive about their prospects than those at Chalksmere College, where the mode response was “disagree” (Table 6.2). It may

be that the older Chalksmere College students were more realistic about the low prospects of changing the system at their college, whereas the younger pupils may have had more faith in their ability to change the status quo. In reality, it is likely that the 16 and 17 year olds at Chalksmere College have a greater ability to affect their college's water consumption, but whether they have the desire to do so is a different matter. The response from all three schools in terms of ability to change their actions at home is a positive finding, however.

Table 6.1 Responses to the statement "If I decided to, it would be easy for me to use less water at home" (first questionnaire)

	Mode response	Strongly agree	Agree	Neither/ don't know	Disagree	Strongly disagree	No answer
AS/Y7	Agree	7 (29.2%)	8 (33.3%)	6 (25.0%)	1 (4.2%)	2 (8.3%)	0 (0.0%)
BS/Y9	Agree	11 (20.4%)	28 (51.9%)	9 (16.7%)	6 (11.1%)	0 (0.0%)	0 (0.0%)
CC/Y12	Agree	4 (5.3%)	44 (57.9%)	14 (18.4%)	12 (15.8%)	1 (1.3%)	1 (1.3%)
All 3 Schools	Agree	22 (14.3%)	80 (52.0%)	29 (18.9%)	19 (12.3%)	3 (2.0%)	1 (0.7%)

Table 6.2 Responses to the statement "If I decided to, it would be easy for me to use less water at school" (first questionnaire)

	Mode response	Strongly agree	Agree	Neither/ don't know	Disagree	Strongly disagree	No answer
AS/Y7	Agree	2 (8.3%)	10 (41.7%)	8 (33.3%)	3 (12.5%)	1 (4.2%)	0 (0.0%)
BS/Y9	Agree	12 (22.2%)	23 (42.6%)	11 (20.4%)	8 (14.8%)	0 (0.0%)	0 (0.0%)
CC/Y12	Disagree	3 (4.0%)	18 (23.7%)	20 (26.3%)	30 (39.5%)	5 (6.6%)	0 (0.0%)
All 3 schools	Agree	17 (11.0%)	51 (33.1%)	39 (25.3%)	41 (25.6%)	6 (3.9%)	0 (0.0%)

6.2.3 Attitudes towards hygiene and cleanliness

Norms are also at play in terms of what young people and adults perceive to be clean or hygienic.

Water conservation as dirty

The idea that actions to conserve water may be dirty or disgusting arose in the first focus group of the process, held at Braveley School. While chatting about ways to conserve water and what might be deemed essential water uses, a pupil said: *"I would say toilet but you*

don't necessarily have to flush it" [Braveley School/Y9]. This was met with laughter from the other focus group participants and exclamations of *"Euuurgh!"*. A similar (though milder) reaction followed another pupil saying *"I don't think washing machine…and washing up seems as important…you can save a few days and not do that" [Braveley School/Y9]*. Possibly as a result of these interactions, contentious behaviours were not brought up in the second Braveley School focus group. In this situation, normally private behaviours or those uncommonly talked about outside the family environment had been exposed to peers and not met positively.

At Alfon School, I noted that the class teacher was reluctant for the pupils to discuss bathroom behaviours in the classroom, again probably due to the sensitivity of the topic and the chance of embarrassment. It could also be that the teacher felt wary about discussing a topic with students at an age where hygiene is a sensitive issue.

Following these observations, a question was added to the Chalksmere College survey to see how water conservation behaviours were rated alongside other pro-environmental behaviours, with the students asked to tick the three environmental behaviours they perform most often. Figure 6.1 shows recycling behaviours to rank highest, followed by turning off the tap when brushing teeth. "Not flushing the toilet every time it is used" was the lowest ranked action, with only one student selecting this as one of their behaviours. Even "taking shorter showers" is in penultimate position.

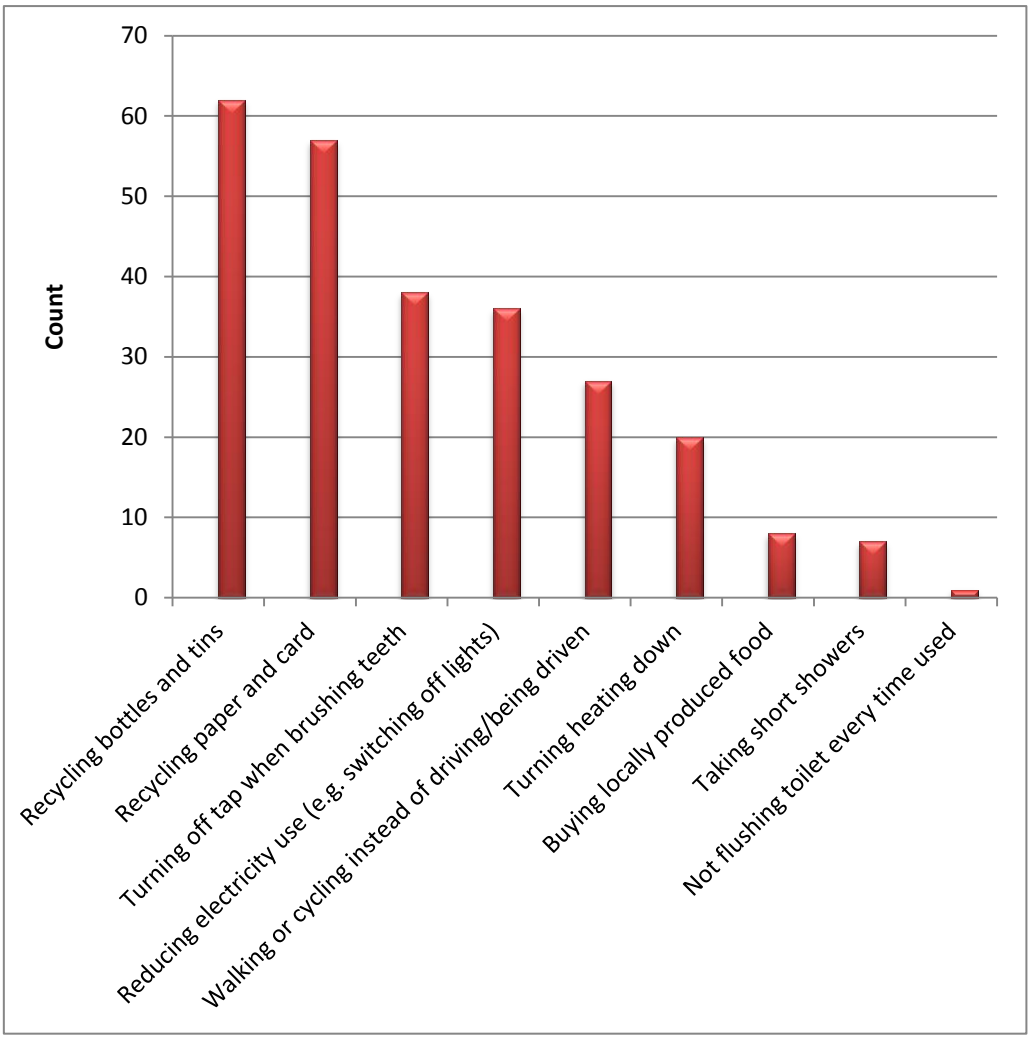


Figure 6.1 Responses to the question "Please tick up to three environmental behaviours you perform most often" (Chalksmere College only; first questionnaire. n=76)

Clearly this question does not uncover every pro-environmental behaviour as it only asks for a "top three" (and does not include the option to suggest a different action that is not listed), but the pattern indicated demonstrates that water conserving actions seem to be less popular than other pro-environmental efforts. I suggest that water conserving behaviours are not being selected because it is perceived that reductions in hygiene practices would need to be made, and this may not be well accepted amongst teenagers.

Social norms play a role in showering practices, and in particular the youngest students tended to agree with the statement "It is important to

shower every day" which was presented as a statement in the first questionnaire. Moving up the age groups, opinions became slightly less strong but the mode response from Braveley School and Chalksmere College was still "agree". It is likely that young people are given the message by parents and teachers in Personal, Social and Health Education (PSHE) lessons that it is important to stay clean and healthy, particularly at the start of adolescence. Indeed, it is imperative to consider how we balance the requirements of PSHE lessons with education for water conservation, and where priorities will (or need to) lie for schools and parents.

Going back to Figure 6.1, it is also clear that recycling is being prioritised amongst the young people surveyed. It could be the case that recycling has been favoured and the participants see this as 'doing their bit', as argued in Chapter 5, potentially leading to negative spillover and therefore a lack of effort in other environmental domains. However, it could also be the case that infrastructure and provision (in this case of kerbside recycling bins, by local authorities) has made this the simplest situation to change. We see others' recycling efforts- through boxes left on the kerbside, and use of public bins- so this becomes a publicly enacted behaviour, perhaps even influenced by a local prolific recycler (Reid et al., 2010). This contrasts with the multiple water-using behaviours which take place inside the home.

Private behaviour

The idea that water use takes place inside the household draws out the concept of private behaviour. When asked in the first questionnaire to compare their own household's water use to that of the average household in their area, or a friend or relative's household, a handful of students made comments along the lines of *"Don't know how much people I know use" [Braveley School/Y9]*. It seems that water behaviour is not generally discussed, whether that is because it is not thought

about, or because it is often embedded in acts of cleanliness which take place behind the bathroom door.

According to research by Waterwise, around 42% of household water consumption occurs through flushing the toilet or showering (Waterwise, 2013). Therefore a question can be raised as to whether it will be necessary to get people talking about water use in private spaces in order to encourage conservation. However, one student mentioned in a lesson *"We don't want to know how you wash" [Alfon School/Y7]*, thus rendering the idea of making water consumption something that is discussed probably an unpopular or unacceptable solution. What may be more appropriate is making water uses that are not thought about more visible, for example O'Toole et al.'s (2009) method of putting a card and pen on the bathroom door to aid completion of a diary study. They found a poor connection between the results of the diary study and the answers obtained from a telephone survey to one member of the household, demonstrating that they might not be aware of the water use going on within their own household.

6.2.4 The family, peers and the community

Continuing with the idea of interaction between young people and others, this section considers the influence of overlapping and nested communities on an individual's water use, such as the household or family, the classroom or peer group and school, and the neighbourhood.

Family influence on child

"My mum's always going on about saving water and turning lights off and putting on more clothes instead of the heating." [Braveley School/Y9]

"Mum does get fussy, when we got the water bill back, um a couple of weeks ago she was really annoyed 'cause it was quite high, so she gets quite fussy about how long we spend in the showers" [Chalksmere College/Y12]

It can be seen in these quotations (the former from the questionnaire, and the latter from a focus group) that influence from parents is conceptualised by some young people as being 'made' to do something or having a parent who is "fussy" or "always going on". Acting environmentally is seen as something to be nagged about, like a household chore.

On the other hand, one of the Braveley School focus group participants highlighted the difficulty in encouraging younger siblings to not waste water, perhaps indicating a sense of responsibility to set a positive example:

"...and sometimes it gets quite hard to try and stop them from using so much water...'cause with them, they love having showers and baths and all that, and spend so long in there, that then they won't really get out if you tell them so sometimes it can get quite hard depending on your age" [Braveley School/Y9]

Alfon School students showed most uncertainty about responding to the statement "The way my family behaves towards the environment affects how I behave" in the questionnaire, with the mode response being "neither/don't know" but the second most popular response as "strongly disagree". This is interesting as this youngest age group would arguably be the most highly influenced by their parents. There was very little difference between the proportion of Braveley School students agreeing and the proportion disagreeing with the statement. The mode response from Chalksmere College was "agree" (Figure 6.2). One theory could be that young people are willing to say that their parents

'nag' them about environmental efforts in the home, but are less willing to say that this actually impacts upon their actions. Perhaps as they get older, they recognise the impact parents have on their behaviour towards the environment and are more comfortable admitting this.

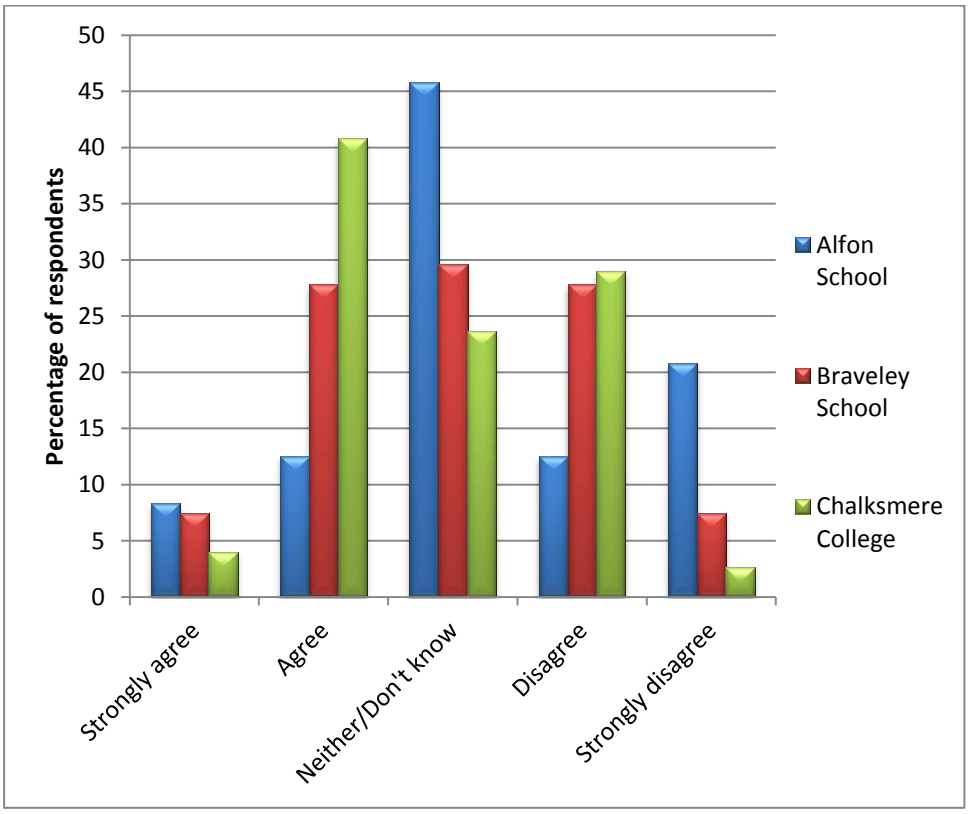


Figure 6.2 Responses to the statement "The way my family behaves towards the environment affects how I behave" (first questionnaire- students divided by school)

Child influence on family

The young people were also all asked in each focus group how much of an influence they felt they had over their families. Very few students acknowledged having this, seeing behavioural influence instead as something coming from their parents. It is interesting that the young people interviewed were not conscious of 'pester power' which has been cited as a key influence on parental decision making for example by Owen et al. (2009), who found adults to have been told by children

to turn off the tap when brushing their teeth. When focus group participants in the present study were asked whether they went home and talked to their families about what they had learned about water, a couple of the younger pupils gave examples:

"I asked my mum if she could buy a hippo bowl…and she said 'not at the minute 'cause we've got to decorate kitchen'" [Alfon School/Y7]

"I spoke to my mum about it but she thought that we couldn't really use much less 'cause we have quite a big family, erm so she thought that we couldn't use much less, when, actually when you think about it, there's quite a lot that we could…do. But she didn't really have time to talk about it in much more detail" [Braveley School/Y9]

It is possible to see more evidence for the 'messiness of everyday life' in the instances above: limited disposable income due to household renovations, and a lack of time to discuss or think about changing practices. It may be that these students felt they had little impact on family decisions due to their parents' responses, but actually had more of an effect than they realised. Dauphin et al. (2011) found 16-21 year olds to behave as decision-makers in households but others (e.g. Jenkins, 1979) have found children to have a limited influence on family decision making apart from in terms of activities. In the current research, children perceived themselves as having little influence on household water consumption. However, it is likely that a different picture would emerge if I had interviewed parents as well. It is very promising that (at least a proportion of) the students went home and spoke to their parents about what they had learned. This demonstrates an influence of the water lessons and the potential for positive change towards water values and conservation. The chance of this happening may depend on how a young person perceives their family's attitude is towards water conservation.

The mode response for all three schools on the statement “If I tried to reduce the amount of water I used my family would…” was “approve”. The schools show a similar picture to one another (with Chalksmere College responses skewing slightly more towards “neither approve nor disapprove/not care”) (Table 6.3). Nonetheless, this is promising and signals a good opportunity for support of water efficient values and use in the home.

Table 6.3 Responses to the statement “If I tried to reduce the amount of water I used my family would…” (First questionnaire- all three schools)

	Mode response	Strongly approve	Approve	Neither approve nor disapprove/ not care	Disapprove	Strongly disapprove	No answer
AS/Y7	Approve	5 (20.8%)	12 (50.0%)	5 (20.8%)	1 (4.2%)	0 (0.0%)	1 (4.2%)
BS/Y9	Approve	11 (20.4%)	36 (66.7%)	7 (13.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
CC/Y12	Approve	12 (15.8%)	33 (43.4%)	29 (38.2%)	1 (1.3%)	0 (0.0%)	1 (1.3%)
All 3 schools	Approve	28 (18.2%)	81 (52.6%)	41 (26.6%)	2 (1.3%)	0 (0.0%)	2 (1.3%)

Peer influence

Peer influence has already been noted in the focus group with Year 9 students, in terms of attitudes towards particular water actions and hygiene. Looking at Table 6.4, a clear pattern arises from responses to the statement “If I tried to reduce the amount of water I used, my friends

would…" with 76.0% of students saying their friends would "neither approve nor disapprove/ not care". A strong contingent did select "approve" however, swayed by the students at Alfon School where 37.5% selected this option. This demonstrates (perhaps not surprisingly) that the surveyed young people, especially the older two groups, tended to perceive a much less positive response from their peers than from their family members. There is potential for this to result in conflicting norms, where different social influences pull young people in multiple directions, though a study by McDonald et al. (McDonald et al., 2012)in Queensland, Australia, found that norm conflict motivated people to conserve water rather than making them less likely to do so (ibid.). However, this may not be as likely amongst young people who may be more heavily influenced by the behaviours of their peers.

Table 6.4 Responses to the statement "If I tried to reduce the amount of water I used my friends would…" (First questionnaire- all three schools)

	Mode response	Strongly approve	Approve	Neither approve nor disapprove/ not care	Disapprove	Strongly disapprove	No answer
AS/Y7	Neither/ not care	0 (0.0%)	9 (37.5%)	13 (54.2%)	1 (4.2%)	0 (0.0%)	1 (4.2%)
BS/Y9	Neither/ not care	2 (3.7%)	6 (11.1%)	43 (79.6%)	3 (5.6%)	0 (0.0%)	0 (0.0%)
CC/Y12	Neither/ not care	0 (0.0%)	13 (17.1%)	61 (80.3%)	0 (0.0%)	1 (1.3%)	1 (1.3%)
All 3 schools	Neither/ not care	2 (1.3%)	28 (18.2%)	117 (76.0%)	4 (2.6%)	1 (0.7%)	2 (1.3%)

The community

Previous research recognises the influence of communities and networks on pro-environmental behaviour (e.g. Olli et al., 2001). In the present study, a couple of students responding to the questionnaire noted the environmental friendliness (or lack thereof) of their communities through recycling, the uptake of which can be seen clearly on collection day:

"I live in an older persons estate and they don't bin things they recycle them and for me it's the same" [Alfon School/Y7]

"It's rare I see another blue bin at end of drive on my street!" [Chalksmere College/Y12]

Here it can be suggested that seeing others recycle could increase inclination to do the same, but alternatively recognising that others are not recycling may induce pride in action and a desire to continue doing so. This could reflect Reid's (2010: 322) concept of a prolific local recycler as a "change champion": whether that is someone who is already recycling in a young person's street, or even the teenager themselves. The influence of socio-economic background is brought up by a Chalksmere College student in their questionnaire response:

"…my area is a rough area and I therefore don't believe being environmentally friendly is a big part of their lives" [Chalksmere College/Y12]

Previous research has highlighted the role of higher social capital (the benefits an individual derives from communities and cultures) in increasing the uptake of pro-environmental behaviours, including recycling (Tsai, 2008). In a Canadian study Berger (1997) suggests that those with lower household incomes may have smaller properties with

less space to store recyclables. In a review of the field, Sidique (2010) reports no clear relationship between either income or education level and recycling rates.

Water usage by neighbours tends to be less obvious but it was noted or inferred by some of the older students in their questionnaire responses:

"I live in [particular area in East Midlands] and I don't think people are overly bothered about their household water usage as many are not on a meter" [Chalksmere College/Y12]

"Neighbours have rain collection butts and we don't, they also collect water from guttering to water plants- we don't" [Chalksmere College/Y12]

"We don't wash our car or water our garden with hoses like our neighbours do" [Chalksmere College/Y12]

Mostly these are observations of outdoor and public water uses or conservation efforts, which enable individuals to benchmark their water use against that of their neighbours. Difficulty arises when trying to assess neighbours' water usage inside their own homes, but living in an area where metering levels are known to be low may mean assumptions of high water use are made, as suggested by the first Chalksmere student quote above.

The school is a community with its own ethos. This may be why a considerable difference could be seen between responses from each of the three schools in relation to the statement *"*At my school, saving water is seen as important". Alfon School pupils showed uncertainty above all (mode response "neither/don't know"), while the Braveley School respondents leaned towards "agree" but a strong contingent

disagreed. At Chalksmere College, the mode response was “disagree” but again there was a high degree of uncertainty. Out of the three institutions, only Braveley School is registered with the Eco-Schools initiative, so this may hold influence over pupils’ responses. A whole school approach to sustainability action and becoming an agent of change is one of the recommendations of Shallcross (2005). However, a school is also a set of nested communities, consisting of classes and classrooms, pupils and teachers. Pupil responses may well be influenced by the attitudes of the teachers they come into contact with, and this would be an interesting element for future research.

6.2.5 Technology and restrictions

It is useful to briefly consider the role of technology and restrictions, as these factors were brought up by the participants.

Technological fixes and the home as the water user

Technological fixes, or what Fielding et al. (2011) term efficiency actions, relate to purchasing devices or appliances which are water efficient or reduce water consumption. This is in contrast to curtailment actions which involve changing one’s practices or habits (ibid.). In past water and energy studies, technological fixes have been found to be more popular amongst higher income households as they often involve a cost, with curtailment actions being more popular in mixed income studies (Fielding et al., 2011, Poortinga et al., 2003). Of course, it only takes a single water efficient individual in a household to install a technological fix which reduces the water use of everyone living in the dwelling. One Chalksmere questionnaire respondent had noted an installation in their home: *"We have shower savers that make the showers use less water" [Chalksmere College/Y12]*. Others made suggestions as to technological changes they could add to their homes in the future, either instead of or as well as curtailment actions. This leads on to a theme that arose from the data analysis, which was the

idea of the home as the water user, and those living inside as passive. The following quotes were in response to comparing the environmentally friendliness of their home to that of a friend or neighbour:

"We don't have a very environmentally home" (sic) [Braveley School/Y9]

"I have 2 more bathrooms to waste water in [than my friend does]" [Braveley School/Y9]

"All the houses are the same when it comes to the environment" [Chalksmere College/Y12]

This mind-set takes responsibility for water conservation away from the individual and relates to a sense of helplessness and inability to act. Educational initiatives could work to increase a sense of responsibility for action amongst young people, rather than allowing blame to be placed entirely on the infrastructure of the home.

Restrictions

Data collection at Chalksmere College followed the 2012 UK drought, and therefore restrictions were discussed in the first focus group at the college. As described earlier, it seemed for one student that the absence of a hosepipe ban in their region made it seem like no action needed to be taken locally, rather than the restrictions resulting in longer lasting value change:

"I think you'd only like, do something about it like if they told you to like a hosepipe ban, you wouldn't stop using your hosepipe unless you've got that in place. So it's like…you only change something when you're told to" [Chalksmere College/Y12]

Some of the students at Chalksmere College also recognised the presence of a water meter (or lack thereof) as having an impact on their water consumption, demonstrating that financial drivers were affecting some of their decisions around water consumption.

6.3 Overall conclusions to chapter

This chapter examined the composition of 'everyday' water use as constructed of habits, routines and lifestyles, and influenced by social norms, peers and family members, as well as technology and infrastructure. I argued that breaking down these elements so they become distinguishable to the consumer helps to make water use more visible, and in turn allows for the potential development of a sense of responsibility towards conserving water resources.

In terms of 'everyday' environmental behaviour, this chapter considered how norms of use are constructed and to what extent there is a desire to be 'normal' or to distinguish oneself from the crowd. I suggested that there is a 'trading off' of environmental actions taking place, in particular in terms of recycling habits, and a perception that 'doing your bit' is enough. There is potential in some cases for a positive spillover between water conservation and other pro-environmental behaviours, as suggested by Defra (2008a), but this was not noted amongst the participants. An idea emerged of young people doing what is 'normal' and 'what everyone does', which interestingly seems to include recycling. For this reason, there may be merit in making water conservation 'normal' in a similar way, if possible. I found some evidence in the data of financial motives affecting young people's behaviour, even though they are not responsible for paying water and energy bills at home.

In terms of the 'messiness of everyday life', this chapter suggested that young people are happy to admit that they forget to behave in a water efficient way at home and see this as a reason in itself for not doing so: something that adults may be less likely to do. The difficulty of habit change was highlighted by older students even though they studied water for a prolonged period of time, so traditional water education alone may not be able to break through the habit barrier. This could pave a way for 'nudging' strategies, but equally more innovative

methods which work to make water use more visible might have the potential to shift habits towards more sustainable water use, whilst also encouraging more sustainable values. More positively, a strong contingent at all three schools felt able to reduce their water use at home if they decided to.

Moving on to social norms of hygiene and cleanliness, I explored the way in which water is used in public and private realms and its subsequent susceptibility to social and subjective norms. This is likely to be pertinent amongst the teenage age group, as the participants are at an age where hygiene is increasingly important to them. It was suggested that water conservation education may be difficult to fit with the requirements of social and health education, which is an important consideration for future education programmes. Some water uses may benefit from being made more 'visible', but do not necessarily need to be discussed in school.

The chapter considered the communities which a young person engages with at different scales, ranging from the household and school to the local area, and how they may have to manage conflicting norms between their peers, parents and teachers. The ideas which they come to school with influence how they interpret the messages they receive, which will again be reconsidered as they go away from class and hear their peers' and parents' opinions. It seemed that the younger participants were reluctant to admit the influence their family has on their actions, despite some describing how they are 'nagged' to conserve water. Similarly, many felt they had little influence over their parents, but some had still gone home and spoken to their parents about water use, which is in itself a positive outcome.

In terms of technology and restrictions, some students had noted water saving devices in their homes or could suggest ones that could be added. Conversely, a number of students seemed to refer to their house as the 'water user', coming across as a passive resident who had little control over consumption. I considered how the Chalksmere

College students related to the hosepipe ban, with one pupil suggesting that a subsequent absence of restrictions meant there was no impetus to save water.

In the next chapter, I discuss how educational interventions can develop water literacy and citizenship in young people, perhaps overcoming some of these potential sociological barriers to attitude change.

Chapter 7: The role of education and learning in developing water literate citizens

7.1 Introduction

To briefly recap, so far the thesis has reported finding a basic level of water literacy amongst secondary school participants in terms of knowledge about water, its use, and how it could be saved; but some key misconceptions and knowledge gaps in terms of the global water cycle, and additionally a lack of appreciation for water in its hidden uses. The young people surveyed perceived themselves as acting in a reasonably environmentally friendly way, but it tended to be the case that other pro-environmental behaviours such as recycling were chosen over water conservation due to ease or norms of hygiene and cleanliness, and where water efficient behaviours were enacted, often these were small-scale actions along the lines of 'water saving tips' like turning off the tap whilst brushing teeth. However, while pupils felt some ability to save water at home, many described feelings of inefficacy and the influence of parents over their actions. Connections between the nested scales of direct and virtual water consumption are not being made clear by education materials, and the invisibility of water in everyday activities has been highlighted as a key barrier to change.

In this chapter I discuss the experience I had in each of the three case study schools, where I trialled several water education lessons. The aim was to see how water lessons could potentially develop young people as water literate citizens, through bringing water to the forefront of discussion in order to make it more 'visible'. I was also able to test the effectiveness of water education in the short term with a follow-up questionnaire and focus group, although it is vital to pay consideration

to the potential for longer term or latent effects, which could come into play when the young person gets older or moves out of the family home. The research question addressed in this chapter is:

What are the wider insights that can be gained concerning the role of water literacy initiatives in increasing young people's water citizenship?

The main theme in this chapter is the potential for education to make water more visible in everyday actions, which could encourage recognition of ability to act in specific ways. This may provide opportunities for water citizenship and potentially sustainable behaviour change in the future. This theme is drawn out through exploring possible barriers to and opportunities for action, around the power young people perceive in themselves both to act at the household scale and to have an impact on water sustainability more widely at regional, national and global scales. The chapter also considers the support of family and peers, and perceived responsibility to act.

Moreover, I describe the lesson observation process at the schools through the method of biography, and briefly consider the role of the teacher and researcher. Clearly I as the researcher will have had an influence on the pupils' experience, and this is drawn out in the chapter as a number of factors differed at each school. Methodologically, as with adults, there is likely to be a social desirability bias in responses (desire to give the "right" answers), and this has been observed across nearly all self-report data collection measures (Fisher, 1993). This bias could have a stronger effect on some young people who perhaps want to 'help' the researcher or wish to feel that they have performed well, but conversely children could feel less pressure to give socially acceptable responses than an adult might.

7.2 Biography of school experience

The process started in July 2011 and was completed in November 2012. The schools are listed in the order in which the data collection took place. Details of the lessons designed and/or observed can be found in Section 3.5.6 of the Research Methods chapter.

7.2.1 Braveley School

Designing and observing the lessons

After speaking to three geography teachers at Braveley School, I sent them resources and facts to be devised into one lesson that would link water into the current Year 9 geography topic of contemporary issues in Africa. Upon hearing pupil views from the questionnaire and focus group I decided that it would be good to get pupils thinking more carefully about different water uses other than drinking, and also water consumption outside the home, such as in agricultural and industrial activity. In order to link this into the international nature of the theme being studied in the classes that term, I chose to collect resources on virtual water.

One of the teachers used the resources I provided to put together a lesson pitched at a suitable level for the classes, entitled “How does our use of virtual water affect Africa?”. This incorporated a starter activity (“How much water?”) on the amounts of water used to produce different goods; a discussion of what virtual water means using information from a video clip; mapping the UK’s virtual water consumption or water footprint on a world outline; and a case study activity of the impacts of our virtual water consumption on African nations (Figures 7.1 to 7.3).

The aims of the lesson that the Braveley School teacher designed were:

- To know what is meant by virtual water consumption
- To know amounts of water required to produce certain goods
- To understand how our use of water can affect the continent of Africa (and other countries) environmentally
- To consider some ways of reducing our virtual water footprint

STARTER TASK

How much water does it take?

- Study your sheet showing various products
- Write down how much water you think it takes to produce that product in litres.

1

How does our use of Virtual Water affect Africa?



Contemporary Issues in Africa
Year 9 Geography

2

Today's lesson

- Know what is meant by virtual water consumption
- Know amounts of water required to produce certain goods
- Understand how our use of water can affect the continent of Africa (and other countries) environmentally
- Consider some ways of reducing our virtual water footprint

3

70 litres

4

15 500 litres (l)

40 litres

5000 litres

140 litres

Impacts on African nations

- Around the room are several different Case Studies of products the UK imports
- Complete your table to assess the positive and negative impacts of Virtual Water.



17

Impacts on African nations

Country	Product	Positive impacts	Negative impacts	Other info

18

Ghana cocoa

Cocoa is my way of life and all I know. I have heard that these seeds make the most amazing chocolate but I have never tasted it. How much I earn can vary greatly because sometimes there is so much cocoa in the world it is sold for very little. This is hard because I have no income security. As with any crop they need water and water is a scarce resource here in Ghana. So much land is taken up by this cash crop that my country doesn't even grown enough to support the people here. That seems so wrong!

21

Ivory coast cotton

We all work for the fair trade cotton cooperative in our local town. This means that we are guaranteed a fair price for the work we do and are able to put our children through school and have an opportunity to give them a better start in life.

The cotton requires and awful lot of water and is very demanding in terms of irrigation. Whilst this can put pressure on local wells and water courses things have improved greatly because we have cut down on the amount of dangerous chemicals we use. Cotton is grown for export to other countries in the world and this means that there is often a shortage of land for people to grow their own food and alongside drought, it can be hard for people to get by without food aid.

22

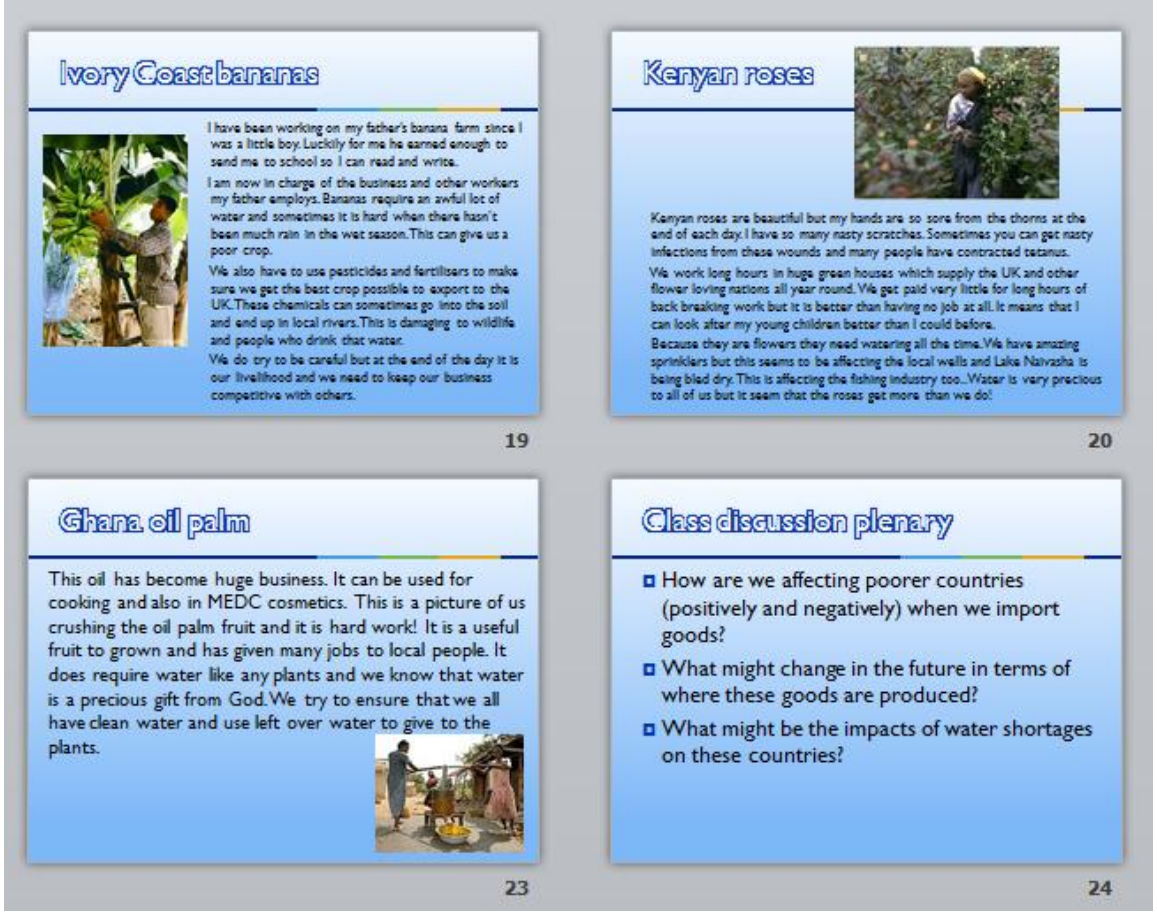


Figure 7.1 Selected slides from lesson on virtual water and Africa, taught to two Year 9 classes at Braveley School (Pages 254-256)

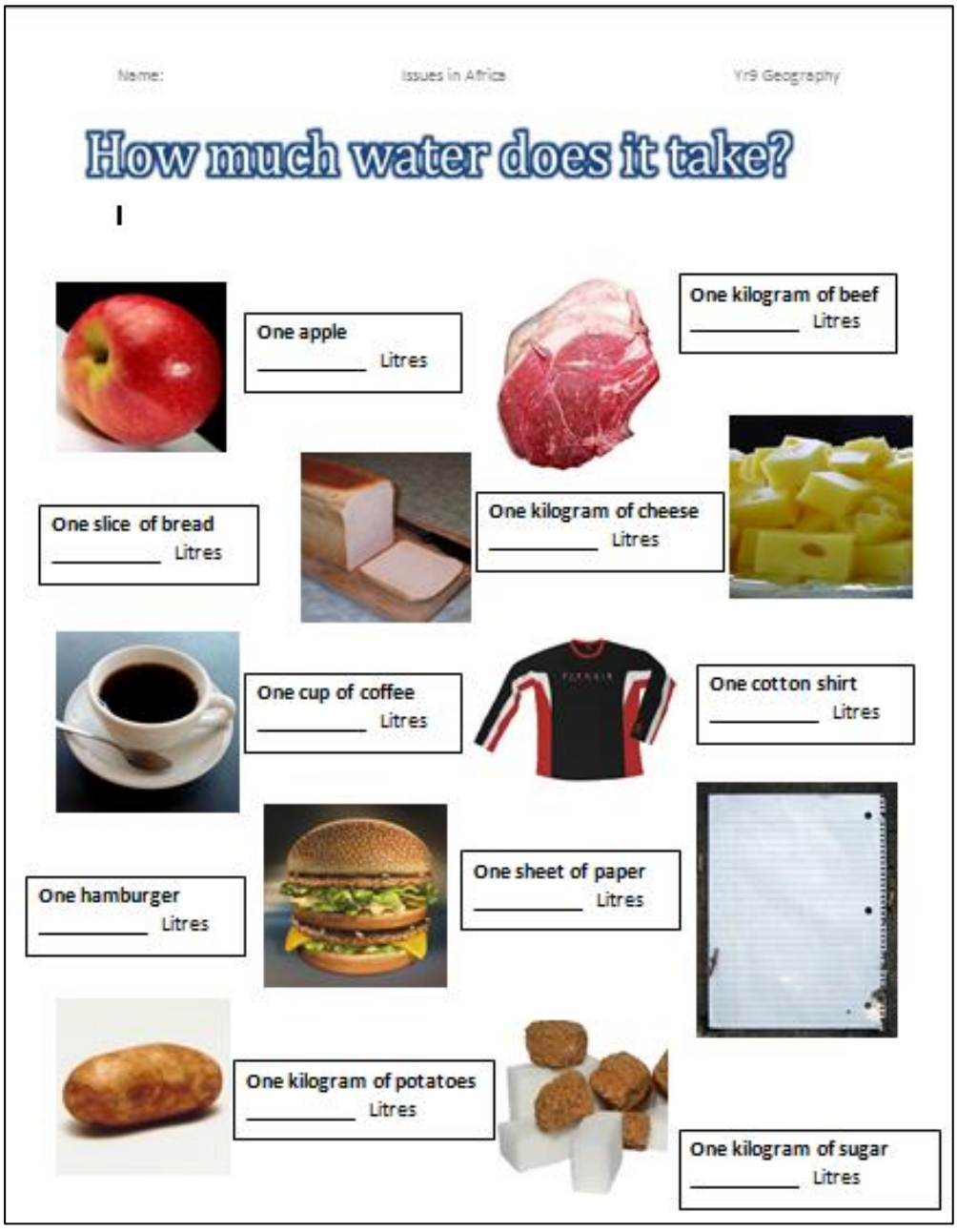
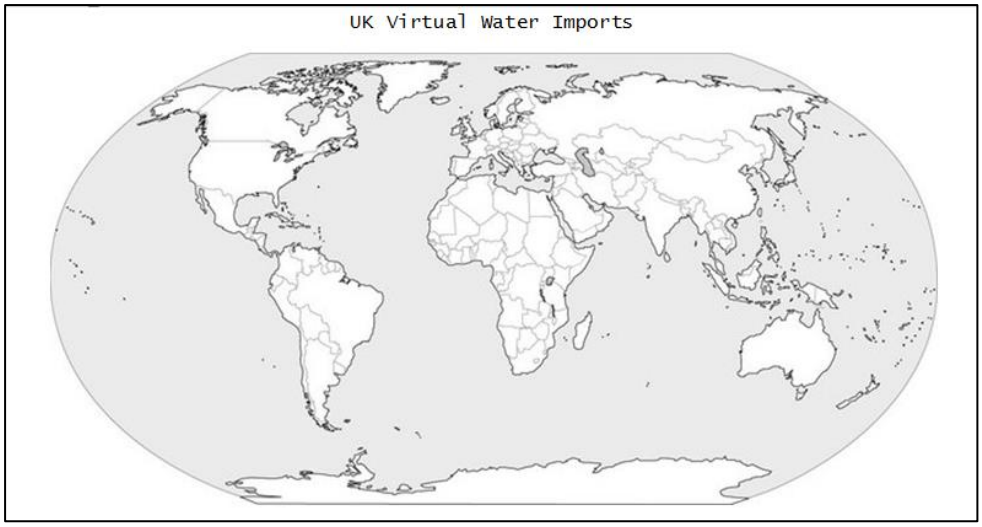


Figure 7.2 Braveley School virtual water activity



Country	Products	Millions of cubic metres/year	Other information
Kenya	Roses	No data	70% UK roses from Kenya
Ghana	Chocolate, ground nuts, oil-palm	2,740	Cocoa is biggest contributor
Ivory Coast	Coffee, bananas, cotton, cashew nuts	1,826	
India	Tea, rice, ground nuts, cotton	2,317	
Brazil	Beef, soybeans, coffee, poultry, maize	4,141	The largest Virtual Water exporter to UK
France	Maize, rapeseed, wheat, milk	3,055	
USA	Soybeans, grapes, cotton, maize, wheat,	1,293	

Figure 7.3 Braveley School activity on UK virtual water imports

Briefly, the lesson concluded with looking at what might change in the future in terms of water availability and what we could do to alter the potential situation. I observed the lesson being taught twice, to different classes (here termed Classes A and B). All the focus group participants came from Class A.

During the lesson, both classes were very engaged and enjoying the content, though the afternoon class (Class B) was much livelier than the morning class, and pupils spent time chatting and expressing surprise about their answers to the worksheet. After the video clip, the Class A teacher asked for a definition of virtual water. One student replied *"Water behind the scenes"*, a definition the teacher really liked, although one which does not necessarily account for the way in which water has been exported and imported.

The Class B pupils lost some interest during the video clip about virtual water but asked thoughtful questions afterwards (for example *"Is it an issue that we're using that much water?"*) so it seemed a good proportion of pupils were concentrating. While keen to complete the case study exercise, most of the pupils I spoke to in Class B were not particularly engaged in deeper thinking about the impacts of importing water. However, during the whole class discussion, both Class A and Class B teachers expanded on pupil answers to provide more information, which enriched the learning experience and broadened the lesson out to include issues of differences in health and safety culture in other countries, and the British demand for exotic and out-of-season fruits and vegetables all year round. The Class A students asked intelligent questions such as *"why do we get things from France and Germany?"* and *"Is the figure for average daily water use [150 litres] based on the UK or the world?"* and engaged in whole-class discussion about the case study exercise.

I collected copies of the notes made in class by the focus group participants. The sets of notes were all very similar to each other and accurately reflected the discussion in class and what the teacher had been saying.

Summary discussion

Data collection at Braveley School went very smoothly and the lesson seemed to be enjoyed by the majority of pupils, though just engaging in a one-off lesson meant there would have been a novelty value to the class. The teachers were keen to incorporate water into the themes currently being studied, which meant disruption to their planned scheme of work was minimised, but the impact of the water topic on pupil attitudes might have been lessened because it was only studied for a short period of time.

7.2.2 Alfon School

Designing and observing the lessons

The original plan for 12 lessons can be found in Appendix E, of which five lessons were taught due to arising time constraints. These are outlined in Table 7.1. As there was more lesson time available at Alfon School, I decided I wanted to develop the young people's water literacy across a range of spatial scales and bring in the concepts of water futures, as well as building a base level of knowledge about water supply and availability.

Table 7.1 Outline of water lessons taught to Year 7 class at Alfon School

Lessons 1 and 2	**Lesson aim** To understand why we need to manage water	Introductory PowerPoint presentation
		Water uses in the home and figures on water usage
		Consolidation of learning from previous lesson
Lesson 3	**Lesson aim** To recognise differences in water availability and consumption across the world, and the outcomes of this	Studying Worldmapper maps of water availability and water use across the world
		How do people in other countries use water?: Taking notes from video clip on collecting water in rural Kenya
Lesson 4	**Lesson aim** To understand how water usage and availability will change in the future	True or false game about water use and availability
		Worksheet on water use in the future (e.g. luxury uses)
Lesson 5	**Lesson aim** To understand how we use virtual water	Video clip introducing the concept
		Writing definitions and guessing water footprints of different items
		Creating mind maps and posters using facts from video

For lessons 1 and 2, the class teacher designed a short PowerPoint presentation to use during the lessons, consisting of the links I had supplied (Figure 7.4).

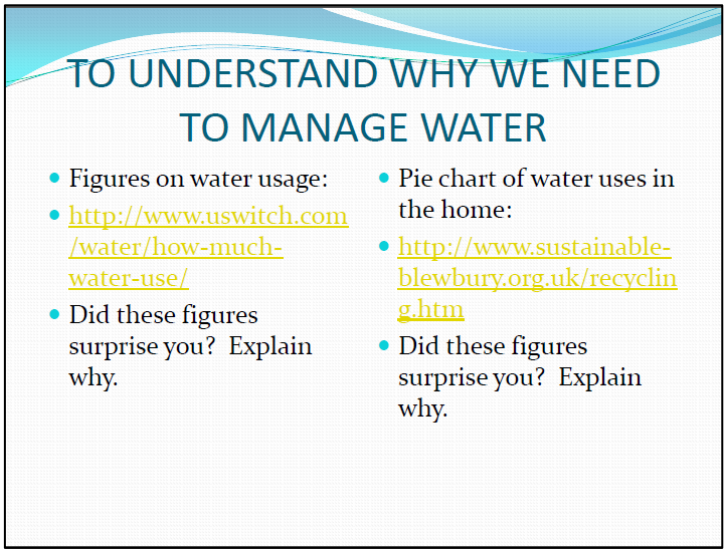


Figure 7.4 Sample slide from Lesson 1 at Alfon School

These lessons involved testing pupils' understanding of statements and facts. As a history specialist, the teacher may not have been fully comfortable with some of the subject matter and looked to me for assistance with some pupil questions. For homework from the first lesson, the pupils were asked to think about how much water they use over the weekend, but only five pupils had done this by the start of the following lesson.

The second lesson began recapping some of the information from the previous lesson, to consolidate understanding. The teacher added a few personal insights, such as expressing surprise that 70% of water use globally is for agriculture. A short story about the teacher's child wasting water was followed by a poll of the class*: "Who turns off the tap when they are brushing their teeth?".* Half put their hands up and the teacher gave the rest the target to start doing this. The teacher moved on to bathing and did a class poll once again on who bathes and who

showers. Chattering ensued as the children found this topic very interesting. However the teacher said "*I don't want to get too personal about your hygiene habits"*: perhaps this was wariness of the ethical issues involved and potentially making the children feel uncomfortable. The teacher brought up a pie chart of relative water uses and one pupil asked *"Is that possible? How does flushing the toilet use more water than washing the car?"*. This may demonstrate engagement with the topic beyond memorising facts, and therefore potential for thinking about personal water consumption more critically.

The third lesson looked at water resources across the world. The teacher asked me to introduce and explain the two WorldMapper maps I provided, which show countries scaled according to their water resources or water usage (see Appendix F for an example). The pupils seemed to grasp the task to some extent but did not appear to understand it fully. It was decided that the water carrying activity I had suggested (see Appendix F for details) would not be feasible, though this meant the pupils had less opportunity to develop a personal connection with the video clip shown about collecting water in rural Kenya (Figure 7.5).

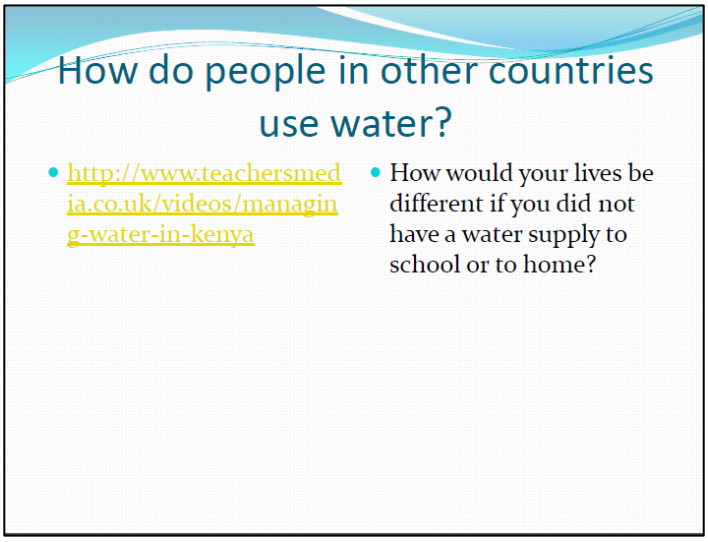


Figure 7.5 Slide from Lesson 3 at Alfon School

In their exercise books pupils wrote one sentence answering the question “How would your lives be different if you did not have a water supply to school or home?”. This helped the pupils to visualise the lives of others and so develop a sense of empathy. Unfortunately lesson 4 was not developed beyond the original lesson plan, and an additional issue was the fact that interviews for the post of geography teacher had been taking place that day at the school, and the pupils had already had a geography lesson as part of the interview process. This, I feel, made them slightly restless. Lesson 4 was about how much water we will have in the future. Upon finding out that we get some of our water from India and Brazil, a keen pupil asked *“How do they clean the water? How does the water get there?”,* and the teacher said *“We’re going to find out”*.

For lesson 5 I had planned to use the Greenpeace resource *The Water Game*, which was examined in the water education provision review (Chapter 4). The teacher had not had time to look over the materials and I felt that I would not take good quality observation notes if I was running the lesson. I instead returned to my resources on virtual water and wrote a lesson (including PowerPoint presentation) on this topic (Figure 7.6).

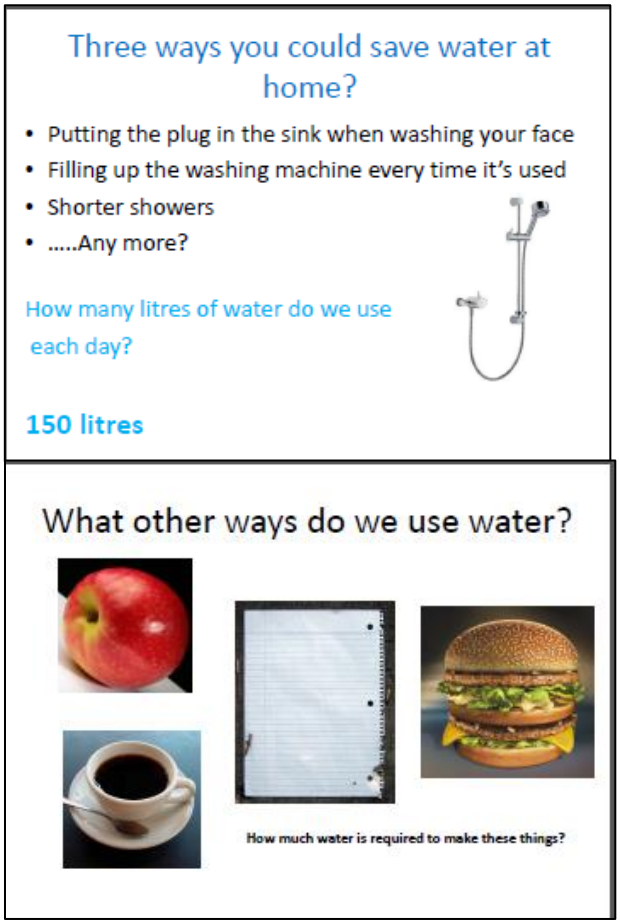


Figure 7.6 Sample slides from presentation for Lesson 5

I discussed the concepts and content with the teacher the day prior to the lesson. On the day of the lesson, the teacher started by asking pupils what they thought virtual water was. One guess, *"water that is put into stuff"* was close (however most others were wide ranging, including *"water in a game"* and *"water that is canned…is fake"*). The teacher presented the lesson aims and explained the word 'consumption', then asked again what the students thought was meant by the term 'virtual water'. One of the focus group participants (who had already been introduced to virtual water) said *"Is it how much water is needed for each of the products?",* demonstrating some understanding of the topic. The pupils were asked to note down five things in the classroom that would require water to make. After lots of discussion the

pupils came to realise that almost everything requires water. The teacher next brought up a slide on water saving actions. The pupils had already thought about some more ideas and when the teacher mentioned that a friend does not always flush the toilet after use, a pupil suggested "*Why doesn't she just get one of those things when you get a small flush and a big flush?"*. This demonstrated engagement with the topic and some appreciation of alternative ways to conserve water which may not involve perceived sacrifices in hygiene. For the final task, pupils guessed how much water is used to make different items displayed in the PowerPoint presentation. The children were enthused and excited, asking, for example, why a burger requires so much water to make. The class teacher and pupils chose to return to the topic of virtual water after the end of the sessions to create posters (Appendix G) which could prove their enjoyment of the topic.

Summary discussion

I held a brief review conversation with the teacher who had enjoyed learning about water issues and found the content interesting, but would need to create more teaching resources before teaching the topic again as the pupils spent lot of time note taking from the board. Despite this, the teacher felt the pupils had coped very well. Support for non-specialist teachers, particularly in answering questions from inquisitive pupils, is something to bear in mind when designing water literacy resources.

7.2.3 Chalksmere College

Observing the lessons

At Chalksmere College, the water lessons had already been devised by the class teacher in accordance with the Edexcel A-level geography specification. The lesson structure consisted of detailed plans with

learning objectives, teaching activities, a student class activity and independent work or homework for each of the eight lessons (Table 7.2).

Table 7.2 Summary of Year 12-13 water unit at Chalksmere College

Weeks 1 and 2	The geography of water supply	Reviewing the hydrological cycle
		Mismatch between supply and demand
		Effect of human activities on water availability and access to water
		Water supply and demand balance: A selection of case studies e.g. Three Gorges Dam, China; Colorado River and Last Vegas, USA
Weeks 3 and 4	The risks of water insecurity	Case studies of water supply and transboundary issues: Aral Sea and Middle East
Week 5	Water conflicts and the future	Trends in global water demand; players and their roles including NGOs (case study on Sudan or Ghana)
Weeks 6 and 7	Solutions	Water conservation, harvesting, restoration, and large-scale technological fixes (with various case studies

In a number of the research lessons, students looked up information independently using suggested sources and filled in a case study revision sheet (Figure 7.7).

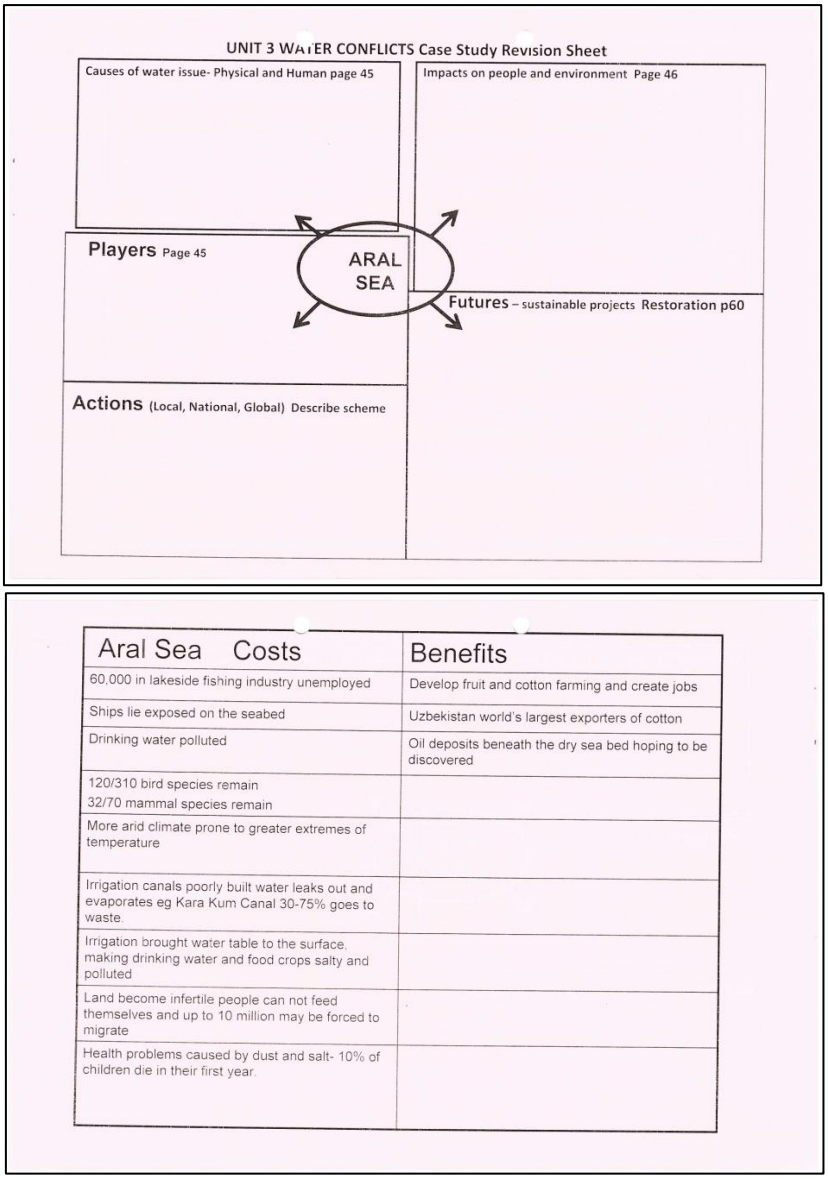


Figure 7.7 Front and back of an example case study revision sheet

I chose two lessons to observe which were most relevant to education for water literacy for the purposes of this research. The first was a 'taught' lesson (as opposed to a 'research' lesson) on the Colorado River and Las Vegas as case studies of water supply and demand. Students seemed generally very engaged, perhaps because this was the start of their A2 course. The teacher was also enthusiastic, asking them questions and answering student questions in detail. There were multiple references to popular culture and film clips were shown such as a short history of the siting of Las Vegas, and a BBC Learning Zone

‘Class Clip’ named *Water in the desert: Las Vegas*. The students filled in a case study revision sheet and annotated other sheets.

The second lesson I observed was a research lesson about water conservation and desalination (the penultimate lesson of the topic). In the previous taught lesson the students had watched a DVD which detailed potential methods of ensuring water resources in the future. Students were to research these options further using their laptops and fill in a sheet of the positive and negative aspects of each technique. I walked around the class to chat to students about the task, which revealed some opinions but many students were quite passively doing the work.

Interestingly, in the second focus group, the (two) present participants agreed that because the lessons did not focus on water in the UK, they could not apply many of the examples to themselves: *“I don’t think many people would think ‘oh we could do that here as well’” [Chalksmere College/Y12].* One survey respondent added *“We more focused on the unsustainable water than people who are positively using it” [Chalksmere College/Y12]*, which is an interesting note on how we could perhaps better engage young people through positive examples of behaviour.

Summary discussion

The students I observed at Chalksmere College were generally quiet, studious and academically able. They (as well as the teacher and the lessons) were strongly focused on the upcoming examinations, which was reflected in some of the responses to the questionnaire and focus group. There was little discussion for me to listen in on in the classroom, unlike at Alfon School.

7.2.4 Cross-school comparisons

The classroom experiences were each quite different: there was a particular contrast between the student-led, discussion-based lessons at Alfon School, and the examination and case study focused lessons at Chalksmere College. Of course this reflects the very different purposes of geography lessons in Year 7 and Year 12. Didactic teaching is not as necessary at Key Stage 3 as there was not as much specific content that needed to be covered, and therefore the lesson topics could stem from my research interests rather than an examination specification. Moreover, the Year 7 students were the most inquisitive, asking lots of questions which led to students and teacher often learning together, as the class teacher was not a geography (or water) specialist. However, this may have slightly diminished the value of the concepts learned and it is important to consider a need for professional teacher development alongside the production of pupil teaching resources.

Didactic teaching is likely to make a return as the current Secretary of State for Education, Michael Gove, in September 2013 argued for teachers actively passing on their knowledge, particularly in subject areas where pupils are unlikely to discover knowledge on their own (Gove, 2013). This could put more pressure on non-specialist teachers who could have less opportunity to engage with sources of professional development like the Geographical Association, and also contemporary developments in the discipline, after leaving teacher training. A 2011 report by Ofsted analysing geography teaching in 90 English secondary schools found for half of the schools, Key Stage 3 teaching was poorer than that in Key Stage 4 examination classes. This is attributed to the proportion of teachers who were non-specialists or lacked experience (Ofsted, 2011). Where non-specialists were teaching geography, the report described a reliance on textbooks and a lack of accurate assessment of pupil comprehension (ibid.).

At Chalksmere College, the teacher was experienced and as a sixth form teacher, very used to teaching examination-driven lessons. These were all meticulously planned and focused on building up case studies with resources and facts for examination purposes. However, this did mean the students were also highly grades and targets focused, and it was difficult to shift them away from participating in ways that they thought might hinder their attainment in examinations.

To return to the chapter research question, the discussion so far has highlighted that interesting, engaging classroom activities, along with an enthusiastic teacher, seem to be fairly effective in inspiring younger secondary school pupils and helping them to better their understanding of new and potentially challenging ideas (bearing in mind the constraints of school education at different stages, such as leading up to an examination). This is likely to have brought water to the forefront of students' minds as a subject of discussion, made water use in their lives more visible, and perhaps had knock-on effects of increased capacity and willingness to change their own behaviour. This in particular will be discussed in the next sections.

For the following sections, I compare responses to statements and questions before and after water lessons, by school. The data has been paired (each student's before and after response: Table 7.3) and so the dataset is smaller than that which was analysed before water lessons in Chapter 5, but pairing the data increases the chance that the exact same students have been consulted at each time period. This means the results are more representative of actual knowledge, attitude and perceived behaviour change than if every survey collected had been analysed. The non-parametric alternative to paired t-tests, Wilcoxon Signed Ranks test, is used as much of the data was not normally distributed when it was viewed in histogram format.

Table 7.3 Data set used for Chapter 7 analysis

School	Number of paired sets (before and after water lessons)
Alfon School (Y7)	19
Braveley School (Y9)	40
Chalksmere College (Y12)	34

7.3 Discussion

7.3.1 Conceptual understanding and learning

One direct measure of conceptual understanding was used in the survey (question: “How much water does the average person in the UK use each day?”). Table 7.4 shows the mode response and percentage of correct answers in the first and second questionnaire. Only Alfon and Braveley Schools are considered here, as I did not design the lessons for Chalksmere College, and therefore I cannot be sure they learned this information in their lessons.

At both Alfon and Braveley Schools, the mode response shifted to the correct answer after water lessons (Table 7.4). A significant difference in responses can be seen at Alfon School, with almost 73.7% of pupils responding correctly in the second questionnaire ($p=0.007$), which is a positive result.

Table 7.4 Comparing responses to the question "How much water does the average person in the UK use each day?" between the first and second questionnaire (paired data)

	First questionnaire (before water lessons)		Second questionnaire (after water lessons)		Related-Samples Wilcoxon Signed Rank Test results (p-value)
	Mode response	Percentage answering correctly (150 litres)	Mode response	Percentage answering correctly (150 litres)	
Alfon School (Y7) (n=19)	20 litres	26.3	150 litres	73.7	0.007*
Braveley School (Y9) (n=40)	100 litres	15.0	150 litres	42.5	0.579

Because other specific pieces of knowledge or facts were not 'planted' in the water lessons, it was difficult to test changes in conceptual understanding beyond average daily water use in the UK. I also did not wish to encourage 'parroting' back of nuggets of information in the lessons or the focus groups, which I noted some examples of in the first Braveley School focus group session. I did not feel this would signify water literacy and instead wanted to encourage greater depth of thought about water-related issues.

Some of the young people did express how they felt more knowledgeable about water. Even more encouragingly, one Chalksmere College student expressed in their questionnaire how they were already acting in a water conserving manner but now better understood the positive consequences of this:

"I became more aware of how important it is to save water. I always brush my teeth with the tap off, but I understood how important this is and how it potentially could cause issues in other countries if I was too wasteful with water" [Chalksmere College/Y12]

A handful of Year 7 students also expressed that it would now be easy for them to change their behaviour because they knew how much they were using and therefore could reduce it. Of course it is difficult to test the extent to which this positive attitude would be applied to action, but it is a positive outcome.

7.3.2 Opportunities arising for water citizenship and potential behaviour change

Three interesting themes were noted in opinion changes amongst the pupils after the water lessons: power and efficacy, the perceived influence and support of others, and responsibility to act. These are all prospective indicators of water citizenship development, which has potential in the future to extend to changes in behaviour towards more sustainable water usage.

Power and efficacy

Perceived control over water use behaviour at home (responses to the statement “It would be easy for me to save water at home if I decided to”) decreased marginally at Alfon School after the water lessons. Little change could be seen at the other two schools and no significant difference occurred at any of the schools after water education (Table 7.5). Uncertainty increases amongst the youngest and oldest students. This could be for a number of reasons: the global focus of the lessons may reduce feelings of personal efficacy, for instance, or it may be that the education programmes highlighted previously unconscious water

uses around the home that a young person does not feel the ability to change:

"Because my family doesn't go out of their way to save water so my input would make no difference" [Chalksmere College/Y12]

"I'm not quite sure what I can do that's within my control" [Braveley School/Y9]

In terms of family influence over water behaviour (responses to the statement “The way my family behaves towards water affects how I behave”), Alfon School students remained unsure after the water lessons, while Chalksmere College students agreed significantly more with the statement after the lessons (Table 7.6; p=0.010). It may be the case that both these cohorts of students thought they were in control of their water consumption (perhaps considering themselves adults, as many of the Year 12 students did when responding about the number of adults and children in their household), but being encouraged to think about it as they go about their daily lives revealed to them a lack of personal control. This is one of the arguments for smart metering feedback systems, capturing real time consumption data and communicating it to the user, and also potentially demonstrating who is using water in the household, when and where.

Table 7.5 Comparing responses to statements relating to power and efficacy between the first and second questionnaire (paired data)

	Alfon School (Y7)		**Braveley School (Y9)**		**Chalksmere College (Y12)**	
It would be easy for me to save water at home if I decided to	*Before (%)*	*After (%)*	*Before (%)*	*After (%)*	*Before (%)*	*After (%)*
Strongly Agree	26.3	15.8	25.0	17.5	5.9	8.8
Agree	36.8	26.3	47.5	52.5	64.7	50.0
Don't know/ Neither	21.1	31.6	17.5	15.0	11.8	23.5
Disagree	5.3	21.1	10.0	10.0	17.7	17.7
Strongly Disagree	10.5	5.3	0.0	2.5	0.0	0.0
No answer	0.0	0.0	0.0	2.5	0.0	0.0
Mode response	Agree	Don't know/ Neither	Agree	Agree	Agree	Agree
The way my family behaves towards water affects how I behave	*Before (%)*	*After (%)*	*Before (%)*	*After (%)*	*Before (%)*	*After (%)*
Strongly Agree	0.0	15.8	7.5	12.5	3.0	11.8
Agree	15.8	15.8	27.5	40.0	50.0	58.8
Don't know/ Neither	52.6	36.8	27.5	17.5	23.5	23.5
Disagree	10.5	10.5	32.5	20.0	23.5	5.9
Strongly Disagree	21.1	21.1	5.0	7.5	0.0	0.0
No answer	0.0	0.0	0.0	2.5	0.0	0.0
Mode response	Don't know/ Neither	Don't know/ Neither	Disagree	Agree	Agree	Agree

Table 7.6 Related-samples Wilcoxon Signed Rank Test results (p-values) calculated in SPSS

	Alfon School (Y7)	Braveley School (Y9)	Chalksmere College (Y12)
It would be easy for me to save water at home if I decided to	0.371	0.442	0.687
The way my family behaves towards water affects how I behave	0.253	0.152	0.010*

As described in section 6.2.4, some Braveley and Alfon School students reflected on the lack of influence they have on household water use and decisions, and therefore their inability to make changes, with one pupil saying *"I think if you are brought up by parents who waste water then you will" [Braveley School/Y9].* Another pupil also expressed this through sarcasm: *"'Cause you put the hose on all the time don't ya" [Alfon School/Y7].*

However in itself, the fact that a proportion of the participants were going home and talking to their parents about what they had learned is a very positive result, even if they did not perceive that they were having an impact on family decisions.

Support of family and peers

The previous section talked about the perceived influence of the family over actions, but this section moves on to the perceived support of the family for water conserving behaviours (statement “If I tried to reduce my water usage, my family would”).

The most positive picture comes from Braveley School with a slight increase in those saying their parents would strongly approve of their

water conserving behaviour. Perception that the family wouldn't care is highest at Alfon School and has increased since the first questionnaire, while there is little change at Chalksmere College. None of the changes are statistically significant, however. Socio-economic circumstances add a layer of complexity here: while in some parts of the world, people from less wealthy backgrounds may give more thought to their water consumption, it may be the case in the UK that people from poorer backgrounds have other concerns, particularly if they are not charged volumetrically for their water use. It may be that this is illustrated by the quotes below about family attitudes, from a pupil at Alfon School (where the number of pupils entitled to free school meals is well above the national average), contrasting with a pupil from Braveley School (where free meal provision is lower than average):

"My family doesn't listen…they'd just say 'stop being random and shut up'" [Alfon School/Y7]

"I think they support [what] I was doing more than I originally thought" [Braveley School/Y9]

In terms of presumed approval from friends of water conserving behaviour, the percentage of students perceiving strong approval increases at Alfon School but perception of indifference does too, with almost 70% of students saying their friends would not care if they tried to save water (Table 7.7). The picture is better at Braveley School, with 20% of students moving over from "not care" to "approve". However at Chalksmere College, 20% of pupils newly decided their friends would disapprove or strongly disapprove of them saving water, and this negative shift in perceptions at Chalksmere College was shown to be a statistically significant change (Table 7.8; p=0.011).

While I have noted that some of the young people were quite keen to give what they perceived to be the 'right' answers in the focus groups (socially desirable responding), this was rarer in response to the question "Did you discuss any of the things you learned, outside the

classroom with friends or family members?" which I asked in the follow-up focus groups. The Year 12 students in particular barely spoke to their families, and few of the focus group participants (all groups) said that they talked to friends about the water topics outside of the classroom, which would explain why opinions on this statement changed very little. However, it may well be the case that pupils could not remember speaking to parents about what they learned but in fact had done so, or simply did not wish to admit to doing so.

There is no obvious explanation for the negative shift in perceptions of peer approval at Chalksmere College, particularly as when asked in the survey the students tended to think their opinions on this statement had not changed since the first questionnaire. Other researchers have warned that this type of incidence can happen when no strong opinion is actually held, but a survey respondent feels they should have one (e.g. Bertrand and Mullainathan, 2001), although providing the option "Don't know/neither agree nor disagree" should help to reduce the chances of this happening (Converse, 1976). Another possibility is that that a proportion of the Chalksmere College students have realised how essential water is to hygiene practices, having clean hair and bodies, and wearing freshly washed clothes, and therefore they have realised that reducing the frequency of washing and laundry practices is not something their friends would approve of. Gram-Hanssen (2005, 2007) highlights the sensitivity of young people's water and technology consumption behaviours to their peers' attitudes and actions.

Table 7.7 Comparing responses to statements relating to support of family and peers between the first and second questionnaire (paired data)

	Alfon School (Y7)		**Braveley School (Y9)**		**Chalksmere College (Y12)**	
If I tried to reduce my water usage, my friends would…	*Before (%)*	*After (%)*	*Before (%)*	*After (%)*	*Before (%)*	*After (%)*
Strongly Approve	0.0	10.5	5.0	5.0	0.0	0.0
Approve	36.8	15.8	10.0	30.0	23.5	14.7
Not care/Neither	52.6	68.4	80.0	60.0	76.5	64.7
Disapprove	5.3	0.0	5.0	5.0	0.0	14.7
Strongly Disapprove	0.0	5.3	0.0	0.0	0.0	5.9
No answer	5.3	0.0	0.0	0.0	0.0	0.0
Mode response	Not care/ neither	Not care/ neither	Not care/ neither	Not care/ neither	Not care/ neither	Not care/ neither
	Alfon School (Y7)		**Braveley School (Y9)**		**Chalksmere College (Y12)**	
If I tried to reduce my water usage, my family would…	*Before (%)*	*After (%)*	*Before (%)*	*After (%)*	*Before (%)*	*After (%)*
Strongly Approve	15.8	15.8	17.5	35.0	14.7	5.9
Approve	47.4	31.6	70.0	42.5	44.1	58.8
Not care/Neither	26.3	52.6	12.5	22.5	41.2	35.3
Disapprove	5.3	0.0	0.0	0.0	0.0	0.0
Strongly Disapprove	0.0	0.0	0.0	0.0	0.0	0.0
No answer	5.3	0.0	0.0	0.0	0.0	0.0
Mode response	Approve	Not care/ neither	Approve	Approve	Approve	Approve

Table 7.8 Related-Samples Wilcoxon Signed Rank Test results (significance values) calculated in SPSS

	Alfon School (Y7)	Braveley School (Y9)	Chalksmere College (Y12)
If I tried to reduce my water usage, my friends would…	0.803	0.073	0.011*
If I tried to reduce my water usage, my family would…	0.564	0.513	0.813

Responsibility to act

In terms of feeling a common responsibility towards water conservation for future generations (statement: "It is everyone's responsibility to ensure there is enough water for future generations"), responses from Alfon and Braveley Schools showed a slight positive change and Chalksmere College a slight negative shift, though no statistically significant change was noted (Table 7.9).

A further question was added for the questionnaires to Alfon School and Chalksmere College: "I feel personally responsible for making sure there is enough water for future generations". Both schools showed a shift from "Disagree" to "Agree" as the mode response, and at Alfon School this change was statistically significant (Table 7.10; p=0.005). This is a promising result, though of course again the potential for socially desirable responding must be borne in mind. If it is a true reflection of the young people's sense of personal responsibility, it could be a step towards more water efficient behaviour. This is the opposite to what Kellstedt et al. (2008) found in their survey to American people about climate change. The researchers determined that the more informed individuals felt a lower sense of responsibility. They note that this is self-reported informedness, so it could be the

case that those who thought they were ill-informed actually knew more (the idea of ‘known unknowns’) than those who considered themselves informed. The present PhD research is different in that all the students surveyed had participated in a known amount of educational activity specifically aimed at enhancing their water literacy.

Table 7.9 Comparing responses to statements relating to responsibility to act between the first and second questionnaire (paired data)

	Alfon School (Y7)		**Braveley School (Y9)**		**Chalksmere College (Y12)**	
It is everyone's responsibility to ensure there is enough water for future generations	*Before (%)*	*After (%)*	*Before (%)*	*After (%)*	*Before (%)*	*After (%)*
Strongly Agree	26.3	42.1	42.5	55.0	44.1	32.4
Agree	42.1	21.1	40.0	32.5	50.0	61.8
Don't know/Neither	26.3	31.6	12.5	7.5	5.9	2.9
Disagree	0.0	5.3	5.0	5.0	0.0	0.0
Strongly Disagree	0.0	0.0	0.0	0.0	0.0	0.0
No answer	5.3	0.0	0.0	0.0	0.0	3.0
Mode response	Agree	Strongly agree	Strongly agree	Strongly agree	Agree	Agree
	Alfon School (Y7)		**Braveley School (Y9)**		**Chalksmere College (Y12)**	
I feel personally responsible for making sure there is enough water for future generations	*Before (%)*	*After (%)*	*Before (%)*	*After (%)*	*Before (%)*	*After (%)*
Strongly Agree	5.3	5.3	N/A	N/A	11.8	2.9
Agree	5.3	52.6	N/A	N/A	17.7	44.1
Don't know/Neither	36.8	36.8	N/A	N/A	29.4	23.5
Disagree	47.4	5.3	N/A	N/A	41.2	23.5
Strongly Disagree	5.3	0.0	N/A	N/A	0.0	5.9
No answer	0.0	0.0	N/A	N/A	0.0	0.0
Mode response	Disagree	Agree	N/A	N/A	Disagree	Agree

Table 7.10 Related-Samples Wilcoxon Signed Rank Test results (p-values) calculated in SPSS

	Alfon School (Y7)	Braveley School (Y9)	Chalksmere College (Y12)
It is everyone's responsibility to ensure there is enough water for future generations	1.000	0.287	0.593
I feel personally responsible for making sure there is enough water for future generations	0.005*	N/A	0.359

Kollmuss and Agyeman (2002) state that an individual's sense of responsibility depends on their locus of control, and therefore whether they feel their own personal actions would make a difference. As mentioned earlier, the young people tended to not feel there was much they personally could do to reduce water consumption, and so this would explain the modest perceptions of personal responsibility.

Indeed, one of the Chalksmere College focus group participants felt it was more the responsibility of industry to make large reductions in water consumption:

"I think it'd be easier to cut down the water the more you use, 'cause I don't think my family really use…like waste water and so cutting it down by that much, I don't know if we'd be able to do it because there wouldn't really be that much water to like...but if erm...I think if like big industries that are wasting loads of water and things like that, I think they'd be able to do it, 'cause they just...change little things and it'll make a big difference" [Chalksmere College/Y12]

On the other hand, Babcock (2009) sees this as a symptom of cognitive dissonance, where a lack of personal action in accordance with personal values is blamed on a broader situation or the lack of perceived effort by governments, companies, or society more generally.

It is encouraging that Alfon School students displayed a higher sense of personal responsibility towards ensuring the availability of water resources for future generations (and were also more likely to agree that this is everyone's responsibility, though this result was not statistically significant). Responsibility did not change significantly at Braveley or Chalksmere, however. This difference between the schools could be due to pupils learning about international case studies at Braveley and Chalksmere, and indeed this was alluded to in some of the questionnaire responses from Chalksmere College students about their lessons:

"I didn't feel I could apply any of it to myself" [Chalksmere College/Y12]

"We learned more about other types of water use, other than in the home" [Chalksmere College/Y12]

7.3.3 Perceptions of opinion change

An interesting additional finding relates to the young people's perceptions of whether their attitudes had changed or not. Participants were asked in the second questionnaire whether their opinions on the statements had changed since they filled in the first survey, and if so, why. When matched up with their previous questionnaire, it could be seen whether they were right in thinking their viewpoint had or had not changed. Across the board, pupils rarely perceived that their attitude had changed but in many cases it had. In fact for no statement or school did pupils accurately recognise their own opinion change (Table 7.11). The biggest discrepancy, and the also largest degree of opinion change, was in terms of perception of ability to save water at home, where the majority of students had changed their opinion but did not

realise that they had. Unfortunately, as noted earlier in this chapter, that this was dominated by a decrease in perceived ability to reduce water consumption after the water lessons.

As mentioned earlier, Bertrand and Mullainathan (2001) state that often people feel they 'should' have an attitude on a topic because they are being surveyed about it, and this can lead to different answers in a follow-up survey despite people thinking their opinions have not changed. People also may not know what their attitudes are, but a first questionnaire causes them to actively think about it. The same could be the case for behaviours, which are discussed in the next section.

Table 7.11 Young people's perceptions of whether their opinions had changed, and percentage that had actually changed (by school)

	Alfon School (Y7)		**Braveley School (Y9)**		**Chalksmere College (Y12)**	
	Think changed? (%)	*Actually changed? (%)*	*Think changed? (%)*	*Actually changed? (%)*	*Think changed? (%)*	*Actually changed? (%)*
It would be easy for me to save water at home if I decided to	15.8	79.0	15.0	72.5	5.9	53.0
It is everyone's responsibility to ensure there is enough water for future generations	15.8	68.4	15.0	55.0	5.9	32.4
If I tried to reduce my water usage my family would…[rating from strongly approve to strongly disapprove]	10.5	52.6	7.5	45.0	0.0	32.4
If I tried to reduce my water usage my friends would…[rating from strong approve to strongly disapprove]	10.5	47.4	7.5	37.5	2.9	38.2

7.3.4 Making water more visible in everyday actions

Pupils at Alfon and Chalksmere were asked “Did the lessons change the way you use water?”. 48.0% at Alfon School responded yes, and 52.0% responded no. At Chalksmere College, 33.3% responded yes and 66.7% responded no. This shows a relatively positive response to the water education lessons for the younger pupils but less so for the older pupils. Clearly it cannot be expected that a set of lessons on water issues will have a profound and sustained effect on behaviours, and even if this is the case, the only way to accurately measure this would be through in-house monitoring. However, this result is a moderately positive indication for future actions.

The pupils were also asked the reason for their answer: amongst the Year 7 pupils, those who said they had changed their behaviour generally said they tried to use less, with a couple citing lack of availability of clean water in other countries as their reason for changing behaviour. Those who said no predominantly fell into two camps: those who felt they were already trying to save water, and those who argued they needed to use the amount that they do. One student said no *“because we learnt that water all ways comes back” [Alfon School/Y7]*, which reinforces the need for careful teaching of the hydrological and water treatment cycles. A much greater range of responses was given by the Chalksmere College students, and there are detailed in Table 7.12. It should be noted that I have categorised the responses by “theme” (using the wording of students wherever possible) and so the grouping of responses does bear my own influence.

Table 7.12 Spread of responses from Chalksmere College (Year 12) students to the questions "Did the lessons change the way you use water?" and "Why?"

Yes (n=14)		No (n=28)	
Theme of reason	**Number citing this reason**	**Theme of reason**	**Number citing this reason**
More aware of limits/importance of saving water	4	Don't use much water anyway	4
More knowledge now (practical)	3	Already save water/know about saving water	3
More knowledge now (theoretical)	2	Difficulty of habit change/in the habit of using lots of water	3
Enjoyed learning about a possible future	1	Learned more about water use outside the home	2
Feelings of guilt	1	Case studies were out of date	1
Made to think about the consequences	1	No urgent need to save water in this area	1
Realised water is valuable resource	1	Can't be bothered/forget to act	1
Made more conscious of water use/waste	1	Couldn't apply learning to self	1
		More drastic action should be taken (i.e. not domestic water conservation)	1
		Family doesn't save water so individual input would make no difference	1
		No reason given	10

Looking at Table 7.12, In terms of those who responded positively, knowledge could be seen as the key driver of more sustainable water use, specifically in terms of the limits to water or importance of saving it, and theoretical knowledge (the “why” to act). Second to this was knowledge of “how” to act. Other reasons mentioned related to an increased consciousness of use, waste and consequences of waste.

On the other hand, those who said the programme did not change their behaviours principally related this not to what they learned, but because they either already save water or use a minimal amount. This shows similarities to the reasons given by the Alfon School students. For around half of the “No” contingent from Chalksmere College, we can note an opportunity for more targeted water education which is relevant to young people and that they can individually apply to their own behaviour, whilst recognising the impact they personally can make.

Likewise at Chalksmere College, pupils were asked how often they perform particular behaviours relating to water, both in the first and the second questionnaire. Table 7.13 provides an overview of the differences between before and after the water lessons for three behaviours, with trends made more visible in Figures 7.8- 7.9.

Table 7.13 Overview of differences in responses between the first and second questionnaire to statements relating to specific water actions (Chalksmere College only; n=34)

	Before (%)							After (%)						
	Very often	Often	Occasionally	Rarely	Very rarely	No answer	Mode	Very often	Often	Occasionally	Rarely	Very rarely	No answer	Mode
While I am waiting for the water from the tap to run hot, I collect the cold water and re-use it	2.9	0.0	2.9	11.8	82.4	0.0	Very rarely	0.0	0.0	5.9	8.8	85.3	0.0	Very rarely
I [turn off] the tap running when I brush my teeth [statement reversed for clarity of arguments]	38.2	26.5	8.8	8.8	17.7	0.0	Very often	50.0	23.5	8.8	5.9	11.8	0.0	Very often
I put the plug in the sink when I wash my face	29.4	23.5	8.8	14.7	23.5	0.0	Very often	29.4	17.7	8.8	11.8	32.4	0.0	Very rarely

The action of collecting cold water sees very little change between before and after the water education lessons. This may be partly because young people are less likely than adults to have practical uses for saved water such as washing vegetables or watering plants. Indeed, as one Braveley School student said as they filled in the first questionnaire*, "Why would anyone DO that?".* This question will not be explored further at this stage.

An increase in respondents saying they turn off the tap "very often" when they brush their teeth is a positive result (Figure 7.8). On the other hand, more pupils said they "very rarely" put the plug in the sink when they wash their face: enough so for this to become the mode response (Figure 7.9).

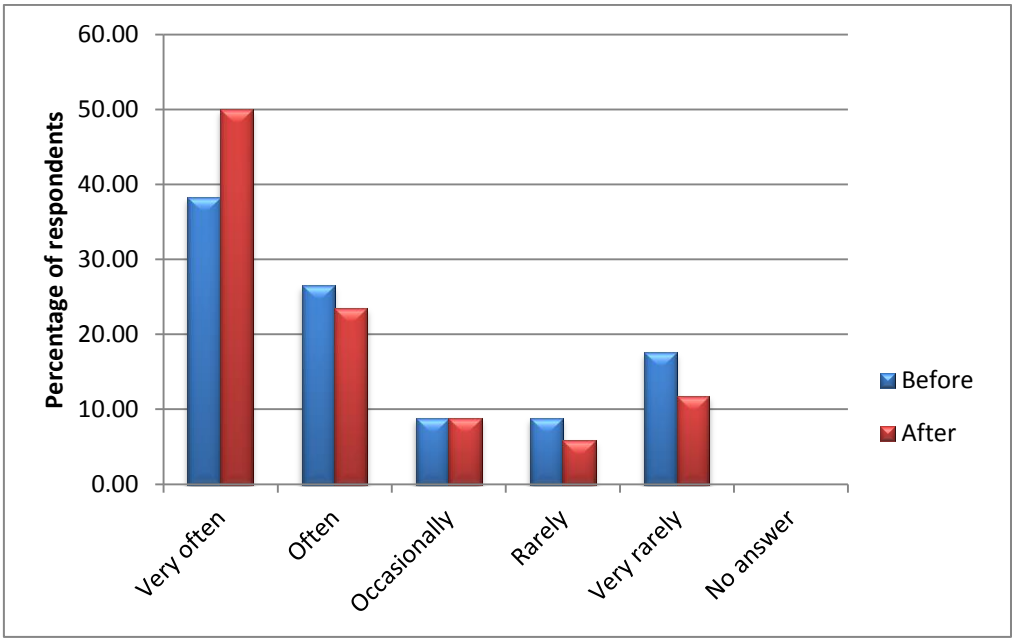


Figure 7.8 Chalksmere College responses to the statement "I [turn off] the tap when I brush my teeth" before and after the water lessons (paired data)

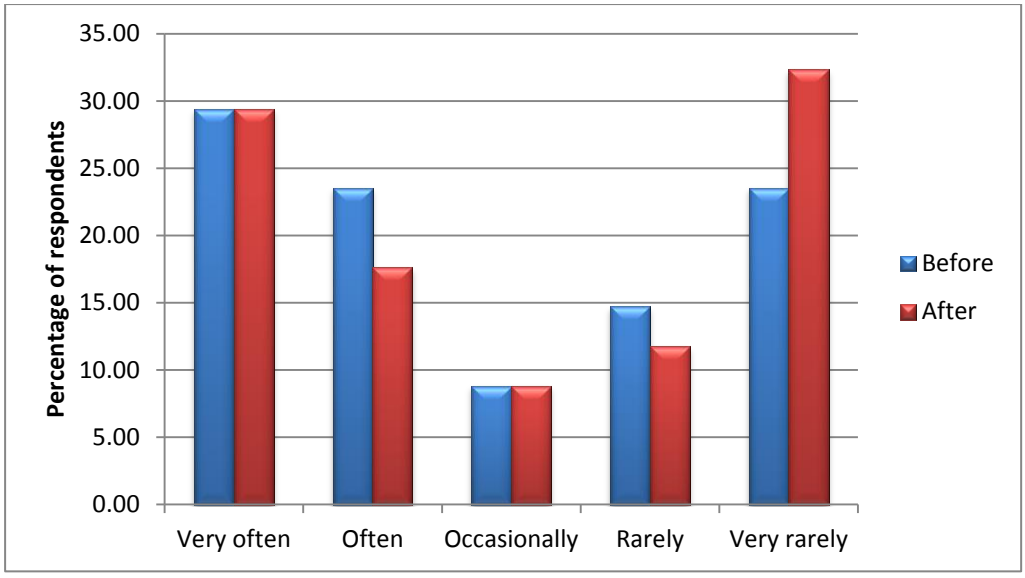


Figure 7.9 Chalksmere College responses to the statement "I put the plug in the sink when I wash my face" before and after the water lessons (paired data)

It is unlikely that that the water lessons have made them less likely to put the plug in the sink when they wash their face: instead, it is probably the case that the participants have become more aware of their behaviour, bringing otherwise subconscious behaviours into consciousness (through increasing the visibility of water use). It may mean in the future, when they could have greater motivation to save water, they will know what actions they could take. In fact, Table 7.14 shows that no statistically significant difference was found between these actions before and after water lessons.

It was not expected that such a short intervention would result in behavioural changes, and indeed self-reported responses to Likert statements referring to specific actions would certainly not be the best way of testing this (in-house monitoring or a diary study would be preferential). However, it was interesting to see if the water literacy initiatives had had any short-term impact on water-using behaviours.

Table 7.14 Related-Samples Wilcoxon Signed Rank Test results (significance values) calculated in SPSS

	Chalksmere College (Y12)
While I am waiting for the water from the tap to run hot, I collect the cold water and re-use it	0.774
I put the plug in the sink when I wash my face	0.478
I [turn off] the tap when I brush my teeth	0.075

7.3.5 Problems and barriers

There were a number of issues encountered in the data collection and analysis for this chapter which it is pertinent to consider alongside the results.

Differing characteristics of each age group

Student sampling was random for Chalksmere College as the whole geography year group was sampled and the students chose to fill in the questionnaire (however this in itself may have warranted more able students taking part). For Alfon and Braveley Schools, the classes I worked with were 'top set' geography as the teachers were allowed to select the classes themselves and the schools considered that these classes would gain the most from taking part in the research.

I found the Braveley School students (Year 9) to be confident, chatty and generally attentive during the focus group, but they did seem to be attempting to give the 'right' answers, occasionally quoting back figures from the questionnaire and being keen to agree with me. This was more the case in the second focus group as it is likely the pupils had figured out the purpose of my research and wanted to 'help' with this. Braveley School was the only school where the class teacher sat in on the focus group. While at the time I was happy for this to happen, and the teacher

rarely interacted in the session, it is likely to have influenced the responses of the students.

The Alfon School students (Year 7) took a while to engage in the focus group but seemed to enjoy themselves, particularly once they had started telling personal anecdotes. They were much less enthusiastic in the second focus group, which I would attribute chiefly to poor timing (9am on a Friday) but also possibly partly due to having studied water for five weeks and tiring of the topic.

Both the younger groups (Alfon and Braveley) were interested in hearing about how their friends use water, as it is likely this is not something that is often discussed. A chance to hear about their friends' hygiene habits may have been welcomed, but a school geography lesson is perhaps not the appropriate place for this.

On reflection, it may have been confusing for the Year 12 students to have a researcher come in to their A-level class and attempt to talk to them about attitudes and values towards water, when their motivation was to get on with their work and learn from the teacher. Compared to the other two groups, there was also much less chat between students in class, which provides further support for this idea.

Role of the materials and topics

The expected role of the teacher was to design the lessons (for Alfon and Braveley Schools, using resources I had provided), and tailor these to age group, abilities and specific requirements of their class, as this was something I did not have the experience to judge myself. The original plan in every school had to be managed and reduced down due to my own, the teacher's, and curriculum time constraints. The popularity of virtual water with both teachers and students showed this to be an engaging topic, which could also be tailored to a scheme of work (as the Braveley School teachers did along the theme of contemporary issues in Africa). From working out what the concept

actually means, through to applying it to rethink their everyday lives, both the Year 9 and Year 7 pupils showed excitement and surprise in the classroom in relation to the topic of virtual water. Interest is likely to have stemmed between this being such a new and unfamiliar topic, but the connections they were expected to make between themselves and distinct lives could have been challenging.

In hindsight, there was certainly a need for lessons to be academically rigorous, and discussions about how much water is used and where in the home is unlikely to meet this criteria. Non-specialist teachers need background knowledge to be able to turn resources (such as those I selected and provided) into lessons. The role of professional development for teachers became apparent through the research, so that those who are new to the topic would be able to use their judgement and knowledge to decide what should be taught in school lessons.

Role of the focus group and the researcher

As a 'special visitor', it is very likely that I will have had an influence on the way (particularly the younger) students engaged with the subject matter. As mentioned, the Year 9 focus group were particularly keen to 'please' me with what they perceived to be right answers. Whether or not they were being completely honest, it is likely that the focus group experience will have had an impact on their water values and behaviours, perhaps even more so than the one lesson they had on water issues. Once a topic becomes integrated into the curriculum and taught in a similar way to other themes, it becomes routine. There is potential in focus groups for co-production of knowledge to take place, but this may be more likely in research with adults who are bringing expertise from different walks of life.

Furthermore, there are numerous potential barriers to an effective water learning experience. Teachers are under a great deal of time pressure and as seen, may lack specific expertise in the topic to convince pupils

of its importance. Equally, even the most keen and enthusiastic teacher would struggle at A-level to talk to young people about things that will not be on their examination paper. It would have been good to spend longer in Braveley School, but being present for a shorter time than at the other schools adds an extra level of comparison in terms of whether enthusiasm might be greater for a 'one off' lesson topic than a series of lessons.

These various sensitivities operated to bound the discussion and it can therefore only go so far. Nonetheless, important findings were made and highlighted in this chapter.

7.4 Chapter conclusions and summary of findings

The aim of this chapter was to see what insights could be gained into the role of initiatives to develop young people as water literate citizens. The chapter centred on how education can make water use more visible in everyday actions, and where opportunities lie for encouraging water citizenship and potential behaviour change around developing power and self-efficacy, support from family and peers, and sense of responsibility to act.

Changes in conceptual development were not actively 'tested' apart from in the first question, which asked pupils how much water they thought the average person in the UK used each day. A significant difference in answers could be seen from the Alfon School participants, and a positive change towards more correct answers (150 litres became the mode response). Without testing the students, knowledge change was a difficult aspect to prove as many of the students expressed that they felt they knew much more about water and water issues after the lessons. Equally, clearly one multiple choice question is not enough to test the level of understanding a person has. Perhaps

what is more interesting is what the students have ‘done’ with this new-found knowledge. On the other hand, the Year 12 students who felt their water behaviours had changed tended to attribute this to having more knowledge after the water lessons.

I suggest that the Year 12 students, who perceived a greater influence of the family on their water use after the lessons, may have simply been more aware of how much of the household water use was carried out or mediated by their parents or guardians. If this is the case, I advise that this lack of control over actions needs to be addressed by tailored education materials, particular because sense of responsibility rose at Alfon School, where the lessons were more tailored to personal water use and the changes an individual young person could make. An important result was that some students, particularly in the Year 7 group, were going home and talking to their parents about water use in the household. As they are unlikely to have a high level of control over water consumption at home, this is a very positive result. It is bringing water to the forefront of students’ minds, increasing citizenship and potentially opening the door to behaviour change. The element of surprise and the unexpected in the lessons, particularly shown in relation to virtual water, is also a key finding and presents an opportunity for making water literacy education engaging and interesting.

While behaviour change was not actively tested in this PhD research, uptake of specific unsustainable actions appear to change very little. The slight increase in those turning off the tap when they brush their teeth may be due to those who previously didn’t engage in this behaviour realising that it has actually become a norm. There was a strong contingent who said that their water use had decreased as a result of the process. The younger pupils (Y7 and Y9) were keen to volunteer ways in which they had done this, but the older students were

less so, and indeed a smaller percentage of the Y12 students said that their behaviour had changed after the water lessons.

What is a more important result than evidence of behaviour change is that water has become more visible and the subject of discussion, and that young people have been encouraged to reflect on their consumption. Recognising capacity and having willingness to change their own behaviour to more sustainable actions suggests water citizenship, and potential for future behaviour change.

Chapter 8: Conclusions and Implications

8.1 Introduction

This chapter summarises the findings of the analytical chapters and the contributions this research makes to the sustainable water management field, bearing in mind the research aim and questions set out in Section 1.3.1. I highlight the key practical insights made and from these, offer some recommendations for how the results can inform future water education strategies and resources for schools, charities and organisations. I acknowledge remaining research gaps and limitations to the thesis, and end by emphasising the potential for innovative water literacy programmes to change unsustainable attitudes and behaviours.

I began this thesis by highlighting a gap in the literature in terms of linking the sociology of ordinary consumption and practice theory with research around environmental education, which traditionally relies on active consumption of water. An impasse was identified between the social practice and rational actor models. I proposed education for water literacy as a possible way of connecting the two bodies of work to forge a way forward in encouraging more sustainable norms of water use and active thought about habits and routines in the home, and so developing a sense of responsibility and water citizenship. I also emphasised the dearth of work around children's domestic resource use and, in particular, the water values, attitudes and behaviours of teenagers living in the UK.

My aim, therefore, was:

to explore the impact of initiatives for water literacy on the water citizenship of young people, specifically secondary school students.

Data collection consisted of two main elements: an analysis of water education resources and teaching in the East Midlands region, and a school-based study of young people's water literacy before and after lessons on water. The first element involved collection of resources (relating to water efficiency, cleanliness, availability, use and other key terms) accessible to students or teachers, and for which the target audience was 11-18 year olds living in the UK. Around 50 resources from 13 providers were coded in a content analysis process to determine the main topics around water and the pedagogical strategies employed. This was supplemented with a thematic analysis of Edexcel examination specifications and a questionnaire to geography teachers employed by secondary schools in the East Midlands. The second element was a school-based study of three year groups at three different schools, surveying students from one to five classes at each, and carrying out a focus group with between five and seven pupils. Lessons on water literacy were observed (and for two of the schools, I helped to design the lessons), and a follow-up questionnaire and focus group was held after each of the education programmes.

In this chapter I make two overall connected conclusions to the thesis. Firstly, I argue that a way to encourage water citizenship amongst young people is by making water use more 'visible', primarily by bringing it to the forefront of conversations. By working to increase the conspicuousness of water, people should become more able to act according to their values. Secondly, I argue that by making connections between water use at household, local, national and global scales, water literacy initiatives can enable young people to understand the ways in which water operates as a global resource.

In the next section I summarise the main chapter findings and the contributions this thesis makes to the gap identified in the research field, dealing with each of the research questions in turn. This is followed by the overall conclusions to the thesis, and the benefits and limitations of the research. Lastly, I focus on the implications of the research for practice, and a suggested agenda for future research.

8.2 Chapter findings and contributions

8.2.1 Locating and summarising a gap in the literature

I began by summarising the main arguments being made in four bodies of literature, with particular focuses on: models of understanding water use (rational actor model, social practices model and water citizenship); the role of soft measures for demand management in the absence of metering; and the use of pedagogical strategies for environmental literacy.

This highlighted a need for education programmes capable of accounting for the inconspicuous consumption of water in the household, tying in with geography curricula and building environmental citizenship, bearing in mind the abilities and existing responsibilities of young people.

8.2.2 Framing water literacy in education materials

The research question *'How, and how well, do education materials currently encountered by young people in the East Midlands work with respect to making water use visible?'* was addressed in Chapter 4 by considering the presence of water in education resources for secondary

school-aged children, with a focus on non-formal providers such as Severn Trent Water, Action Aid and the Geographical Association. It was noted that education resources help to make water use more visible by encouraging conversation about water and bringing it to the forefront of learners' minds. However, since many education materials focus on international examples, a need could be identified for a constructivist approach to teaching, connecting new material to what pupils are already familiar with.

The main argument in Chapter 4 was for the use of nested and connected scales in water education materials to develop a sense of responsibility towards water used in different localities. I suggested that working across a range of scales from the personal to the global (including local and national scales), and drawing connections between these scales, is likely to increase young people's sense of responsibility and citizenship towards water conservation. I noted the absence of attention to 'the local' as a scale in existing water education materials, which misses the opportunity to help people feel a greater sense of personal connection to their area. I also drew attention to the 'missing scales' which could help to clarify links between personal water use and the global problem of water scarcity. The existence of local or regionally focused non-formal water education resources would help to improve this situation, and could act as sources of information for parents and non-specialist teachers as well.

Focus on the local/regional and national scales is vital in order to make issues personally relevant and increase an individual's sense of responsibility. Where materials fail to make issues personally relevant, for example through discussing personal water use, virtual water or tourism, there is a risk that personal efficacy will decrease and apathy will take hold. It emerged in later chapters that the young people I spoke to did not feel they had a great deal of control over their water consumption and many felt little personal responsibility to act. This means that education materials need not only to pay attention to the agency and responsibility of young people, but also to strive to increase

this where necessary. The commonly utilised ‘water saving tips’ tend to link to small actions, as argued by Crompton and Thøgerson (2009), failing to provide background information on *why* an individual should act, and *what* the wider impact of changes in their personal behaviours and actions would be.

In addition, Chapter 4 argued for the importance of a futures dimension to education materials in order to encourage a sense of intergenerational citizenship (Hicks, 2008, Dobson, 2007), but noted difficulties in maintaining care over long distances and timescales, as was previously identified by Barnett and Land (2007).

8.2.3 Understanding young people’s water literacy and everyday behaviours

The research question ‘*What is the current state of water literacy amongst young people in the East Midlands?’* was addressed in Chapter 5. In that chapter I showed that young people’s knowledge about water was largely centred on a few ‘water saving tips’.

The main theme in Chapter 5 was determining the understanding and conceptions young people have about their own water use and resources more generally. I argued that it seemed that young people do not feel a great deal of responsibility to act and give little thought to their water use as a result, which reflects the body of literature on the sociology of ordinary consumption (Shove and Warde, 1998, Gram-Hanssen, 2005). I noted feelings of personal inefficacy amongst many of the students, reflecting the results of previous studies in revealing young people’s feelings of disempowerment. However, feelings of personal inefficacy are likely to stem not only from the scale of the issue (resulting in Connell et al.’s (1999: 101) “action paralysis”), but additionally from the smaller range of water-using activities that teenagers engage in inside the home, and therefore relate to the limited power young people have to change routines at home. This can also

connect to feelings of inefficacy resulting from the inaction of other family members, as suggested by Fielding et al. (2011) and Grønhøj (2006). A lack of responsibility could also relate not only to a value-action gap (Blake, 1999) but an underdevelopment of sustainable values towards water.

A key finding was that while many students described making a 'reasonable effort' towards water conservation, akin to 'doing their bit', a strong contingent outlined their special efforts to act sustainably, making clear that this is not yet something that has become normal behaviour. This is an important finding which suggests making water conservation the 'norm' could work for a proportion of students, but as others seemed to enjoy setting themselves apart from the norm, a strategy tailored to these pupils is also important. This finding also highlights the potential for efforts to make water use visible to have a real impact.

Water emerged as largely invisible in its consumption at the household scale. A lack of understanding about the connections between water resources domestically, locally, nationally and globally could also be detected amongst the younger students, demonstrating a need for scales to be explicitly connected in educational resources, as was argued earlier. Indeed, a disconnect was noted between conceptions of water use at the household scale, and water availability nationally and in other countries, demonstrating the often inactive and subconscious consumption of a resource which bears little relation to water in the landscape once it enters the home, in what Bakker (2003a: 49) terms the "hydrosocial cycle".

I also considered whether there was a significant difference in specific water attitudes and behaviours between the three pupil groups prior to water education. Braveley School students were found to be statistically the most likely to turn off the tap when brushing their teeth, while Alfon School students were the least likely. Knowing how many litres of water the average person in the UK uses each day appeared to become more

common with rising age (the Alfon School pupils were least likely to know this, while the Chalksmere College students were most likely). Indeed, the older students were also probably more capable of comprehending and visualising this figure, though this may even be challenging for adults.

8.2.4 Unpacking the influences of norms on water use and barriers to action

The third research question, *'What are the social influences on water values, attitudes and behaviours and how do these affect the development of both water literacy and citizenship?'*, was addressed in Chapter 6 through exploration of the reasons why traditional education might not be able to tackle unsustainable water behaviours. The theme of this chapter was examination of the composition of 'everyday' water use as consisting of habits, routines and lifestyles, and being influenced by social norms, peers and family members, as well as technology and infrastructure. This contrasts with the idea that water consumption is enacted individually, which Grønhøj (2006) also criticises.

Firstly, I considered how young people's norms of water use are constructed and the extent to which individuals wish either to act 'normally' or to act in ways that distinguish them from peers. In exploring the gap between general water and environmental attitudes and the behaviours undertaken, I argued that some environmental actions could be 'traded off' against each other, with individuals potentially selecting actions perceived as 'easier' - like recycling being performed preferentially (partly due to its promotion and the availability of infrastructure) and used as an excuse for failing to take actions perceived to be more difficult, such as saving water. This relates to the concept of negative spillover described by Thøgerson and Ölander (2003) and others, and it was more noticeable than positive spillover resulting from catalyst behaviours in the manner suggested by Defra's (2008a) research. Recycling can be seen to have shifted into the realm

of normal behaviour, whereas many other pro-environmental actions have not, and Barr et al. (2001) argue it no longer requires environmental values. However, a strong contingent described the 'special effort' they were making either towards water conservation or pro-environmental actions more generally, which certainly should not be ignored, and suggests the idea of subconsciously nudging young people towards sustainable water behaviour might not be universally successful.

There was some evidence in the data that financial motivations affect young people's behaviour, even though they are not responsible for paying domestic water and energy bills. Considering young people's agency in greater detail, in terms of the 'messiness of everyday life' I suggested that parental attitudes and priorities, such as saving money or time, do influence the sustainability of the habits of their children. The young people were happy to admit that they forget to behave in a water efficient way at home and see this as a reason in itself for doing so. As recognised in earlier chapters, there are limits to the influence and, hence difference, children can make at home. Some of the participants in the focus groups recognised this, acknowledging that their parents led busy lives and may not be able to take time out to support them in taking on more sustainable behaviours.

With respect to social norms of hygiene and cleanliness, I found that some water conserving behaviours were perceived as unhygienic or dirty, and indeed at Braveley School the focus group participants vocally objected to one student's suggestion of saving water by not always flushing the toilet. I explored the way in which water is used in public and private realms and its subsequent susceptibility to social and subjective norms. This is particularly pertinent to the teenage age group, as the participants were at a stage where hygiene is becoming increasingly important to them. I considered the difficulty in starting conversations about water efficiency whilst still promoting hygienic and healthy living to teenagers, and suggested that water conservation education is also difficult to fit with the requirements of Personal, Social

and Health Education (although some aspects of it may fit more appropriately in PSHE classes than in geography). One barrier to a shift towards seeing water conservation as a 'normal' or a chosen environmental behaviour could be pupils' perceptions of it as 'dirty' or as resulting in reduced standards of personal hygiene. In this context, many of the young people surveyed understood perfectly well that they were not acting as sustainably as they could in terms of water use, but were quite willing to accept that behaviour.

In Chapter 6, I also considered the social communities to which a young person belongs and how they may have to manage conflicting norms between their peers, parents and teachers. The ideas which they come to school with - Thomson's (2002) 'virtual school bags' - influence how pupils interpret the messages they receive; a process that will be reconsidered as and when they are away from class and are more receptive to their peers' and parents' opinions. Young people may be reluctant to admit the influence their family has on their actions, despite some describing being 'nagged' to conserve water.

8.2.5 Making educational interventions: challenges and ways forward

The fourth and final research question, *'What are the wider insights that can be gained concerning the role of water literacy initiatives in increasing young people's water citizenship?'*, was addressed in Chapter 7. Taking the insights and ideas reported in previous chapters on board where possible, I used them in Chapter 7 to explore how effective educational experiences for water literacy might be in stimulating a sense of water citizenship.

The main argument in this chapter was the potential for education to encourage recognition of ability to act in ways that provide future opportunities for water citizenship and, potentially, sustainable behavioural changes. This theme was drawn out through exploring

possible barriers to and opportunities for action, around the power and efficacy young people see in themselves, perceived responsibility to act, how specific water uses can be made more ‘visible’, and the support of family and peers.

I noted an increase in basic factual knowledge after the sessions had finished at Alfon and Braveley Schools, where most students seemed to feel more knowledgeable about water. This increase was statistically significant at Alfon School. There was no significant difference in perceived ease to reduce water consumption at home, but amongst Chalksmere College students the perceived influence of the family increased. More positively, feelings of personal responsibility towards future water availability increased significantly at Alfon School.

Specific behaviour changes were questioned at Chalksmere College (although it was not envisaged that a short educational programme would have changed behaviours significantly). Small changes in responses could be detected though these were not statistically significant. This could indicate marginally better awareness of behaviour and perhaps a first step on the path to more water efficient behaviours, influenced by increased water literacy and citizenship and water use at home becoming more visible. However, results would need to be verified with a longer-term study.

Interestingly, the vast majority of the students were unaware that their opinions had changed in the second questionnaire. In particular, I noted a large discrepancy in the percentage recognising that their perceived behavioural control had changed (in terms of ability to save water at home). Half of the youngest students thought the lessons had changed the way they use water, but only a third of oldest students. Amongst the oldest students, who gave the most detailed responses, knowledge was perceived as the key driver of change in behaviours for those who said their behaviours had changed, but those who did not think their actions had changed predominantly referred to already having sustainable behaviours as their reason for not acting differently. For these students

to change their actions, education would need to encourage them to recognise where they might still be wasting water, for example by carrying out a water audit. I noted that the focus groups themselves will have had an impact on attitudes: perhaps, as a stand out 'special visit', they could have had more of a lasting impact than normal lessons would have done. There is potential for co-production of knowledge to take place in focus groups, though this may be more appropriate when working with groups of adults, rather than school pupils who are expecting to learn pieces of information applicable to their examinations.

Indeed, some students wanted water education that applied more to their personal behaviours, which could be beneficial for behaviour change but is unlikely to be a feasible option in school lessons, particularly at A-level where there is pressure to prepare for examinations. I also noted that integrating education for water literacy into geography lessons is difficult, and becomes even more so after Key Stage 3. However, a case can certainly be made for making water education relevant to young people and the behavioural changes they are capable of making. As mentioned earlier, there may be potential for water literacy initiatives to be taken up by PSHE lessons in the context of conserving water whilst still remaining clean and healthy, or for water citizenship to become a whole or cross curricular topic.

In sum, water literacy education was demonstrated to have an impact on young people's water values, though the effect differed widely between schools and individuals. It is unlikely that behaviours were changed simply as a result of the lessons but acknowledgement of actions seemed to have increased, which is a positive result. The most promising outcome was an increase in sense of responsibility, though a decrease in perceived behavioural control was a cause for concern.

8.3 Overall conclusions to thesis

The main conclusion to the thesis is the idea that effective educational initiatives for water literacy should make water use 'visible' across spatial scales.

The first element of this is 'visibility' of water, which comes about through conversations about water use: finding out the ways in which it subconsciously enables everyday domestic activities for cleanliness, hygiene, relaxation and food preparation, where water is rarely if ever 'used' for its own means. The ways in which these activities come together to form daily habits, routines and lifestyles mean that water as an element becomes increasingly hidden. Making water use at home more visible through water lessons could develop a young person's sense of ability to act. Deconstructing the routines, habits and lifestyles in which water plays a part, and the influences of peers, family and social norms on water use, help to bring water consumption into the foreground, and hence easier to make more sustainable.

Knowledge about the volume of water used for these actions and habits- and what a figure in litres actually means- is also important, and it should not be assumed that young people (or even adults) are able to visualise and comprehend what a number of litres looks like, whether those litres of water are being used to flush a toilet, or enable the production of the ingredients of a packed lunch. Conversations about water use bring it to the forefront of young people's minds, and perhaps increase the possibility of water conserving behaviours being considered "normal" in the future, in the way that recycling behaviours appear to be with the teenage generation. A high proportion of domestic water use takes place behind the bathroom door, and enabling conversations about water use in this realm increases its 'visibility' and active thought; however, it is questionable whether a school lesson is the appropriate place for these conversations. Ways of

bringing water into conversations increases the conspicuousness of water consumption, enabling people who may already have water conserving values (or who have developed these through education programmes) to put these values into practice, if they so desire.

The second element of the overall conclusion to the thesis is for water use to be made visible across spatial scales. Water literacy initiatives can enable young people to understand the ways in which water operates as a global resource; linking a young person's personal actions to their local environment, the state of water resources in their region or country, and the impacts they might actually be having on water availability in other countries. Starting with personal actions utilises a constructivist pedagogical approach by moving from the known to the unknown, enabling connections to be made by pupils, and making sure concepts do not come across as abstract. This, in turn, could help foster development of a sense of water citizenship and responsibility. Water issues are less likely to be thought of as "not affecting me" when concepts such as virtual water are understood.

8.4 Benefits and limitations of the research

This thesis constitutes an original, interdisciplinary contribution to knowledge in the fields of environmental education and young people's resource consumption. I did not intend to provide large dataset quantitative analysis, and clearly a limitation of the thesis is that only the questionnaire and focus group data collected before the water lessons is directly comparable across schools, and as a different age group was engaged at each school, there is at least one major co-varying factor. However, the breadth of ages and teaching experiences covered add to the value of the thesis and allowed for many more qualitative findings and arguments to be put forward.

While focusing research on three schools neglected some groups of young people (e.g. home-schooled children, post-16 school leavers, and those in Pupil Referral Units or otherwise not in formal education), it was a straightforward environment to gain access to for research and ensured a very high response rate to the questionnaires. Bias existed in the selection of pupils and classes: the Alfon School and Braveley School classes were both 'top set' geography as the teachers felt they would benefit most from the experience. This means the results are not necessarily representative of other students at the school. At Braveley School and Chalksmere College, students volunteered to take part in the focus group, which is the most democratic means of recruitment, but this process may have favoured more able students (although at Chalksmere College, the teacher suggested the volunteers were predicted AS grades ranging from A* to U).

The size of the samples and datasets may limit the implications that can be inferred from them and risks drawing conclusions that do not reflect the views and actions of young people more generally. For this reason I have taken care to not make generalisations about young people as a whole and instead focused on a case study approach. Additionally I reiterate here that the findings from each school were only directly comparable before the water lessons, because different topics were covered at each school. However, I felt that this added an extra degree of interest to the thesis and enabled me to gain richer qualitative data in a short space of time.

8.4.1 Evaluation of the conceptual approach

The theoretical framework established in the Introduction chapter set the rational actor model against social practices theory. In this context, the conceptual approach adopted in this thesis promoted educational initiatives for water literacy as a 'middle route' between rational action and social practices. I suggested that water literacy initiatives could

help to develop a sense of water citizenship and responsibility amongst young people. This approach envisages water literacy initiatives as helping young people to become knowledgeable, and able to apply this knowledge to their values, which are connected to a range of personal, local, national and global water contexts.

I can reflect that the weakness of this approach was that- while water literacy could be explored through a questionnaire- there was an inherent difficulty in measuring water citizenship. Efforts were made to do this, in particular using the RSA *Civic Pulse* tool in the design of the questionnaire (outlined in Section 3.5.2) which aims to aid the measurement of active citizenship (McLean and Dellot, 2011). While this informed the inclusion of statements measuring self-efficacy and feelings of responsibility, there are many more elements to this tool that could have been incorporated into measuring active citizenship in adults: for instance relationship with services and local authorities (ibid.).

Because of this difficulty in measurement, the thesis leans towards focusing more on pupils' perceptions of their personal water use than their wider water citizenship. Both rational action and social practice theories focus strongly on the behaviours in which a person engages, while water citizenship does not necessarily need to consider actions themselves. However, this flexibility is one of the strengths of water citizenship as central to the thesis' conceptual framework. Furthermore the concept incorporates a sense of how an individual acts for the greater good, which arguably does not feature in rational action or social practices theory. As Dobson (2007) reflects in his definition of environmental citizenship, it functions at a deeper level than targeted behaviour change approaches by instead questioning the underlying attitudes that shape behaviours, and how these impact society more widely. Of course, water citizenship can be about actions in civic and political space, rather than simply personal actions. Examples of this were outlined in Section 4.4.2. This represents a different model of

citizenship to direct action, which would be difficult to incorporate into the theoretical framework of social practices and rational action.

It is also difficult to consider actual water usage and behaviours in the home without installing monitoring equipment or incorporating a diary study. Furthermore, while behaviours may not have shifted in the short space of time following the water lessons, there remains the potential for behaviour changes to occur later: either when the content of the lessons has had more time to embed, or when children have grown older and gained more responsibility for household tasks.

In sum, the conceptual framework was limited by its narrow focus on personal, direct water use in the home, and self-reported changes in this within a short period (between two and five months passed from the initial questionnaire and focus group to the follow-up questionnaire and focus group). However, the conceptual framework was successful in terms of highlighting the need for stronger connectivity between personal water use and wider issues around water scarcity, and in pinpointing some of the barriers to this for young people- such as a limited sense of self-efficacy, inability to take action and a potential reliance on ‘doing your bit’. These are factors which the rational actor model and social practices theories do not fully address.

Going forward, these findings can be utilised in order to further develop water educational resources, utilising different models of water citizenship beyond personal direct water use, such as political activism, networking, or purchasing products with small water footprints.

8.5 Implications of the research for practice

Greater understanding of the composition of young people's water use at home can help inform an innovative education programme which works to increase the visibility of water at home, and explicitly link personal water use to local, national and global scales, which subsequently should not only increase young people's sense of responsibility towards water but help them to identify how they could take action. Connections between past, present, possible and probable futures should also be made. While social practices and education researchers come at natural resource use from very different angles, there is potential to utilise insights from a range of literatures to make water use more visible and recognisable.

To take these findings forward, I suggest that the dearth of personal responsibility detected amongst students, despite a generally positive environmental or water conservation attitude, relates in part to the invisibility of water in everyday use, and a lack of connection between the personal and the global scale in education materials. At Alfon School, where lessons attempted to link scales using concepts such as virtual water, sense of personal responsibility increased in the second questionnaire. Elements of a futures dimension in the Alfon School lessons may have also contributed to this increase, and both of these components could be developed further in future lesson plans.

The divide in student opinion on personal water actions, with many citing themselves as making a 'reasonable effort' but not a 'special effort', or 'doing their bit', has been previously cited in the literature (e.g. Owen et al.'s (2009: 29) "good behaviours") and is perhaps more liable to negative spillover rather than the positive spillover that might be expected. This group of individuals would be best targeted with

demonstrating sustainable norms of behaviour, which is a dominant strategy in water and environmental social marketing and education.

Conversely, the small contingent of respondents who were keen to set themselves apart from the norm and demonstrate the extra effort they are making may not currently be being targeted by educational materials (perhaps because arguably they don't need to be) but should certainly not be ignored. I also wish to note the challenges to working in the classroom, which include: limitations on what can be achieved in a lesson (including a heavy focus on preparation for national examinations from age 15 onwards); the legitimacy of potentially teaching about behaviour change (bearing in mind Standish's (2009) argument that uncritical pro-environmental teaching could be 'greenwashing'); and the potential for longer term changes that could not be tested in practice.

The thesis has proposed a role for education for water literacy, in order to make young people aware of their water consumption, knowledgeable about water issues and empowered to act differently. However, the findings also highlight some of the remaining challenges to altering young people's water behaviours, in terms of responsibility and ability to act at home; and the need for specific strategies to confront negative spillover and the messiness of everyday life.

The thesis also argues for the careful planning of education for water literacy in order to avoid decreasing perceived behavioural control and self-efficacy amongst young people. This includes a shift away from the message of 'doing your bit' for water conservation and instead recognising and harnessing the desire of some young people to set themselves apart from the norm. Otherwise, as has been demonstrated, water education could act to decrease perceived behavioural control and self-efficacy. Possibly, this can be avoided through collaboration with parents.

While water saving tips certainly have a role to play in water education, I would recommend more focus on building deep understanding about water issues and tailoring behaviour changes to what a young person would be capable of and also motivated to do. The Alfon School focus group participants highlighted less obvious household water uses like sterilising dummies, water fights and cleaning out fish tanks. There could be potential for devising engaging water education programmes which reference less obvious uses like these and how they could be carried out more sustainably. Knowledge and understanding at a deep level at least gives young people evidence to inform potential behaviour changes.

As mentioned in Chapter 7, while the benefits of education for water literacy can align with the aims of geography curricula, the case for behaviour change to be taught in the classroom is less clear. This highlights a potential role for water companies and charities, as opposed to formal education providers, although the priorities and agendas of these organisations should be borne in mind when using their materials. Furthermore, where specialist knowledge is required, sources of professional development for newly qualified and non-specialist teachers may be necessary, whether this is through formal or non-formal channels.

8.6 Towards a future research agenda

It is clear firstly that benefit could be gained from repeating the study on a larger scale to obtain a greater amount of comparable quantitative data. Engaging a larger number of schools, with comparable age groups, would provide a more reliable data set on young people's water values, attitudes and behaviours in the UK, for which there is currently little data. This could be made even more beneficial through a longer term study, with a second follow-up session six months after the first,

for instance. In addition, there is an opportunity to collect more in-depth quantitative and qualitative data on behaviours, asking a greater number and range of young people about their water behaviours before and after education, while also providing more open-ended questions. However there remain possible issues related to this type of study in terms of self-reported behaviours and a desire to give the 'right' answers.

Indeed, due to the time restraints in carrying out the data collection, it was not possible to utilise all the findings from the questionnaires and focus groups in designing the water lessons. There is now an opportunity to design water literacy education programmes in accordance with my findings, attempting to develop responsibility, empowerment and self-efficacy, whilst building a concrete knowledge base on water issues from the personal to the global scale, and making water use visible.

Finally, a research question that emerged during the course of my research is whether parents recognise their influence on their teenage children's water usage and vice versa. It would be interesting to collaborate with parents in corroborating information provided on water habits and behaviour changes, and this would decrease the problems associated with self-reported data. Steps could also be taken to overcome adolescents' perceived limited ability to act on water consumption at home if parents were engaged in the research.

This study has established that education for water literacy can play a role in making water use more visible at a range of connected scales from the personal to the global. I therefore suggest that further research should be pursued in three main strands:

1. A longer term, larger dataset study to build our understanding of young people's water literacy and water citizenship at present;

2. Creating, testing and finalising education packages for water literacy and water citizenship, focused on tackling the ‘invisibility’ of water from personal use up to the global scale;

3. A more integrated approach utilising family and household units to explore the dynamics of water use in the household, and how young people’s school education influences and is influenced by household practices.

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Appendices

Appendix A: Forms and information sheets designed to fulfil ethical requirements

The University of Nottingham
UNITED KINGDOM · CHINA · MALAYSIA

School of Geography
Sir Clive Granger Building
University Park
Nottingham
NG7 2RD

[DATE]

Dear [HEAD TEACHER NAME]

I am a PhD student at the University of Nottingham carrying out research in collaboration with Severn Trent Water and the Papplewick Pumping Station Trust. My project is entitled 'Water literacy and citizenship: education for sustainable water management', and is seeking to explore in what ways different teaching approaches can help young people become 'water literate' citizens. More information is provided on the next two pages. I have had some initial contact with the geography department, who are willing to work with me, and so I am writing to you to ask whether you are willing to support this research work in your school.

I hope that my research can have beneficial outcomes for [SCHOOL NAME] as well as the University of Nottingham, and I am very flexible to work around you and the geography department as convenient.

My work will involve some data collection with staff and students. The data collection processes will include two questionnaires and additional focus group discussions. If appropriate, I anticipate conducting this work between [DATE] and [DATE]. I appreciate that the school will need to approve my questionnaires in advance and that any student involvement in focus group discussion will need to be supported by the college. For your reassurance I do have CRB clearance.

If you are happy for the data collection to go ahead, I would appreciate it if you would sign and return the consent form. If you have any questions, please contact me using the details on page 3.

Thank you for your time.

Kind regards

Georgina Wood

PhD research student

Information for teachers

Background to project

This project runs from October 2010 to October 2013 and is funded by the Economic and Social Research Council (ESRC), in conjunction with Severn Trent Water and the Papplewick Pumping Station Trust. The research will make a real contribution to the academic field, whilst also allowing recommendations to be made for regional and national policy.

Your school's part

I would like to work with [SCHOOL NAME] to explore the effectiveness of education in changing values and attitudes towards water. This will involve observing lessons relating to water management with a year group mutually agreed with the geography department. Prior to the lessons, I would like to distribute a questionnaire to the classes to find out what the students know about water and their attitudes towards it. 5-7 students will be asked to take part in a short focus group (30-40 minutes in length) to discuss issues arising from the questionnaire, supervised by a teacher. After the water lessons, I would like to repeat the questionnaire and focus group.

Confidentiality

The focus group conversations will be recorded digitally and transcribed. The recording and the transcription will be stored on a password-protected computer in a locked office. You are welcome to request a copy.

The data will be used to explore opportunities in education for sustainable water management in the region. All children will remain anonymous and not be identified in publications. Participation in the research is entirely voluntary and students or the school may opt out of the research at any time.

Using the data

The results will be written up in the PhD thesis which will be presented to the University of Nottingham in 2013 or 2014. They may also form part of a report

to the project partners (Severn Trent Water and the Papplewick Pumping Station Trust) who are interested in seeing the outcomes. Articles may be published in academic journals and presentations will be given at conferences in the UK and abroad.

Possible risks and disadvantages of taking part

There are no expected risks to anyone taking part in the study. However, a full risk assessment has been carried out and this can be made available to you.

Possible benefits of taking part

The effect of water education in secondary schools and colleges on household demand for water is an unexplored area. This study will bring original university research to the school and the results of the project will be communicated at national and international conferences. The results may also be useful in the planning of future lessons on water resources. You can use this opportunity to build links between your school and the University of Nottingham, Severn Trent Water and the Papplewick Pumping Station Trust.

Further information

This study has been approved by the University's School of Geography Research Ethics Officer and School of Education Research Ethics Committee. Further ethical information can be obtained from the ESRC (2010) Framework for Research Ethics and the University of Nottingham Research Ethics Guidelines, which have been adhered to in producing this documentation. I have obtained enhanced CRB clearance. For any other information, please contact me.

Contact details

Researcher (primary contact):

Georgina Wood
Tel. 0115 951 5384
Email Ttxgw7@nottingham.ac.uk

Or write to School of Geography, Sir Clive Granger Building, University Park, Nottingham NG7 2RD

Supervisor:

Professor Colin Thorne
Tel. 0115 951 5431
Email: Colin.Thorne@nottingham.ac.uk

Or write to School of Geography, Sir Clive Granger Building, University Park, Nottingham NG7 2RD

Complaint procedure

If you wish to complain about the way in which the research is being conducted or have any concerns about the research then in the first instance please contact the supervisor. If this does not resolve the matter to your satisfaction then please write to the address above or contact the School of Geography Research Ethics Officer, Dr Susanne Seymour (tel. 0115 951 5453, email: Susanne.Seymour@nottingham.ac.uk).

Head Teacher/Teacher Consent Form

(To be signed and returned to researcher)

Project: Water Literacy and Citizenship: Education for Sustainable Water Management – Georgina Wood

In signing this consent form I confirm that:

- I have read the Information For Teachers and the nature and purpose of the research project has been explained to me

- I have had the opportunity to ask questions and I understand the purpose of the research project and [SCHOOL NAME]'s involvement in it

- I understand that participation is voluntary and I may withdraw the school from the project at any stage, without giving any reason, and withdrawing will not penalise or disadvantage us in any way

- I understand that while information gained during the study may be published, any information a child provides is confidential (with one exception – see below), and that no information that could lead to the identification of any individual will be disclosed in any reports on the project, or to any other party. No identifiable personal data will be published

- I understand that the researcher may be required to report to the authorities any significant harm to a child/young person (up to the age of 18 years) that she becomes aware of during the research. I agree that such harm may violate the principle of confidentiality

- I understand that the focus groups will be recorded using electronic voice recorder. I agree that extracts from the focus group recording may be anonymously quoted in any report or publication arising from the research

- I understand that data will be securely stored

- I understand that I may contact the researcher or supervisor if I require further information, and that I may contact the Research Ethics Officer of the School of Geography, University of Nottingham, if I wish to make a complaint relating to [SCHOOL NAME]'s involvement in the research

- I agree to [SCHOOL NAME] taking part in the above research project

PLEASE CIRCLE:

1. Will parental and child consent be required for the researcher to observe lessons and carry out questionnaires in class (child will be allowed to opt out)? **YES/NO**
2. Will consent forms need to be completed by focus group participants? **YES/NO**
3. Will consent forms need to be completed by a parent/guardian of each focus group participant? **YES/NO**

Head teacher's name (BLOCK CAPITALS)	Signature	Date
Researcher's name (BLOCK CAPITALS)	Signature	Date

Information for participants

Title of research project

Water literacy and citizenship: education for sustainable water management

Investigator

Georgina Wood (PhD student)
School of Geography
University of Nottingham

What is the purpose of the project?

The study aims to find out how education in schools can help us manage water more sustainably in the East Midlands

What is my role in the study?

You filled in a **questionnaire** about water for me and I would like to invite you to talk about your views in more detail along with around 7 other pupils (a **'focus group'**). You don't need to study for this and there are no wrong answers- I would just like to know your opinions! I will give you a sheet with a few points to think about beforehand. During the weeks after this, you will be covering water as a topic in Geography lessons. I will be observing these lessons and may talk to you a bit about how you find the classes. Following the lessons, I would appreciate it if you could fill in a second **questionnaire** and take part in a second focus group. This isn't to test what you have learned so don't worry! There may be a few follow-up questions a few months later. The whole study will be finished by July 2012.

What are the possible disadvantages and risks of taking part?

There are no expected risks to you during this study. There will be **two lunchtimes** where I would like to talk to you for about **40 minutes** (dates to be confirmed). With your permission, I may also photocopy some samples of your work.

What are the possible benefits of taking part?

The research will help us understand how young people perceive water use and the best ways we can manage the resource. In return for attending both focus groups, you will receive a certificate and a letter of thanks.

What should I do if I have any questions?

If you want to ask anything about the study, please contact me (Georgina) using the details on the next page. If you still have any questions, please ask your geography teacher for the contact details of the university.

What will happen to the results of the research study?

The results will be written up in a report which will be presented to the University of Nottingham in 2013 or 2014. They may also form part of a report to the project partners (Severn Trent Water and the Papplewick Pumping Station Trust) who are interested in seeing the outcomes. Articles may be published in academic journals and presentations will be given at conferences in the UK and abroad.

Will my taking part in this study be kept confidential?

The 'focus group' conversation will be recorded and I will type up the recording, but your name and personal details will not be included. The recording and typed version (**'transcription'**) will be stored securely at the university. You can ask for a copy of the transcription if you like.

Thank you for your time and I hope you are willing to take part in this study! If there is anything you don't understand, please email me.
If you are happy to participate, please sign the **consent form**.

Contact details

Georgina Wood
Email: Ttxgw7@nottingham.ac.uk

Or write to address on footer

Appendix B: Questionnaire to teachers

Georgina Wood
School of Geography
Sir Clive Granger Building
University Park
Nottingham
NG7 2RD
Telephone 0115 9515384

The University of Nottingham
UNITED KINGDOM · CHINA · MALAYSIA

Thank you for taking the time to fill in this questionnaire.

Please answer the questions to the best of your knowledge, but if a question is not relevant to you or you do not wish to answer, please leave it blank. If you have further information to provide, please let me know. If you would like to know more about my research project, please contact me using the details above.

Georgina Wood

PhD student

Questionnaire to Teachers – Water Education in Schools

December 2011

Section 1: About you

Name ……

Name of school ……

Position/job title

……

……

Please circle the year groups you teach: 7 8 9 10 11 12 13

Special interests within geography

……

……

……

……

Additional subjects you teach

……

……

Other positions held at school (e.g. committees)

……

……

Are you a member of an environmental/ sustainability group outside the school? Please circle **YES / NO**

If yes, please provide details

…..……
……..

Section 2: Water education teaching

Which examination boards and syllabuses are used in your school?

	Board	**Syllabus (if applicable)**
Geography GCSE		
Geography A-level		

Year group	**Is water resource management, water efficiency or water scarcity covered in geography lessons?** Please circle	**Please briefly detail** (overarching theme, topics, field trips/site visits, assessments etc)
7	YES / NO	
8	YES / NO	
9	YES / NO	
10	YES / NO	
11	YES / NO	
12	YES / NO	
13	YES / NO	

Does your school run any geography fieldtrips with elements relating to water management/efficiency?
Please circle **YES / NO**

If yes, please provide details
……
……..

Are you aware of the education programme run by Severn Trent Water?
Please circle **YES / NO**

If yes, please fill in the table below:

	I have heard about this (please tick)	**I have used this service before** (please tick)	**If you ticked "I have used this service before", please provide details** e.g. is this a regularly used service? Which year group was engaged?
Outreach visits by a Severn Trent Water representative			
Site visits to sewage works			
Severn Trent Water classroom and assembly materials			
Other			

Are there any other sources of water education you have used in the classroom or for special events?

	I have used materials from this provider before (please tick)	**If yes, please provide details** e.g. materials used, year group engaged, context
Oxfam education		
WaterAid		
WWF		
A water company (other than Severn Trent Water)		
Climate4Classrooms (British Council)		
Other		

Have pupils ever been asked to carry out an audit of the school's water consumption? Please circle **YES / NO**

Section 3: Special events and targets

Does your school run an Eco Day, Sustainability Week or something similar? Please circle **YES / NO**

If yes, please provide details

……
……..

……
……..

Is your school working towards environmental or sustainability targets (e.g. Eco-Schools)?
Please circle **YES / NO**

If yes, please provide details

……
……..

……
……..

Does your school celebrate World Water Day or something similar?
Please circle **YES / NO**

If yes, please provide details

……
…….

……
……

If you would be willing for me to visit your school to observe a water management lesson or special event, please provide your contact details:

Telephone

……
……..

Email address

……
……..

Appendix C: Questionnaires to pupils

First questionnaire to both Alfon and Braveley Schools

PhD research project

School of Geography

The University of Nottingham

UNITED KINGDOM · CHINA · MALAYSIA

I am doing a research project looking into **water management in the East Midlands.** I would like to find out a bit more about your opinions through this questionnaire, as well as a follow-up questionnaire later in the year. There may also be the opportunity to take part in a group discussion, where we will chat about some more issues relating to water and the environment.

Section 1 is a quiz and you can find out the answers afterwards. Section 2 and 3 are just about your opinions and behaviour, so there are no right or wrong answers.

I hope you find this survey interesting and **if there are any questions you do not wish to answer, please leave them blank.** If there is anything you don't understand, please ask.

Thank you! Georgina Wood

Section 1 – Water Quiz

1. A) How much water does the average person in the UK use each day?

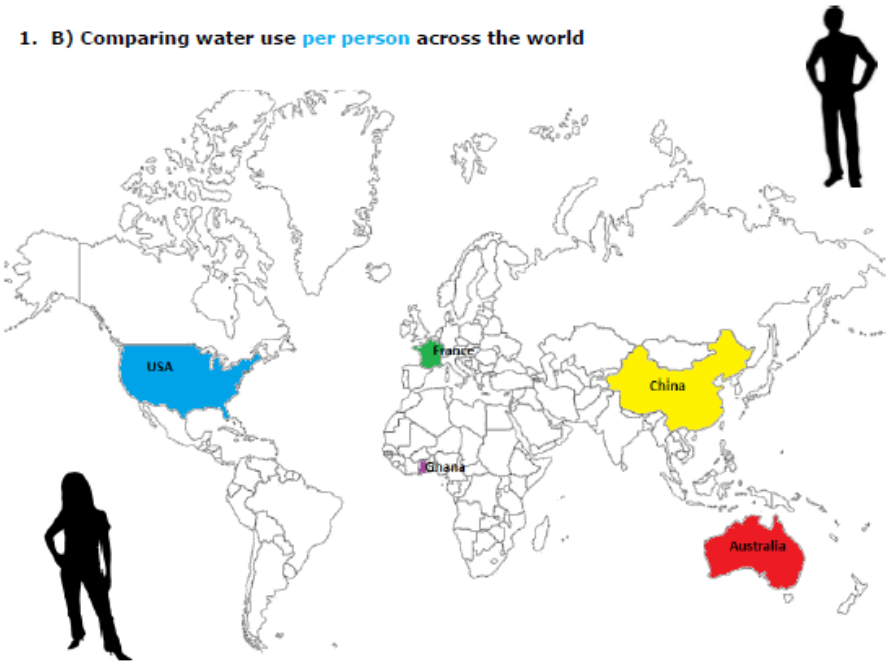
Please circle one answer

20 litres	50 litres
100 litres	150 litres
200 litres	300 litres

Hint:

This is a two litre bottle

1. B) Comparing water use per person across the world



Country	Do you think a person in this country would use more or less water than a person in the UK? *Please circle More or Less for each country*	Why do you think this?
USA	**More / Less**	
Australia	**More / Less**	
China	**More / Less**	
Ghana	**More / Less**	
France	**More / Less**	

2

2. **Put these activities in order according to how much water you think they use (highest amount of water at the top of the list; lowest amount of water at the bottom)**

Washing the car with a hose

A bath

Washing your hands and face

One washing machine cycle

An electric/gravity shower

Write them in here

1 (Most litres of water used)	
2	
3	
4	
5 (Fewest litres of water used)	

Section 2 Your opinions and behaviour!

Please rate how you feel about the following statements:

Put a tick in one box for each statement

		Strongly agree	**Agree**	**Don't know/ neither agree nor disagree**	**Disagree**	**Strongly disagree**
1	I see myself as an environmentally friendly person					
2	Britain is a rainy country- it doesn't seem like we have problems with water shortages					
3	If I decided to, it would be easy for me to use less water *at home*					
4	Climate change is a worry for me					
5	The way my family behaves towards the environment affects how I behave					
6	Looking after the environment is an important part of who I am					
7	At my school, saving water is seen as important					
8	I feel personally responsible for making sure there is enough water for future generations					
9	If I decided to, it would be easy for me to use less water *at school*					
10	It is everyone's responsibility to ensure there is enough water for future generations					
11	Future generations will be able to solve the environmental problems we are currently causing					
12	It is important to have a shower every day					

Put a tick in one box for each statement

		Very often	Often	Occasionally	Rarely	Very rarely/never
1	While I am waiting for the water from the tap to run hot, I collect the cold water and re-use it					
2	I leave the tap running when I brush my teeth					
3	I put the plug in the sink when I wash my face					
4	I leave the bathroom to do other things while the shower is running to give the water time to heat up					

Please finish the sentences:

Put a tick in one box for each statement

		Strongly approve	Approve	Not care/ neither approve nor disapprove	Disapprove	Strongly disapprove
1	If I tried to reduce the amount of water I used, my *friends* would….					
2	If I tried to reduce the amount of water I used, my *family* would….					
3	If I joined a society or group that helps the environment, my *friends* would….					
4	If I joined a society or group that helps the environment, my *family* would….					

Section 3 About you and your household

1. **Please circle your gender** Female Male

2. **How many people live in your household?** ..... adults ..... children

Please circle one option to fill the gap in each sentence:

3. **A) Compared to the average household in my area, I think my household is ..... environmentally friendly**

Options *(please circle one)*:

Much more More Similarly (no difference) Less Much less

B) Why do you think this?

.....

.....

4. **A) Compared to the average household in my area, I think my household uses ..... water**

Options *(please circle one)*:

Much more More A similar amount of (no difference) Less Much less

B) Why do you think this?

.....

.....

The End - Thank you for your time!

Second questionnaire to Braveley School

PhD research project

School of Geography

The University of Nottingham

UNITED KINGDOM • CHINA • MALAYSIA

Thank you for filling in this second questionnaire. **Some of the questions are the same as last time**- please still answer them, but you can change your answer if you like.

Georgina Wood

1. Please circle your gender Female Male

2. How many people live in your household? ..... adults ..... children

3. How much water does the average person in the UK *directly* use each day?

Please circle one answer

20 litres 50 litres

100 litres 150 litres

200 litres 300 litres

4. How much *virtual water* does the average person in the UK use each day?

Please circle one answer

2000 litres 5100 litres

3400 litres 6600 litres

***For each statement, put a tick in one box for* part a, *and circle yes or no for* part b**

		Strongly agree	Agree	Don't know/ neither agree nor disagree	Disagree	Strongly disagree
5 a)	**I feel personally responsible for making sure there is enough water for future generations**					
b)	Has your opinion on this statement changed since the last questionnaire? **Yes / No** If *yes*, why?					
6 a)	**The way my family behaves towards the environment affects how I behave**					
b)	Has your opinion on this statement changed since the last questionnaire? **Yes / No** If *yes*, why?					
7 a)	**It is everyone's responsibility to ensure there is enough water for future generations**					
b)	Has your opinion on this statement changed since the last questionnaire? **Yes / No** If *yes*, why?					
8 a)	**It is important to have a shower every day**					
b)	Has your opinion on this statement changed since the last questionnaire? **Yes / No** If *yes*, why?					
9 a)	**If I decided to, it would be easy for me to use less water *at home***					
b)	Has your opinion on this statement changed since the last questionnaire? **Yes / No** If *yes*, why?					

		Strongly approve	Approve	Not care / neither approve nor disapprove	Disapprove	Strongly disapprove
10 a)	If I tried to reduce the amount of water I used, my *friends* would....					
b)	Has your opinion on this statement changed since the last questionnaire? Yes / No If *yes*, why?					
11 a)	If I tried to reduce the amount of water I used, my *family* would....					
b)	Has your opinion on this statement changed since the last questionnaire? Yes / No If *yes*, why?					

12. a) Have you learned about water in other subjects at school (either this year or in previous years)?

Please circle Yes / No

b) If *yes*, in which subject(s)? .....

c) Briefly, what did you learn about water in this/these subject(s)?

.....

.....

.....

13. What is your favourite topic to study in Geography, and why?

.....

.....

.....

Please tick if you filled in the first questionnaire on water on 6th November ☐

Please tick if you took part in the discussion at lunchtime on 6th November ☐

(7 pupils from Miss [redacted]'s class)

Please tick if you attended the lesson on Virtual Water on 24th November ☐

The End

Thank you!

Second questionnaire to Alfon School

- As for Braveley School except from Question 12 onwards (see below)

Page 3

		Strongly approve	Approve	Not care/ neither approve nor disapprove	Disapprove	Strongly disapprove
10 a)	**If I tried to reduce the amount of water I used, my *friends* would....**					
b)	Has your opinion on this statement changed since the last questionnaire? **Yes / No** If *yes*, why?					
11 a)	**If I tried to reduce the amount of water I used, my *family* would....**					
b)	Has your opinion on this statement changed since the last questionnaire? **Yes / No** If *yes*, why?					

12. a) Have you learned about water in subjects other than Geography?

Please circle **Yes / No**

b) If *yes*, in which subject(s)?

.....

13. Where have you learned about saving water, other than school? *Please tick one box*

TV/radio ☐ **Family** ☐ **Post/leaflets** ☐

Internet ☐ **Friends** ☐ **Other** ☐ *(where?)* .....

Newspapers/magazines ☐

I don't learn about saving water other than at school ☐

14. Which topic that we have studied did you enjoy the most? *Please tick one box*

Water around the world ☐ **Water in the future** ☐ **Virtual water** ☐

15. Did the lessons change the way you use water at home? *Please tick one box*

Yes ☐ **No** ☐

Why? .....

16. What is your favourite topic to study in Geography, and why?

.....

.....

Please tick if you filled in the first questionnaire on water in January ☐

The End Thank you!

First questionnaire to Chalksmere College

- Pages 1 and 3-5 are the same as for Braveley and Alfon Schools, so are not repeated here

1. B) Comparing water use per person across the world

Country	Do you think a person in this country would use more or less water than a person in the UK? *Please select More or Less for each country*	Why do you think this?
USA		
Australia		
France		
Ghana		
China		

2. A) What do you think is the average volume of rainfall each year in the East Midlands (in millimetres)?

150 (Central Iraq) 300 700 1100 1500 1900 2300 4000 (Amazon rainforest)

2. B) Why did you pick this answer?

2

Select one option for each statement

		Very often	Often	Occasionally	Rarely	Very rarely/never
1	While I am waiting for the water from the tap to run hot, I collect the cold water and re-use it	○	○	○	○	○
2	I leave the tap running when I brush my teeth	○	○	○	○	○
3	I put the plug in the sink when I wash my face	○	○	○	○	○
4	I leave the bathroom to do other things while the shower is running to give the water time to heat up	○	○	○	○	○
5	I try to cut down the length of my showers	○	○	○	○	○

Please finish the sentences:

Select one option for each statement

		Strongly approve	Approve	Not care/ neither approve nor disapprove	Disapprove	Strongly disapprove
1	If I tried to reduce the amount of water I used, my *friends* would....	○	○	○	○	○
2	If I tried to reduce the amount of water I used, my *family* would....	○	○	○	○	○
3	If I joined a society or group that helps the environment, my *friends* would....	○	○	○	○	○
4	If I joined a society or group that helps the environment, my *family* would....	○	○	○	○	○

Section 3 About you and your household

1. Please select your gender ◯ Female ◯ Male

2. How many people live in your household? 1 adults 1 children

3. Other than Geography, what A Levels are you taking?

4. In what type of environment have you spent most of your childhood?

◯ Rural farm ◯ Suburban ◯ City
◯ Rural non-farm ◯ Town ◯ Other *(please specify)*

5. Do you enjoy doing any of the following on a regular basis? *Tick all that apply*

☐ Swimming ☐ Camping ☐ Hiking/Countryside walking
☐ Watersports ☐ Fishing

6. Please tick up to THREE environmental behaviours you perform most often:

☐ Recycling bottles and tins
☐ Turning off tap when brushing teeth
☐ Taking short showers
☐ Reducing electricity use (e.g. switching off lights)
☐ Recycling paper and card
☐ Not flushing toilet every time used
☐ Turning heating down
☐ Buying locally produced food
☐ Walking or cycling instead of driving/being driven
☐ Other or NONE *(please specify)*

Please select one option to fill the gap in each sentence:

3. **A) Compared to the average household in my area, I think my household is ..... environmentally friendly**

Options *(please select one)*:

◯ Much more ◯ More ◯ Similarly (no difference) ◯ Less ◯ Much less

B) Why do you think this?

4. **A) Compared to the average household in my area, I think my household uses ..... water**

Options *(please select one)*:

◯ Much more ◯ More ◯ A similar amount of (no difference) ◯ Less ◯ Much less

B) Why do you think this?

It is important that I can match your responses across the first and second questionnaire. To assist me with this please generate your unique code identifier (see instructions below).

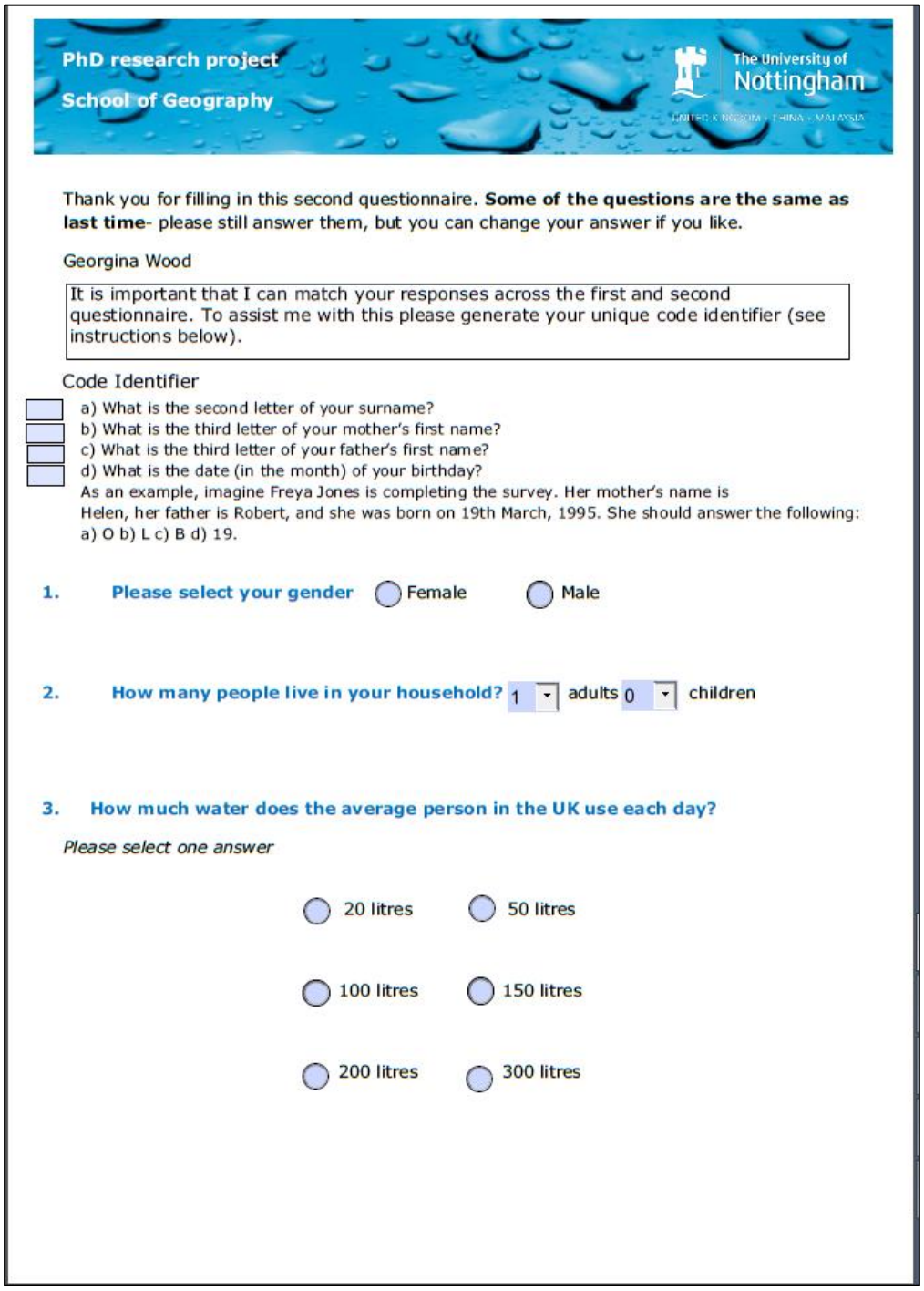
Code Identifier

	a) What is the second letter of your surname?
	b) What is the third letter of your mother's first name?
	c) What is the third letter of your father's first name?
	d) What is the date (in the month) of your birthday?

As an example, imagine Freya Jones is completing the survey. Her mother's name is Helen, her father is Robert, and she was born on 19th March, 1995. She should answer the following: a) O b) L c) B d) 19.

7

Second questionnaire to Chalksmere College



PhD research project

School of Geography

The University of Nottingham

UNITED KINGDOM • CHINA • MALAYSIA

Thank you for filling in this second questionnaire. **Some of the questions are the same as last time**- please still answer them, but you can change your answer if you like.

Georgina Wood

It is important that I can match your responses across the first and second questionnaire. To assist me with this please generate your unique code identifier (see instructions below).

Code Identifier

a) What is the second letter of your surname?
b) What is the third letter of your mother's first name?
c) What is the third letter of your father's first name?
d) What is the date (in the month) of your birthday?

As an example, imagine Freya Jones is completing the survey. Her mother's name is Helen, her father is Robert, and she was born on 19th March, 1995. She should answer the following: a) O b) L c) B d) 19.

1. Please select your gender ◯ Female ◯ Male

2. How many people live in your household? 1 adults 0 children

3. How much water does the average person in the UK use each day?

Please select one answer

◯ 20 litres ◯ 50 litres

◯ 100 litres ◯ 150 litres

◯ 200 litres ◯ 300 litres

***For each statement, select one answer for* part a*, and select yes or no for* part b**

		Strongly agree	Agree	Don't know/ neither agree nor disagree	Disagree	Strongly disagree
4 a)	**I feel personally responsible for making sure there is enough water for future generations**	◯	◯	◯	◯	◯
b)	Has your opinion on this statement changed since the last questionnaire? ◯ **Yes** ◯ **No** If *yes*, why?					
5 a)	**The way my family behaves towards the environment affects how I behave**	◯	◯	◯	◯	◯
b)	Has your opinion on this statement changed since the last questionnaire? ◯ **Yes** ◯ **No** If *yes*, why?					
6 a)	**It is everyone's responsibility to ensure there is enough water for future generations**	◯	◯	◯	◯	◯
b)	Has your opinion on this statement changed since the last questionnaire? ◯ **Yes** ◯ **No** If *yes*, why?					
7 a)	**It is important to have a shower every day**	◯	◯	◯	◯	◯
b)	Has your opinion on this statement changed since the last questionnaire? ◯ **Yes** ◯ **No** If *yes*, why?					
8 a)	**If I decided to, it would be easy for me to use less water *at home***	◯	◯	◯	◯	◯
b)	Has your opinion on this statement changed since the last questionnaire? ◯ **Yes** ◯ **No** If *yes*, why?					

For each statement, select one answer for part a*, and select yes or no for* part b

		Strongly approve	Approve	Not care/ neither approve nor disapprove	Disapprove	Strongly disapprove
9 a)	If I tried to reduce the amount of water I used, my *friends* would....	○	○	○	○	○
b)	Has your opinion on this statement changed since the last questionnaire? ○ Yes ○ No If *yes*, why?					
10 a)	If I tried to reduce the amount of water I used, my *family* would....	○	○	○	○	○
b)	Has your opinion on this statement changed since the last questionnaire? ○ Yes ○ No If *yes*, why?					

		Very often	Often	Occasionally	Rarely	Very rarely/ never
11	While I am waiting for the water from the tap to run hot, I collect the cold water and re-use it	○	○	○	○	○
12	I leave the tap running when I brush my teeth	○	○	○	○	○
13	I put the plug in the sink when I wash my face	○	○	○	○	○
14	I leave the bathroom to do other things while the shower is running to give the water time to heat up	○	○	○	○	○

12. a) Have you learned about water in subjects other than Geography?

Yes No

b) If *yes*, in which subject(s)?

13. Where have you mainly learned about saving water, other than school/college?
Please tick one box

TV/radio Family Post/leaflets

Internet Friends Other *(where?)*

Newspapers/magazines

I don't learn about saving water other than at school/college

14. Which topic within Water Conflicts did you enjoy the most?

15. Did the lessons change the way you use water at home? *Please tick one box*

Yes No

Why?

16. What is your favourite topic to study in Geography, and why?

Please tick if you filled in the first questionnaire on water in June

Please tick if you took part in the focus group in June

The End

Thank you!

Appendix D: Topic Guides for each focus group

Alfon School and Braveley School – topic guide for first focus group

- **Introduce** self and give brief background to study, if not already given **(3 mins)**:
    - I'm doing some research for the university about how people use water and their attitudes towards it, so that we can manage resources better in the East Midlands. I would like to know your opinions and these will be very useful to me
    - We're just going to chat for about 40 minutes about a few issues around water in the local area, the UK, and internationally
    - It's not a test and not being marked so don't worry, and no right or wrong answers- just interested to hear your views. If you hear something you agree with or disagree with, just jump in
    - I'm video recording the conversation so I can watch back and remind myself what everyone said. It will be typed up but your names won't be on it
    - Check everyone is ok with the plan

- **Brainstorm environmental issues:** Ask pupils to call out suggestions
    - Which of these worries you the most?
    - How do you think these issues might change over time? And why?

- A number of the issues we've mentioned related in some way to water. I want us now to consider **what kind of water-related issues people face in the UK and across the world** (write on board/paper)
    - Get them to suggest some problems- if not forthcoming, hint at cleanliness of water, availability, whether it is piped into the home, flood and water shortage/drought, impacts on farming
    - Which do you think are most important in the UK? Why?

- **Has anyone here had a personal experience of flooding, or of a water shortage (or *drought*)?** (Get them to describe how it made them feel)
    - If no, have you read about it in the papers or heard about people who have? How do you think it affected them?
    - How do you think you would feel about water if you lived in a house that regularly got flooded? And if you were a farmer who regularly experienced a lack of rainfall/drought?

- **Essential water uses activity in groups with paper**: List 6 different activities you or your family uses water for. [I write all suggestions up on or big paper] Which of these do you think are essential and you couldn't live without? [Discuss]. Now imagine you lived in a rural village in an African or Asian country. What water uses might you remove from your list and are there any that you might add? [Discuss]. (Don't hint, as will use again in second focus group)

- **Cutting water use activity in pairs with paper:** I want you to imagine you had to halve the amount of water you use every day.
    - What would you do to cut your water use?
    - Hints (only if they're stuck- want to wait and see what they learn themselves later on!)- showers instead of baths, tap off when brushing teeth, collecting rainwater (where else do we get water from other than the tap? How could we use this?), having plants tolerant of drought, collecting shower water with a bucket and using to flush toilet, not flushing every time, dual flush toilets
    - How would other people in your family feel about making these changes? Would you need your parents' approval to make these changes?
    - How do your parents or siblings act towards water? Or the environment?
- Are you encouraged at home or at school to save water? How do you think this fits in with trying to stay clean and healthy- can you do both?
- Is there anything you notice at school that is different to what you do at home?

Additional for Alfon School: Hidden water activity
Additional for Braveley School: Question about water use in other countries (relating to questionnaire) and changes in the weather over their lifetime

Alfon and Braveley Schools- topic guide for second focus group

Objective: To see whether pupil attitudes towards water have changed and whether there is evidence for increased water literacy

- *Be honest- not about giving the 'right' answers*
- *As before, I'm recording this so I can listen back to it and type it up, but your names won't be on the type-up. Is that all ok with everyone?*

1.Learning/Virtual water

- Can you tell me a few things you learned since I first came in about water? What did you think/were you surprised by anything you learned? Why?
- Were you surprised that the average Australian uses more water than the average Briton? Why do you think this might be?
- Can you tell me some ways we are linked to water resources across the world? (Seen as 'someone else's problem')?
- What did you learn about virtual water? Why might we want to reduce our virtual water footprint?
- Did you discuss any of these things outside the classroom? Did you tell friends/family members?
- What other topics did you study in geography this term? Could you see the links between water and some of these other lessons?
- What types of lessons do you enjoy the most?
- If you were to have another lesson on water, what would you like to learn about?

2. Water use at home

- After the first focus group, did you notice anything differently about how you use water?
- How long did this last for, or still doing it?
- We talked a bit about different attitudes towards water between family members. What are attitudes like in your house about water?
- Could you change yours or your family's water usage? Do you feel like you have this power?
- We talked very briefly last time about hygiene- flushing the toilet, showering and bathing. Water is closely linked to feeling clean and healthy. Do you think it is possible to save water while still feeling clean and healthy? How might we do this?
- How might these kinds of attitudes differ in other countries?
- Imagine you only had running water for a couple of hours each day. Would you find it easy to adapt? How would you change your lifestyle?

Chalksmere College- topic guide for second focus group

Objective: To see whether pupil attitudes towards water have changed and whether there is evidence for increased water literacy

- *Be honest- not about giving the 'right' answers*
- *As before, I'm recording this so I can listen back to it and type it up, but your names won't be on the type-up. Is that all ok with everyone?*

1.Learning

- When did you finish water?
- How are you feeling about this section of the exam?
- Can you tell me a few things you learned since I first came in about water? Were you surprised by anything you learned? Why?
- Could you see the links between water and topics you've studied in geography before?
- What stood out as a major water issue to you?
- Can you tell me some ways we are connected to water in other countries? (Seen as 'someone else's problem'?)
- Did you discuss any of the things you learned, outside the classroom? Did you tell friends/family members?
- I know you've finished water, but were you to have another lesson, what would you like to cover?
- Where else do you learn about saving water, other than at school? (in Q)
- In general, what types of lessons do you enjoy the most?

2. Water use at home

- After the first focus group, did you notice anything differently about how you use water?
- How long did this last for, or still doing it?
- Did you notice anything that you hadn't noticed before? (i.e. processes that involve water and keep things clean; how often you flush the toilet)
- Do you feel more or less like you could reduce your water use?

- Do you think you could you change yours or your family's water usage? [Do you feel like you have this power?]
- We talked very briefly last time about hygiene- flushing the toilet, showering and bathing. Water is closely linked to feeling clean and healthy. Do you think it is possible to save water while still feeling clean and healthy? ….How might we do this?
- How might these kinds of attitudes differ in other countries?

- Imagine you only had running water for a couple of hours each day. Would you find it easy to adapt? How would you change your lifestyle?

- Do you think the lessons have changed your attitude towards water at all? Has it made you think differently?

- Lessons all about global issues- do you relate it to your local area?

Appendix E: Guide for lesson observations

Guide for lesson observations

General- teaching

- Is pace matched to understanding?
- How are learning objectives coming across/being tested?
- In what ways is learning promoted? Is it tailored to different types of learner (e.g. kinaesthetic)?
- Is knowledge being co-produced? If so, how?
- How is the lesson structured in terms of activities?
- Are links made to learning outside the classroom or actions at home (transferable education)?
- What resources and sources of information are used? What might their agenda be? Is any attempt made to balance this?

General- learning

- Are there high fliers/ special needs pupils in the class?
- How are different pupils responding to different types of resources?
- How learner-centred is the teaching approach? Do pupils get to contribute?
- Are they engaged, attentive, interested? Do pupils have a positive attitude towards learning?
- Is learning evaluated/consolidated at the end?

Water

- What are the themes being covered?
- Are the teacher's personal views on the topic apparent? Is an emotional response being encouraged (e.g. empathy)?
- Are connections being made with pupils' personal water use?
- Is the focus global, national, local or a mixture of the three?

- Can the building of water literacy or water citizenship be noted? How?
- Does creativity/action work in the water context?

Notes on:
Lesson … of ….; Time
Topic and lesson name
Group size and number of boys/girls
Year
Support staff?

Appendix F: Lesson plans for Alfon School

1- Introduction	**Date** 12th January
Lesson aim To understand why we need to manage water	
Learning objectives How do we use water? How does water get to where we need it to be?	
Resources needed Photocopies of questionnaire, introductory PowerPoint and technology, video clips	
Suggested activity	**Teaching strategies/actions and sources of information**
Starter: Pupils fill in questionnaire	I introduce myself and briefly explain what I do. Hand out questionnaire for pupils to fill in- allows me to gauge their knowledge about and attitudes towards water before lessons
Introduction	PowerPoint introducing water issues: http://www.ndhs-sites.org.uk/global/water/global_water.htm (Water.ppt link)
How many different ways do we use water, and how much water do we use?	Pupils make a list of all the things they did after school yesterday that used water. Discussion of lists. What other water uses are there in the home? How much water might these actions use? Figures on water usage: http://www.uswitch.com/water/how-much-water-use/ Pie chart of relative water uses in the home: http://www.sustainable-blewbury.org.uk/recycling.htm
(How is water cleaned and moved around?) – if time	(Video clip: http://www.bbc.co.uk/learningzone/clips/water-treatment-in-the-uk/4742.html Use resources from http://www.yorkshirewater.com/education-and-learning/school-zone/the-water-cycle.aspx including posters. Pupils could fill in key words on blank copies)
Why do we need to manage water?	Images of flood and drought- discussion of what these words mean and why this happens Clip on drought: http://www.bbc.co.uk/learningzone/clips/water-shortages-and-drought-around-the-world/11063.html Clip on flooding: http://www.bbc.co.uk/learningzone/clips/rainfall-and-flooding-around-the-world/11170.html

	Other resources:http://www.redcross.org.uk/What-we-do/Teaching-resources/Lesson-plans/Floods http://www.weatheronline.co.uk/reports/wxfacts/Drought.htm
Wrap up: Pupils make mind maps of reasons why we need to manage water	
Assessment opportunities and evidence of skills developed Interpreting tables, charts and images. Mind maps allow comprehension to be assessed	
2- Water across the world	**Date** 13th January
Lesson aim To recognise differences in water availability and consumption across the world, and the outcomes of this	
Learning objectives How is water used across the world? What are the issues associated with not having enough clean water?	
Resources needed Photocopies of maps, video clips and technology, buckets, water supply, litre container, stopwatch, outside space	
Suggested activity	**Teaching strategies/actions and sources of information**
Starter: Which places in the world are water-rich and which are water-poor?	Worldmapper maps of water resources and water usage handed out. What could be the reasons for these differences? http://www.worldmapper.org/posters/worldmapper_map102_ver5.pdf http://www.worldmapper.org/posters/worldmapper_map104_ver5.pdf Pupils write a couple of interesting facts on their maps
Water carrying activity	Introduction to idea of having to go collect water. How long do pupils think it would take to carry a bucket of water a certain distance? Outside- pupils use litre containers to fill the buckets, and then carry them for a given distance (to see what situation is like in countries where water has to be collected). One pupil times the others to see how accurate their guess was
How do people in	Show video clip:

other countries use water?	http://www.teachersmedia.co.uk/videos/managing-water-in-kenya Discussion of water carrying activity and video clip- why did we do this activity? How did it make pupils feel? How successful was it? How would their lives be different if they did not have a water supply to their home/school?
What happens when there is a lack of clean water?	Brief discussion of water-borne diseases and why these affect developing countries more than developed countries (PowerPoint slides) Show The Diarrhoea Song (Water Aid): http://www.youtube.com/watch?v=EtwBxrcPnoc&feature=plcp&context=C35afce9UDOEgsToPDskJHYI2vgg2cNge1jwdAiVcq Pupils write a paragraph about the problems associated with not having a clean water supply to their home (could take on the voice of someone in a developing country)
Wrap up: Discussion about water treatment and supply in the UK (last lesson) compared to developing countries. How many buckets of water would it take to flush the toilet/have a bath/take a shower?	
Assessment opportunities and evidence of skills developed Interpretation of maps, empathy, writing. Written work and responses in discussion will demonstrate understanding	

Additional resources/sources of information:

http://www.peopleandplanet.net/?lid=26385&section=38&topic=44

http://www.youtube.com/watch?v=BQM_auo7-qk

http://www.globaleye.org.uk/primary_spring07/focuson/wateraid.pdf

http://www.actionaid.org.uk/102773/free_downloads.html

3- Water futures	**Date** 19th January
Lesson aim To understand how water usage and availability will change in the future	
Learning objectives How much water will we have in the future? How much water will we need in the future?	
Resources needed Pupil maps from last lesson, video clip and technology, PowerPoint slides on	

the impacts on water usage, Resources on water consumption in UK and other countries, Photocopies of speech bubble sheet,	
Suggested activity	**Teaching strategies/actions and sources of information**
Starter: Recap water usage in the UK and in other countries	Pupils look at their maps from last lesson
Threats on water supply	Show a video clip on this topic- could discuss and pupils take notes Information source: http://worldsavvy.org/monitor/index.php?option=com_content&view=article&id=702&Itemid=1187
What affects water usage? How might this change in the future?	PowerPoint slides on development, industry, demand for luxuries, climate change etc (pupils could write down key words in pairs) Pupils look through table of resources on current and future water consumption in China, Kenya, UK and USA and make notes, referring to their maps to see where these countries are Resources: e.g. http://www.nies.go.jp/gaiyo/panf2002/developing/developing-e.html http://envirowiki.info/Water_consumption
Speech bubble activity: What might this person's opinion be?	Pupils fill in speech bubbles according to what someone from China, Kenya, UK and the USA might think about water supply and consumption
Wrap up: How does supply link to demand, or doesn't it? How could we make sure there is enough water? (introducing tomorrow's topic)	
Assessment opportunities and evidence of skills developed Interpretation of maps, synthesis of information, empathy. Discussion of speech bubble activity and notes from video will demonstrate comprehension	

Additional resources/sources of information:

http://blogs.princeton.edu/chm333/f2006/water/2006/11/how_does_water_use_in_developing_countries_differ.html

4- Saving water	**Date** 20th January
Lesson aim To recognise the ways in which we can reduce our water consumption	
Learning objectives What small and big steps can we take to save water? What would encourage people to use less water?	
Resources needed Photocopies of campaign materials, video clips and technology, PowerPoint slides	
Suggested activity	**Teaching strategies/actions and sources of information**
Small steps	Ask pupils what they could do at home to save water and make suggestions Many sources e.g. http://www.waterwise.org.uk/pages/quick-tips.html; http://www.water-guide.org.uk/tips-home.html
Big steps	Introduction to rainwater harvesting and greywater recycling (e.g. PowerPoint) Sources: http://www.schools.indiawaterportal.org/node/9; http://www.environment-agency.gov.uk/homeandleisure/beinggreen/118948.aspx
Effective ways of saving water	Pupils look through resources from past water saving campaigns e.g. selection of: http://www.guardian.co.uk/environment/video/2009/sep/24/water-saving http://www.bigtapchallenge.co.uk/downloads.php http://www.direct.gov.uk/en/Environmentandgreenerliving/Energyandwatersaving/DG_064370 http://www.wastingwaterisweird.com/ Questions to think about: Why are they/aren't they effective? Why is saving water important? Key words?
Leaflet/poster making	Pupils design a poster or leaflet to encourage children or adults to save water, thinking about what might appeal to different audiences
Wrap up: Discussion/mini presentation of leaflets and posters, with pupils explaining their decisions on how to present it and what to say	
Assessment opportunities and evidence of skills developed Presentations, persuasive writing. Evidence of learning provided by pupil presentations of posters and leaflets	

5 – Water Warriors- The Water Game	**Date** 26th January
Lesson aim To promote understanding of what happens when water is polluted or overused	
Learning objectives What different people use water and what do they use it for? What effects does this have? How can their needs be balanced?	
Resources needed Instruction sheets, box, scissors, blue and brown paper, white paper, labels, templates	
Suggested activity	**Teaching strategies/actions and sources of information**
The Water Game (Greenpeace resource)	Use resources from http://www.greenpeace.org/international/Global/international/artwork/toxics/2010/water/files/Activity_Plan_03.pdf
Wrap up: What issues were come across in the game? What was learnt?	
Assessment opportunities and evidence of skills developed Teamwork, empathy. Discussion of what has been learned at end of game	

6- Introducing and planning the enquiry	**Date** 27th January
Lesson aim To launch an investigation into water at Alfon School	
Learning objectives What questions could we ask about water at Alfon School?	
Resources needed Photographs of Alfon School building, map of Alfon School site, instructions on how to make a rain gauge, table of data on rainfall in local area, information about the water conservation technologies in the school building, blank school water audit sheets	

Suggested activity	**Teaching strategies/actions and sources of information**
Introduction	Idea of investigation introduced and plan for next few lessons
Picking topics using stimuli	Pupils look through resources in groups and come up with a questions they would like to answer with help from teacher e.g. how much rain do we get in different places around the school site? How does rainfall compare at Alfon School? to our homes? What do the water conserving aspects of the building do? How is the rainwater used e.g. for toilet flushing? How much water do we use at school?
Planning investigation	Work in pairs then discuss as a class what information needs to be collected to answer each question and how it could be done e.g. interviewing the school site manager, making and putting down rain gauges in different places, internet research, doing a water audit (e.g. http://thewaterschool.co.uk/Audit/water_audit.html; http://www.anglianwater.co.uk/_assets/media/Waterwise_pack-lowres.pdf). Groups select/are allocated a question to address
Wrap up: Recap of questions and what answering these might tell us. Explain that pupils will be doing presentations on what they find and there will be peer assessment with given criteria- hand out mark sheets. Criteria could be inclusion of key 'water words' as well as clear speaking etc	
Assessment opportunities and evidence of skills developed Identification of research questions, synthesis of resources	

7- Planning and carrying out enquiry	**Date** 2nd February
Lesson aim To carry out enquiry into a topic around water at Alfon School	
Learning objectives How can we answer our question about water at Alfon School?	
Resources needed Site manager, access to grounds, materials to make rain gauges, map of grounds, plan of school	
Suggested activity	**Teaching strategies/actions and sources of information**
What data do we need and how can we collect it?	Teacher talks to each group to help work up a feasible plan

Data collection	After finalising group plans, pupils start collecting data
Assessment opportunities and evidence of skills developed Planning a viable enquiry, data collection/fieldwork, group work. Pupils discuss plans with teacher	

8- Carrying out enquiry	**Date** 3rd February
Lesson aim To carry out enquiry into a topic around water at Alfon School	
Learning objectives How can we answer our question about water at Alfon School?	
Resources needed Site manager, access to grounds, materials to make rain gauges, map of grounds, plan of school	
Suggested activity	**Teaching strategies/actions and sources of information**
Continue from last week- data collection	Teacher checks how much progress made last week and advises groups on how to proceed. Pupils continue with and complete data collection. Tick sheet for pupils to fill in to check progression- have we answered our question? Has every member of the team played a part?
Wrap up: Teacher brings pupils together at end of class to assess progress	
Assessment opportunities and evidence of skills developed Group work, data collection/fieldwork. Progress of each group assessed by teacher	

9- Analysing the information	**Date** 9th February
Lesson aim To analyse the information collected and decide how to present it	
Learning objectives How can this information/data be presented to the class? What can we say about it?	
Resources needed Computers, printer, poster paper, pens, sheets of 'key water words'	
Suggested activity	**Teaching strategies/actions and sources of information**

How to analyse the data?	Discussion with teacher about best way to analyse the collected information
Introduction to presenting	Teacher provides ideas for presentation methods e.g. a poster, leaflet, PowerPoint, role play etc
How to present the data?	Discussion with teacher about best way to present findings to the class
Group work- making presentations	
Assessment opportunities and evidence of skills developed Presentation, group work, data synthesis and analysis. Progress evaluated by teacher during and at end of lesson through discussion with groups	

10- Presenting the findings	**Date** 10th February
Lesson aim To present the findings of group enquiries to the class	
Learning objectives How can we demonstrate what we have learned?	
Resources needed Projector, photocopies of peer assessment criteria sheet	
Suggested activity	**Teaching strategies/actions and sources of information**
Introduction	Go over idea of peer assessment and criteria again- hand out marking sheets
Groups present their findings to the class	Peer assessment with sheets
Discussion of peer assessment results and reflection on what pupils have learned from each other	
Wrap up: Consolidation of scheme of work. If time, pupils write a paragraph about this	
Assessment opportunities and evidence of skills developed Peer assessment and discussion of criteria and marking, presentation, group work	

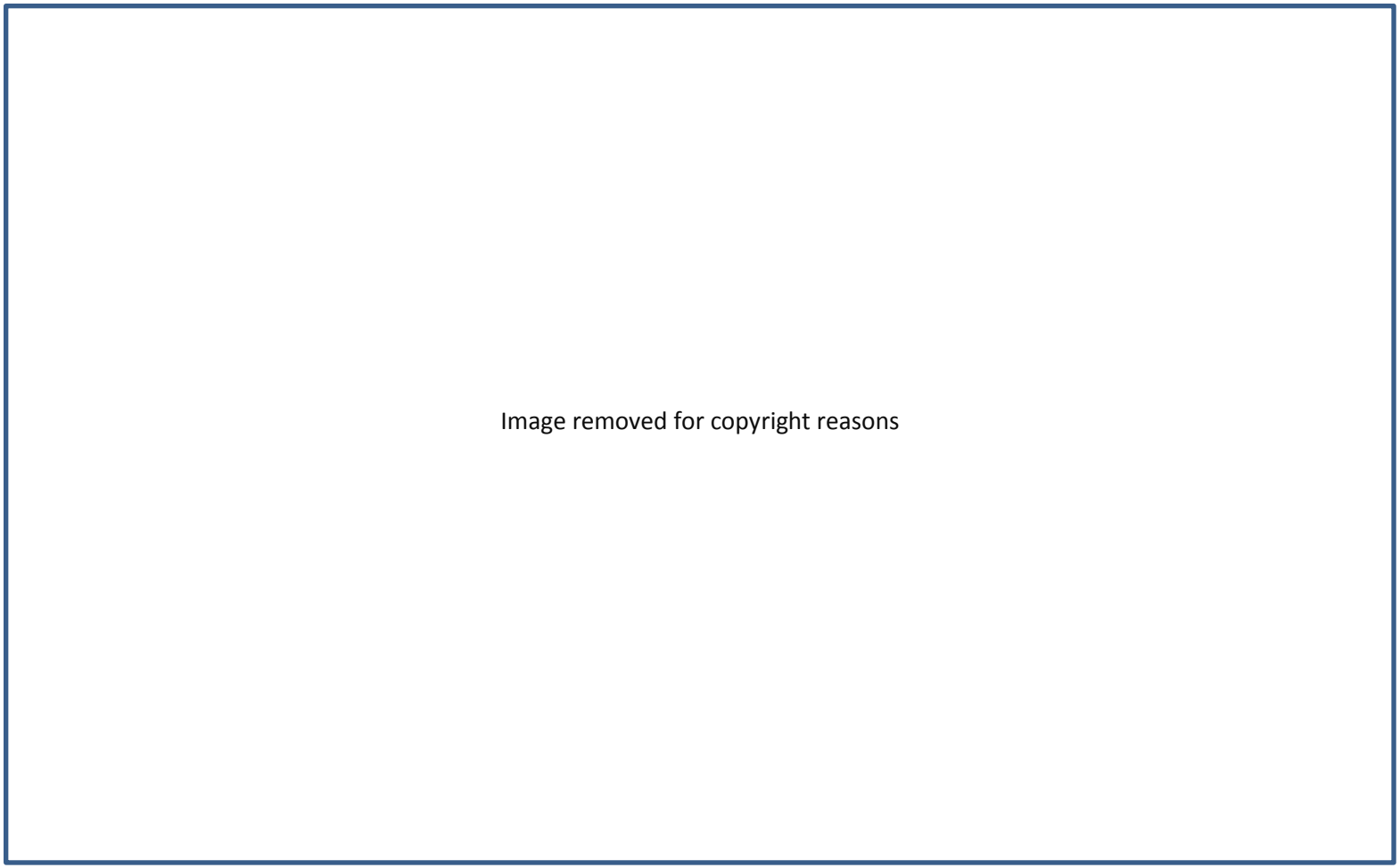
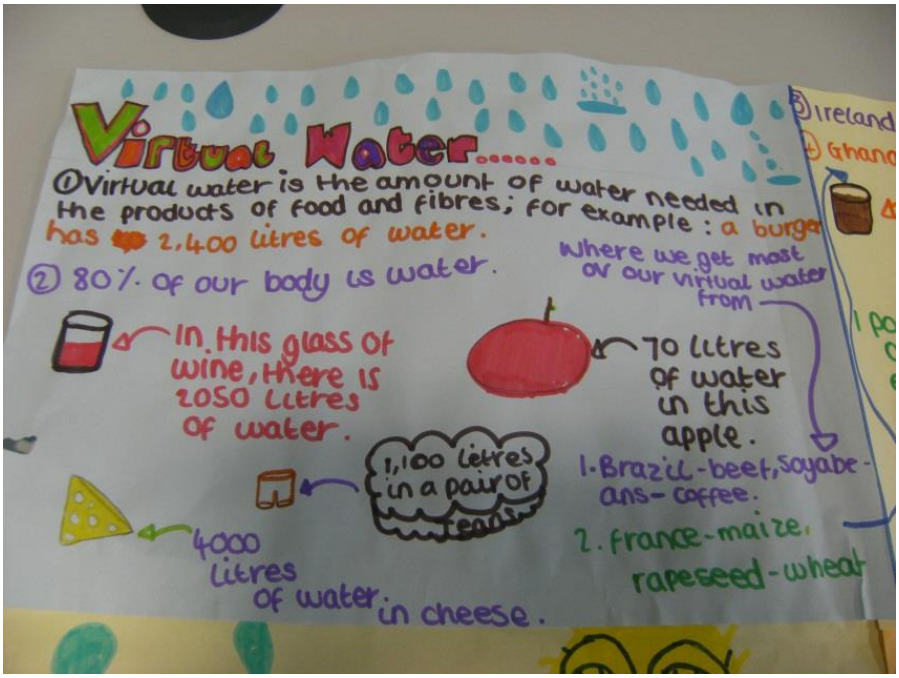
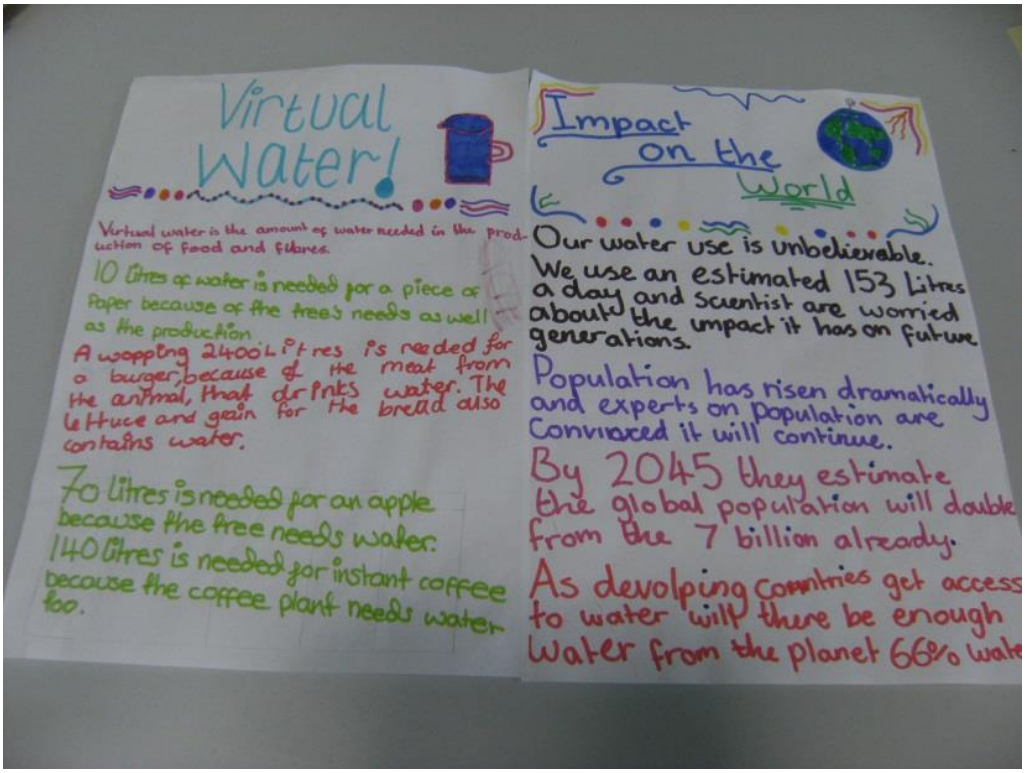


Figure F Map distorted to represent the proportion of global water use occurring in each country (Worldmapper, 2006)

Appendix G: Selection of posters created by Alfon School students after the end of the programme




Virtual Water!
Virtual water is the amount of water needed in the production of food and fibres.
10 litres of water is needed for a piece of paper because of the trees needs as well as the production
A wopping 2400 Litres is needed for a burger, because of the meat from the animal, that drinks water. The lettuce and grain for the bread also contains water.
70 litres is needed for an apple because the tree needs water.
140 litres is needed for instant coffee because the coffee plant needs water too.
Impact on the World
Our water use is unbelievable. We use an estimated 153 Litres a day and scientist are worried about the impact it has on future generations.
Population has risen dramatically and experts on population are convinced it will continue.
By 2045 they estimate the global population will double from the 7 billion already.
As devolping countries get access to water will there be enough water from the planet 66% wate